Course Description
A basic introduction to scientific computing and numerical analysis. Topics include linear equation solving, least squares, nonlinear equation-solving, optimization, interpolation, numerical integration and differentiation, ordinary differential equations, and the fast Fourier transform (FFT). Vectorization, efficiency, reliability, and stability of numerical algorithms will be stressed. Applications of algorithms to real-world problems, such as image processing, medicine, electronic circuits, flight trajectories, and molecular modeling, will be emphasized.

Important Note: Students may not receive credit for both EECS 639 and EECS 781 or MATH 781.

Lectures
MWF, 2-2:50pm, G411 LEEP2

Instructor
Dr. Suzanne Shontz
3016 Eaton Hall
Dept. of Electrical Engineering and Computer Science
Office Phone: (785) 864-8816
E-mail: shontz@ku.edu

Graduate Teaching Assistant
None

Office Hours:
MWF 11am-12pm or by appointment; send e-mail to make an appointment.

Note: I have a second office in 203 Nichols Hall. At times you will be asked to come to Nichols Hall to meet with me if you request to do so outside of office hours. Hence, it is recommended that you set-up meetings in advance via e-mail.

Text

Prerequisites
MATH 127 (Calculus III), Math 290 (Elementary Linear Algebra), and EECS 168 (Programming I) or equivalent.
Course Requirements

Lecture attendance is required, although attendance will not be recorded. The course requirements for EECS 639 include class participation, approximately five homework assignments, one project, twelve quizzes, one midterm exam, and a final exam. The homework and project will require a combination of mathematics, problem solving, algorithmic design and analysis, and programming. Mathematical proofs will also be covered in the course and will be relevant for the exams. Programming for the projects will be done in Matlab, a high-level language for numerical computation. Prior knowledge of Matlab is not a prerequisite for the course.

Homework assignments will be due approximately 7-10 days after they are assigned. Tentative deadlines for the homework are listed on the course calendar. The due dates will be announced in class. There will be a 10% late penalty per day for homework assignments handed in up to 48 hours late. No homework will be accepted more than 48 hours late.

The project will be due approximately 3 weeks after it is assigned. The due date will be announced in class. There will be a 10% late penalty per day for projects handed in up to 48 hours late. No projects will be accepted more than 48 hours late or after 11:59pm the day before Stop Day.

The quizzes will cover topics drawn from the lectures and from the underlying mathematics. The quizzes will be one question in length and will last for approximately 10 minutes.

There will be one midterm exam and one final exam; the date for the midterm exam is given on the course calendar. Please reserve this date on your calendar. A make-up midterm will be given to any student who is absent from the exam for a compelling reason and gets permission from the instructor.

There will be final exam; the date for the final exam is given on the course calendar. It will be 2.5 hours long and comprehensive with an emphasis on material covered after the second midterm. A make-up final will be given to any student who is absent from this exam for a compelling reason and gets permission from the instructor.

The exams will cover topics drawn from the lectures, projects, and quizzes, and from the underlying mathematics.

Grading

Homework assignments will count for 20% of the final grade. The lowest scoring homework assignment will be dropped. One of the homework assignments may be skipped, in which case that is the one that will be dropped. The project will count for 10% of the final grade. The quizzes will count for a total of 15% of the final grade. The lowest scoring quiz will be dropped. One of the quizzes may be skipped, in which case this is the one that will be dropped. The midterm exam will count for 20% of the final grade, and the final exam will count for the remaining 35% of the final grade.
Your final grade in the class will be computed by using the weighted average given above, and
the following scale:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>[92%-100%]</td>
</tr>
<tr>
<td>A-</td>
<td>[90%-92%)</td>
</tr>
<tr>
<td>B+</td>
<td>[88%-90%)</td>
</tr>
<tr>
<td>B</td>
<td>[82%-88%)</td>
</tr>
<tr>
<td>B-</td>
<td>[80%-82%)</td>
</tr>
<tr>
<td>C+</td>
<td>[78%-80%)</td>
</tr>
<tr>
<td>C</td>
<td>[72%-78%)</td>
</tr>
<tr>
<td>C-</td>
<td>[70%-72%)</td>
</tr>
<tr>
<td>D+</td>
<td>[68%-70%)</td>
</tr>
<tr>
<td>D</td>
<td>[60%-68%)</td>
</tr>
<tr>
<td>F</td>
<td>[0%-60%)</td>
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Depending on overall student performance in the course, I reserve the right to lower (but not
raise) the above grade cutoffs. However, this is not something you should count on.

The course will utilize +/- grading in Fall 2019 as indicated above.

Class Schedule
The course calendar shows a week-by-week syllabus. The dates and order of topics are subject
to change by the instructor. Any significant changes will be announced in class.

Course Website and E-mail
There is a course website available at the following URL:
E-mail will be used for announcements not given in class. Students are responsible for all
announcements made in class or via e-mail.

Computing Facilities
For computer programming on the projects, students may use Matlab on the Linux or Windows
machines in the computer laboratories in Eaton Hall.

Additional Course Policies
1. Except medical device(s) and laptops, no calculators, cell phones, or electronic devices
will be allowed. No such devices should be out in the open in the classroom. If you are
using a laptop in class, it must be used solely for taking notes.
2. Students have one week from when an item is returned in class to request a regrade. In
the event a regrade is requested, the entire homework assignment, project, quiz, or exam
will be regraded.
3. If you have a mandated religious observance which conflicts with a scheduled midterm
examination, please contact me privately at the beginning of the semester so that a make-
up examination can be scheduled at a mutually acceptable time. (The university policy
which applies to religious observances in conflict with examinations does not apply to the final examination since instructors do not schedule final exams.)

**Academic Integrity Policy**

Students are allowed to collaborate on the **homework assignments** to the extent of formulating ideas as a group. Each student is expected to write up the assignment by himself/herself. Students must not hand in homework that represents somebody else’s ideas entirely. Students must do the coding for the programming questions by themselves – no program code should be shared.

Students are expected to collaborate on the **project** with the specified number of students. The students in each group will work together on the mathematics, problem solving, algorithm design and analysis, and computer programming. Each student is expected to contribute to the effort. Each group should turn in a single write-up for their project. However, the project group should not discuss the project with students outside of their group. No mathematics or code should be shared with other project teams.

No collaboration of any kind is allowed on the **quizzes or exams**.

Students are permitted to consult outside published material for the **homework assignments and project**, although they will be fully based on the lecture notes and the textbook. If a student (on the homework assignment) or a group (on the project) consults a source other than the lecture notes or textbook, he/she or they, respectively, must cite the source – failure to cite the source will be considered cheating.

Cheating in the course will not be tolerated. **Anyone found cheating will receive a 0 on that work (homework, project, or quiz) or an F in the class (midterm exam or final exam). A second incident will result in an F grade for the course. These penalties will be received by all parties involved, following a hearing with the instructor.** In all cases, reports of academic misconduct will also be made to the Dean’s office where further disciplinary action may be taken in accordance with School of Engineering and University of Kansas guidelines. This may result in much more serious sanctions. It is your responsibility not to let anyone copy your homework/project/quiz/exam; otherwise, you may have to pay the price for others’ misconduct.

**Academic Achievement and Access**

Any student in this course who has a disability that may prevent him/her from fully demonstrating his/her abilities should contact me personally as soon as possible so we can discuss accommodations necessary to ensure full participation and facilitate the educational opportunity.

The Academic Achievement & Access Center (AAAC) coordinates accommodations and services for all KU students who are eligible. If you have a disability for which you wish to request accommodations and have not contacted the AAAC, please do so as soon as possible. Their office is located in 22 Strong Hall; their phone number is (785) 864-4064 (V/TTY). Information about their services can be found at [http://www.achievement.ku.edu](http://www.achievement.ku.edu). Please contact me privately in regard to your needs in this course.
Concealed Carry Policy
Individuals who choose to carry concealed handguns are solely responsible to do so in a safe and secure manner in strict conformity with state and federal laws (http://concealedcarry.ku.edu/information) and KU weapons policy (http://policy.ku.edu/university-kansas-policy-weapons-including-firearms-effective-july-1-2017).

Safety measures outlined in the KU weapons policy specify that a concealed handgun:
• Must be under the constant control of the carrier.
• Must be out of view, concealed either on the body of the carrier, or backpack, purse, or bag that remains under the carrier’s custody and control.
• Must be in a holster that covers the trigger area and secures any external hammer in an un-cocked position.
• Must have the safety on, and have no round in the chamber.

Suzanne M. Shontz, Associate Professor, Department of Electrical Engineering and Computer Science, University of Kansas, shontz@ku.edu
## EECS 639: Introduction to Scientific Computing

### Week-by-Week Syllabus

<table>
<thead>
<tr>
<th>Week</th>
<th>Lecture Topics</th>
<th>Notes</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Aug. 26-30: Introduction to Scientific Computing and Numerical Analysis</td>
<td>Quiz 1 on Aug. 30</td>
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<tr>
<td>2</td>
<td>Sept. 4-6: Intro to Matlab</td>
<td>No class on Sept. 2 (Labor Day); Quiz 2 on Sept. 6</td>
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<tr>
<td>3</td>
<td>Sept. 9-13: Solving Linear Systems</td>
<td>HW1 out on Sept. 9; Quiz 3 on Sept. 13</td>
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<tr>
<td>4</td>
<td>Sept. 16-20: Solving Linear Systems/Fast Matrix Computations</td>
<td>HW1 due on Sept. 18; Quiz 4 on Sept. 20</td>
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<tr>
<td>5</td>
<td>Sept. 23-27: Linear Least Squares</td>
<td>HW 2 out on Sept. 23; Quiz 5 on Sept. 27</td>
</tr>
<tr>
<td>6</td>
<td>Sept. 30 – Oct. 4: Linear Least Squares</td>
<td>HW 2 due on Oct. 2; Quiz 6 on Oct. 4</td>
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<tr>
<td>7</td>
<td>Oct. 7-11: Nonlinear Equations/Midterm Exam</td>
<td>Midterm Exam on Oct. 9; HW 3 out on Oct. 11</td>
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<tr>
<td>8</td>
<td>Oct. 16-18: Nonlinear Equations</td>
<td>No class on Oct. 14 (Fall Break)</td>
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<tr>
<td>9</td>
<td>Oct. 21-25: Optimization</td>
<td>HW 3 due on Oct. 23; Quiz 7 on Oct. 25</td>
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<tr>
<td>10</td>
<td>Oct. 28- Nov. 1: Optimization</td>
<td>HW 4 out on Oct. 28; Quiz 8 on Nov. 1</td>
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<tr>
<td>11</td>
<td>Nov. 4-8: Interpolation</td>
<td>HW 4 due on Nov. 6; Quiz 9 on Nov. 8; HW 5 out on Nov. 8</td>
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<tr>
<td>12</td>
<td>Nov. 11-15: Interpolation/Numerical Integration and Differentiation</td>
<td>Quiz 10 on Nov. 15</td>
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<tr>
<td>13</td>
<td>Nov. 18-22: Numerical Integration and Differentiation</td>
<td>HW 5 due on Nov. 18; Project handed out on Nov. 18; Quiz 11 on Nov. 22</td>
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<tr>
<td>14</td>
<td>Nov. 25: Initial Value Problems</td>
<td>No class on Nov. 27 and 29 (Thanksgiving Break)</td>
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<tr>
<td>15</td>
<td>Dec. 2-6: Initial Value Problems</td>
<td>Quiz 12 on Dec. 6</td>
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<tr>
<td>16</td>
<td>Dec. 9-11: Fast Fourier Transform</td>
<td>Project due on Dec. 11; No class on Dec. 13 (Stop Day)</td>
</tr>
<tr>
<td>FINAL</td>
<td>Wednesday, December 18 – 1:30-4:00pm: Final Exam</td>
<td>Final Exam (comprehensive) on Dec. 18.</td>
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