DESCRIPTION:


PREREQUISITE:  Calculus II (MAC 2312) with a grade of "C" or better.

COURSE DESCRIPTION:  Methods of solution of ordinary differential equations, linear and non-linear systems of differential equations, and boundary value problems. Methods include operators, undetermined coefficients, variation of parameters, Laplace transforms, and series solutions. There is also utilization of the CAS (Computer Algebra System) MAPLE. A graphing calculator is required. Lecture 3 hours.

GOALS OF THE COURSE:  Since this is an introductory course, its primary goal is to teach the student how to solve a fairly representative assortment of types of differential equations which will be useful in her/his future course–work and in his/her future profession. A secondary goal, and one which takes longer to achieve, is that of helping the student to see how to construct mathematical models which are fairly faithful translations of specific physical problems, and which, naturally, result in a differential equation, or system of differential equations. This secondary goal is really the more important of the two, but it cannot be completely accomplished within the framework of MAP 2302; it can at most be begun here with its development continued in subsequent courses.
COURSE OUTLINE:

• Basic Definitions
• First Order Differential Equations
• Preliminary Theory
• Separable Variables
• Homogeneous Equations
• Integrating Factors
• Linear Equations
• Bernoulli Equations
• Linear Differential Equations of Higher Order
• Initial Value Problems & Boundary Value Problems
• Linear Dependence and Linear Independence
• Solutions of Linear Equations
• Constructing a Second Solution from a Known Solution
• Homogeneous Linear Equations with Constant Coefficients
• Undetermined Coefficients; Superposition
• Differential Operators
• Undetermined Coefficients; Annihilators
• Variation of Parameters
• Applications of Second-Order Differential Equations
• Simple Harmonic Motion
• Damped Motion
• Forced Motion
• Systems of Linear Differential Equations
• Operator Method
• Systems of Linear First-Order Equations
• Introduction to Matrices
• Matrices and Systems of Linear First-Order Equations
• Homogeneous Linear Systems
• Laplace Transform
• Laplace Transform
• Inverse Transform
• Translation Theorems and Derivatives of a Transform
• Transforms of Derivatives, Integrals, and Periodic Functions.

PERFORMANCE OBJECTIVES: At the end of this course the student should be able to:

• Solve differential equations employing the techniques of
  • Separation of Variables
  • Homogeneous Equations
  • Exact Equations
  • Linear First-Order Equations
• Solve certain Initial Value Problems and Boundary Value Problems
• Identify Linearly Independent Solutions
• Construct a Second Solution from a known Solution
• Utilize the Method of Undetermined Coefficients
• Manipulate Differential Operators
• Utilize the Method of Variation of Parameters
• Set Up and Solve certain Harmonic Motion problems
• Solve Systems of Linear Differential Equations
• Utilize the Laplace Transform in the solution of certain Differential Equations
ADMINISTRATION:

ATTENTION: ACADEMIC ALERT! The 1997 Florida Legislature passed House Bill 1545 which requires that students enrolled in the same college credit course more than two times shall pay non-resident fees the third time they sign up to take the course. Florida College and Universities were required to start “counting” attempts beginning in the Fall Semester 1997. A course is considered a valid attempt if it remains on your schedule past the published College refund date.

SPECIAL ACADEMIC ALERT FOR FUTURE ENGINEERS:
Engineering schools will not accept the grade from a third try in physics or in other required core courses (such as calculus or chemistry). Your minimum acceptable grade (C for most, B for some majors) and core GPA (at least 2.5 nationally, more for some schools) are figured on at most two attempts, and withdrawals (W or AW) count as attempts. All attempts at any institution you attend are counted, not just ones at TCC.

WEB-ASSISTED CLASS: This is a web-assisted class – def. “Classroom based course with some use of internet resources required.”

BLACKBOARD: I shall use the “BlackBoard” program for posting of announcements and grades.

WITHDRAWALS: If you decide to withdraw from this course, the last date for you to withdraw with a “W” or for me to withdraw you with an “AW” is

Monday, March 24, 2008

ATTENDANCE POLICY: Class attendance is required. Roll will be taken. If you have more than three (3) un-excused absences, you may be withdrawn administratively. If you have more than five (5) absences before Monday, March 24, 2008, for any reason whatsoever, you shall be withdrawn administratively. However, if you simply stop attending class after that date, you cannot be dropped. In such event, you will receive an F in the course.

Any late arrival or early departure, without prior permission not only exhibits poor manners, but also will be counted as an absence.

MAKE-UP POLICY, DUE-DATES, and ABSENCES: All work is due at a specified time, and late work will not be accepted. There can be no exceptions to this policy.
If you are out of town or otherwise unable to attend a class when homework is due, you may FAX me the work – as long as it is received before 9:55am on the day it is due. The departmental FAX number is 201–8119.

In any event, if you must miss any class, it is a common courtesy to notify the instructor. If you must miss a test, it is required that you notify your instructor (me) before the event, if possible, or as soon as possible after–the–fact. My office phone number is 201–8120, my e–mail address is  jonesd@tcc.fl.edu and the department's phone number is 201–8499. The FAX number is 201–8119.

**GRADING:** The following grading procedure is used for this course:

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G = \text{MAX}( G_1 : G_2 ) \quad \text{where} \\
G_1 = \frac{(T_1 + T_2 + T_3 + HQ + 1.5*E)}{5.5}, \\
G_2 = \frac{(T_1 + T_2 + T_3 - \text{min}( T_1, T_2, T_3 ) + HQ + 2.5*E)}{4.5},
\]

and

\[
G = \text{Course Grade}; \quad T_1 = \text{Test 1 Grade}; \quad T_2 = \text{Test 2 Grade}; \quad HQ = \text{Homework, Notebook & Quiz Avg}; \quad \text{and} \quad E = \text{Final Exam Grade}.
\]

The Grading Scale is:

- A: \( G > 89.5 \);
- B: \( G > 79.5 \);
- C: \( G > 69.5 \);
- D: \( G > 59.5 \);
- otherwise F.

**COMPUTERS & CALCULATORS:** The class will be using Maple® periodically, and I'll be using both Maple® and a TI–84 and/or TI–89 ® graphing calculator with an overhead projector just about every day in class. I also use a HP–48GX ®. I shall specify, prior to test time, which calculators will be permitted and whether MAPLE will be permitted.

Please note: **All calculators will be cleared (reset)** at the beginning of each test and at the Final Exam.

Finally, I'll maintain a fairly complete web–page for this course at [http://faculty.tcc.fl.edu/scma/jonesd/index.htm](http://faculty.tcc.fl.edu/scma/jonesd/index.htm)
OTHER EQUIPMENT: In addition to a graphing calculator, discussed above, you will need the following equipment:

- a straightedge,
- a compass,
- a protractor,
- a mechanical pencil (0.5 mm with HB or B lead), and
- a decent eraser (One may come with your pencil, but I doubt it!)

OUTSIDE HELP: I will be more than happy to help you during my office hours. Just come to my office in SM243. Please organize your questions in advance so that we can efficiently use our time.

PHILOSOPHY:

TCC TEACHING MISSION STATEMENT:
The Faculty is committed to creating a learning environment for all students which promotes, encourages, and fosters higher-order thinking and critical thinking skills that are grounded in an understanding of the fundamental concepts of the disciplines in which they are taught.

CRITICAL THINKING:
One goal of the college is to foster critical thinking. Course learning objectives integrate the range of higher-order thinking skills as described by Bloom. The six categories, listed in order of increasing complexity, are:

1. Remember – to retrieve relevant knowledge from long-term memory
2. Understand – to construct meaning from instruction (oral, written, graphical, etc.)
3. Apply – to use a procedure
4. Analyze – to break material into constituent parts and relate to each other and the whole
5. Evaluate – to make criterion-based judgments
6. Create – to put elements together to form coherent whole, to reorganize, etc.

STUDENT ASSESSMENT AND THE FEEDBACK LOOP:
The solution of problems and the learning of how to solve problems are enhanced via the feedback loop. The feedback loop is a process which takes place during and after problem-solving in which both successes and errors are reported back to the problem-solver so that
corrections and adjustments can be made and so that the direction to proceed can be determined.

There are two feedback loops – internal and external. Possibly the more important of the two is the **internal feedback loop** in which the problem–solver critically evaluates her/his work output. This may be the most pure form of **critical thinking!** If errors are detected, the problem–solver (the *student*) has the opportunity to make corrections on the fly and thus not only to avoid incorrect final answers, but also to produce in her(him)self an extremely powerful positive reinforcement regarding the efficacy of her(his) mental ability. However, it seems that in many cases the student has not thought about, has not been taught about, and has not studied this process. Therefore, the degree to which the student applies the feedback loop, if at all, is problematic. Furthermore, even students who do apply the feedback loop often do it only once at the conclusion of their work on a problem, rather than repeatedly during each step of the problem–solving process, where it would be most effective.

The **external feedback loop** consists, of course, in the process of the assessor’s (teacher’s) grading the work product. There are several rather obvious reasons why this latter loop is far less effective in fostering the learning process than the former. (1) The temporal problem – It is well–known that immediate correction produces behavior less–likely to repeat the error than does delayed correction. (2) The psychological problem – Self correction is less threatening to the ego than external correction. And when the ego gets in the way, learning often ceases! (3) The volumetric problem – I (the teacher) often don’t have time to actually “correct” the students’ work. Most often I merely assign a score to the work. This is an important assessment of the work product, but it is of little (or perhaps negative) value to furthering the learning process. However, assess I must!

There are four areas in which I will assess your development of problem–solving, symbol–manipulating skills:

1. **QUIZZES**: Many Pop Quizzes will be given (take–home or in–class).

2. **HOMEWORK**: Homework must be done in order to succeed in this class! If you are unwilling or unable to devote at least two homework hours outside class for every hour inside class, you will not realize your potential. There are two types of homework assigned in this course:

   # **TURN–IN HW & PROBLEMS–OF–THE–DAY (TI & POD)**: Selected homework problems will be collected. They will be graded for technique, accuracy, and

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¹ Note: This is just homework time; it does not include the time necessary to read the textbook, work through the examples, and think about the material.
neatness. At the end of the semester, the lowest TI/POD grade will be dropped before computing your homework average.

# NOTEBOOK HW (NB): These problems are to be done on a daily basis. These problems should be kept in a separate notebook. Each section must be clearly labeled. You will turn–in your homework notebook at test time! The degree of completion of the assigned problems will result in a grade. Each notebook grade will count as three (3) turn–in assignments. No late notebooks will be accepted. No notebook grade will be dropped.

Detailed instructions on the type of notebook required and on the formatting of homework will be given in a separate hand-out.

3. TESTS: There will be three (3) Unit Tests during the semester. The dates are shown on the Pacing Schedule and below. The tests will be free–response (not multiple choice or true–false), and considerable credit will be given for correct technique and proper application of theory and concepts. The tentative test dates are:

  Test #1: Wed. Feb. 20
  Test #2: Mon. Mar. 17 (Unfortunately)
  Test #3: Mon. Apr. 7

4. THE FINAL EXAM: The Final Exam will be cumulative. It will be given in this room.

   # The date and time are: Monday, April 21, 2008 @ 7:30 am – 9:30 am.

IF YOU MISS THE FINAL EXAM FOR ANY REASON WHATSOEVER, WITHOUT PRIOR ARRANGEMENT WITH ME, THEN YOU'LL GET AN “F” IN THE COURSE, REGARDLESS OF YOUR COURSE AVERAGE. IF YOU SUBSEQUENTLY JUSTIFY YOUR ABSENCE, PROVISION WILL BE MADE. HOWEVER, MY GENERAL POLICY IS THAT THERE WILL BE NO EARLY EXAM, NO LATE EXAM, AND NO MAKE–UP EXAM.

ALSO, ANYONE ARRIVING TO TAKE A FINAL EXAM AFTER THE FIRST PERSON HAS LEFT THE EXAM WILL NOT BE ALLOWED TO TAKE THE EXAM.

IV PACING SCHEDULE:
The Semester is a very busy time. As you will see from the pacing schedule (separate
document), we must cover many sections. To be successful, we shall need to demonstrate a great deal of dedication and commitment to this course. **Time management**, both in class and out of class, will be indispensable to our success.

To help you in this course, here are some ideas that come to mind:

- You must be prompt in your arrival to the classroom.
- You should read over the material to be covered in class **before** class, even if you don’t understand it all (or even most of it)!
- You should do your “notebook” homework every day – don’t wait until Sunday evening to do your ODE!
- You should do your “turn-in” homework and/or POD’s (Think of these as “Technical Memoranda” to Your Supervisor) ASAP after the assignment is made.
- You should check the ODE web-page often.
- You must read this entire syllabus.