Math 686, Numerical Solution of Differential Equations

Spring 2020: T 7:20pm – 10:00pm, Exploratory Hall, Room 4106

Instructor: Dr. Daniel Anderson
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Office Hours: Tuesday/Thursday 3:00PM-4:00PM, and by appointment.

Text: *A first course in the numerical analysis of differential equations* (Second Edition), by Arieh Iserles.

Prerequisites: Math 214 and Math 446 or 685 including sufficient recall of undergraduate linear algebra, differential equations and computer literacy including familiarity with Matlab.

Course Description: This course will cover the fundamental concepts of numerical methods for differential equations. Students will learn how computational methods are constructed, and how they are used to solve problems arising from the sciences and engineering.

Topics:

Chapter 1	Euler's Method
Chapter 2	Multistep Methods
Chapter 3	Runge-Kutta Methods
Chapter 4	Stiff Equations
Chapter 6	Error Control
Chapter 7	Nonlinear Algebraic Systems
Chapter 8	Finite Difference Methods (Poisson Eq.)
Chapter 9	Finite Element Methods (Poisson Eq.)
Chapter 10	Spectral Methods
Chapter 16	Diffusion Equation
Chapter 17	Advection Equation

Grading Policy: A student's course grade will be based on homework (50%), a midterm exam (20%) and the final exam (30%).

Final Exam: The final exam date is Tuesday, May 12, 7:30-10:15pm.

Online class information will be posted periodically on my webpage
`http://math.gmu.edu/~dmanders/WEBDAN/math686spring20.html`

Honor Code: It is expected that each student in this class will conduct himself or herself within the guidelines of the Honor Code. All academic work should be done with the level of honesty and integrity that this University demands.

Academic Integrity Mason is an Honor Code university; please see the University Catalog for a full description of the code and the honor committee process. The principle of academic integrity is taken very seriously and violations are treated gravely. What does academic integrity mean in this course? Essentially this: when you are responsible for a task, you will perform that task. When you rely on someone elses work in an aspect of the performance of that task, you will give full credit in the proper, accepted form. Another aspect of academic integrity is the free play of ideas. Vigorous discussion and debate are encouraged in this course, with the firm expectation that all aspects of the class will be conducted with civility and respect for differing ideas, perspectives, and traditions. When in doubt (of any kind) please ask for guidance and clarification.

Mason Email Accounts Students must use their MasonLIVE email account to receive important University information, including messages related to this class.
See http://masonlive.gmu.edu for more information.

Office of Disability Services If you are a student with a disability and you need academic accommodations, please see me and contact the Office of Disability Services (ODS) at 993-2474. All academic accommodations must be arranged through the ODS. http://ods.gmu.edu

Writing Center: A114 Robinson Hall; (703) 993-1200; http://writingcenter.gmu.edu

University Libraries Ask a Librarian http://library.gmu.edu/mudge/IM/IMRef.html

Counseling and Psychological Services (CAPS): (703) 993-2380; http://caps.gmu.edu

University Policies The University Catalog, http://catalog.gmu.edu, is the central resource for university policies affecting student, faculty, and staff conduct in university academic affairs. Other policies are available at http://universitypolicy.gmu.edu/. All members of the university community are responsible for knowing and following established policies.

Math 686 lectures – planned Spring 2020

Date (Sect.)	hw	Topic
1/21 (Chapt. 1)		Euler's Method
1/28 (Chapt. 2)		Multistep Methods
2/4 (Chapt. 3)		Gaussian Quadrature and Runge-Kutta Methods
2/11 (Chapt. 3)		Gaussian Quadrature and Runge-Kutta Methods
2/18 (Chapt. 3/4)		Gaussian Quadrature and Runge-Kutta Methods, Stiff Equations
2/25 (Chapt. 4/6)		Stiff Equations, Error Control
3/3 (Chapt. 7)		Nonlinear Algebraic Systems
3/17 (Chapt. 8)		Finite Difference Methods
3/24 (Chapt. 8)		Finite Difference Methods
3/31 (Chapt. 9)		Finite Element Methods
4/7 (Chapt. 10)		Spectral Methods
4/14 (Chapt. 10 OR 12/13)		Spectral Methods OR Iterative Methods/Multigrid Methods
4/21 (Chapt. 16)		Diffusion Equation
4/28 (Chapt. 17)		Advection Equation (time permitting)
5/12		**FINAL EXAM**