MATH 2420.OU1 Su 2017

Section	Course Number	Location	Days	Time	Instructor
OU1	Math 2420	JSOM 12.218	Tu-Th	12.30-2.45pm	Dr. Viswanath Ramakrishna

Instructor Information

Instructor	Phone	Office	E-mail	Office Hours
Dr. Viswanath Ramakrishna	(972) 883 6873	FO 2.408C	vish@utdallas.edu	Tu-Th 3-4 pm

Problem Sections

Every student must be registered for one of the two problem sessions Math *2420.8U1* or Math *2420.8U2*, held on Tuesdays from 5.30-7.45pm in **PHY 1.202** or **SLC 2.203** respectively. All quizzes for the course will be held during those problem sessions.

Optional Problem Session

Starting June 7th (Wednesday), I (not the TA) will conduct an optional problem session from 4pm to 5pm in JSOM 12.206. The problem session is optional. It will be used to cover HWs and additional material related to the course. Though optional, it is recommended. Students in the past have found it to be important for succeeding in this and subsequent courses which use this course as a prerequisite.

Textbook

The *recommended* text is **William E. Boyce and Richard C. DiPrima, Elementary differential equations and Boundary value problems, John Wiley & Sons**. Class Lecture Notes, based mostly on this text, will be provided. Please be forewarned that the course will cover things not in this text also. *Thus the notes supersede all textbooks.* Other useful texts and sources will be mentioned periodically.

Course Description

(adapted from the **Catalogue Description**): This is an introductory course to the theory of ordinary differential equations (ODEs). Topics to be covered include: first order differential equations, second and higher order linear equations, systems of frist order equations, series solutions of second order linear equations, special functions, the method of Frobenius, Laplace transform techniques, and boundary value problems.

Student Learning Objectives

1. Students will be able to identify different methods of solving differential equations and apply them to obtain solutions for various classes of differential equations.
2. Students will be able to apply their knowledge of differential equations to construct and analyze models arising in applications in mathematics, physics, and engineering.
3. Students will be able to perform quantitative and qualitative analysis of problems described by differential equations.

Course Content: The course will cover the following topics:

1. Introduction: Classification of Differential Equations, Illustrations of solutions to certain differential equations; review of necessary linear algebra.

2. **First Order Differential Equations:** Linear Equations; Exact equations, integrating factors, Separable Equations; Bernoulli equations, Ricatti equations, Statement of the Existence and Uniqueness Theorem.

3. **Second Order Linear Differential Equations**: Homogeneous Equations with Constant Coefficients; Solutions of Linear Homogenous Equations; the Wronskian; Complex Roots of the Characteristic Equation; Repeated Roots; Reduction of Order; Nonhomogeneous Equations; Method of Undetermined Coefficients; Variation of Parameters; Undetermined Coefficients for non-constant coefficient equations, integrating factors and reduction of order for second order linear and nonlinear equations (time permitting).

4. **Higher Order Linear Equations**: General Theory of nth Order Linear Equations; Homogenous Equations with Constant Coefficients; The Method of Undetermined Coefficients; The Method of Variation of Parameters;

5 . **Systems of First Order Equations**: Reduction of a scalar higher order equation to a system of I order equations; constant coefficient equations, exponential of a matrix; variation of parameters for systems of first order equations, systems with periodic coefficients, existence and uniqueness; Picard iteration; undetermined coefficients for systems.

6. **The Laplace Transform**: Definition of The Laplace Transform; Solution of Initial Value Problems; Step Functions; Differential Equations with Discontinuous Forcing Functions; Impulse Functions; The Convolution Integral;

7. **Series Solutions of Second Order Linear Equations**: Review of Power Series; Series Solutions Near an Ordinary Point, Euler Equations; Regular Singular Form, Bessel's Equation; Hypergeometric equations; connections to systems of I order equations.

8. **Boundary Value Problems**: Sources of two point BVPs, Separation of variables for the heat equation, Sturm-Liouville BVPS, Singular Sturm-Liouville problems.

9. **Nonlinear Equations and Qualitative Theory**: Conserved quantities, Lie series solutions, Hamiltonian systems, linearization of nonlinear equations, stability of equilibria, Lyapunov functions, periodic solutions, statement of Poincare-Bendixon theorem.

Assignments, Quizzes and Exams

Assignments: Homeworks will be assigned typically weekly and they very important part of this class. They form **20 percent** of your grade. All the assignments should be completed independently by the students. Each assignment is due on the due date posted on the HW. Some HWs have an online component. Late assignments will NOT be accepted.

Quizzes: From June 6th onwards there will be a weekly quiz during the problem session organized and marked by the teaching assistants. The quizzes constitute **10 percent** of your grade.

Exams: There will be three examinations. Textbooks, notes, calculators or other electronic devices won't be allowed during examination. Missed exams and assignments are assigned a zero. The three examinations have been scheduled as the following:

1. I examination will be held on June 29th during the problem session you are signed up for. The examination starts at 6pm and lasts 75 minutes. It is worth **25 percent of your grade**.

2. II examination will be held on July 27th during the problem session you are signed up for. The examination starts at 6pm and lasts 90 minutes. It is worth **25 percent of your grade**.

3. III examination will tentatively be held in class on August 10th. The exam starts at 12.30pm and lasts 75 minutes. It is worth **20 percent of your grade**.

Makeup Policy:

- In general makeups will be allowed only if there is a valid reason which is supported by official documentation. Examples of valid documentation are i) Doctors' notes; ii) Letter from employer (in case there is required work related travel, which conflicts with the day of an examination); iii) Travel documents (e.g., when a dire family related emergency travel conflicts with the day of an examination). Furthermore, the onus is on the student to intimate the instructor in a timely fashion (in particular, before the scheduled test), the possibility of having to miss the scheduled assignment.
- However, note that all such documentations will be rendered null and void, if there is any evidence that the student was, in fact, in a position to take the examination/quiz/HW at the originally scheduled time. Thus, for instance, a doctor's note advising rest on the date of an examination for this course will be considered null and void, if the student was known to have taken an examination for a different course on the same day.
- The makeup quiz/HW/examination must be taken at the earliest opportunity convenient to the instructor, once the reason for missing the scheduled examination is no longer in force.
- The makeup quiz/HW/examination cannot be guaranteed to be at the same level of difficulty as the original quiz/HW/examination which was missed.
- Failure to observe any of the above procedures will result in a score of zero being assigned for the quiz/HW/examination in question.

Grading Policy

Your grade is based on your cumulative score out of a 100 and the grading scale indicated below:
Grading Scale:

- ≥ 95 : A+; $\geq 88, < 95$: A; $\geq 82, < 88$: A-
- $\geq 78, < 82$: B+; $\geq 75; < 78$: B; $\geq 72 :< 75$: B-
- $\geq 68, < 72$: C+; $\geq 65; < 68$: C; $\geq 62 :< 65$: C-
- $\geq 58, < 62$: D+; $\geq 55; < 58$: D; $\geq 52 :< 55$: D-
- < 52: F

Your cumulative score will be calculated as follows:

1. Homeworks: 20 percent;
2. Quizzes: 10 percent;
3. I Midterm: 25 percent
4. II Midterm: 25 percent
5. Final: 20 percent

The UTD academic calendar lists important dates, such as university closings and withdrawal deadlines. Please consult that for these important dates.

UT Dallas Syllabus Policies and Procedures

The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus. For these policies, please go to

`http://coursebook.utdallas.edu/syllabus-policies/`

These descriptions and timelines are subject to change at the discretion of the Instructor.