### Instructor
Dr. Charles Tolle, Office: EP 323, Phone: 394-6133, Email: charles.tolle@sdsmt.edu

### Prerequisites
EE 221: Circuits II (C or better!)

### Office Hours
MWF 10:00am-11:00am, W 3:00pm-4:00pm, or by appointment.

### Holidays
- Martin Luther King, Jr. Day – Jan. 18
- President’s Day – Feb. 15
- Spring Break – Mar. 6-14
- Easter Break – Apr. 2-5

### Textbook

### Chapter Order
1,2,3,4,5,8,9 (as time permits)

### Supplementary Books
( newer additions may exist)

### Matlab Reading
( newer additions may exist)

### Matlab Tutorials
- [http://scv.bu.edu/documentation/tutorials/MATLAB/](http://scv.bu.edu/documentation/tutorials/MATLAB/)
- [http://www.maths.dundee.ac.uk/~ftp/ng-reports/MatlabNotes.pdf](http://www.maths.dundee.ac.uk/~ftp/ng-reports/MatlabNotes.pdf)
- [http://www.math.utah.edu/lab/ms/matlab/matlab.html](http://www.math.utah.edu/lab/ms/matlab/matlab.html)

### Grading Policy

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<th>Percentage</th>
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<tr>
<td>5%</td>
<td>Attendance, Participation, and Professionalism</td>
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<td>15%</td>
<td>Homework Assignments - Quizzes (~5 assignments – Quizzes as needed)</td>
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<td>Labs (~5 in general the labs will be open throughout the course)</td>
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<td>for each of the 3 Midterm Exams (on or about Feb. 26 and March 26th during class and May 7, 3-4:50pm)</td>
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<td>The instructor reserves the right to modify this grading break down if warranted.</td>
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Grades will be assigned according to natural grade groupings. However it is anticipated that the following scale will be used to assign final grades.

- 100 – 90 A
- 89 – 80 B
- 79 – 70 C
- 69 – 60 D
- below 59 F

The instructor reserves the right to modify this scale if warranted.

### Objectives
The objectives of this course are to provide students a basic understanding of:

- difference between an energy versus power signal
- how to analyze and characterize continuous-time and discrete-time signals in the time domain e.g. convolution and difference/differential equation representations
- how to analyze and characterize continuous-time and discrete-time signals in the frequency domain e.g., Fourier series/transforms, discrete-time Fourier transforms, discrete Fourier transform and z-transforms.
- and how to use modern computational software tools for analysis and processing of signals e.g. MATLAB (possible alternative software programs: Octave, Maple, or Sage).
General Policies

Students are encouraged to work together on assigned homework problems. However, all homework, projects, and tests must not be plagiarized (from any source – even your classmates). Plagiarism is on the rise and it is not acceptable in any form! If caught plagiarizing, you will receive an F for the course and referred to the Department Head and Vice-President for Academic Affairs for further action. In short, you are expected to accomplish your own work! When using other's works cite them! Make-up tests will not be given unless a prior arrangement is made with the instructor. Students have two weeks following the return of any graded material to appeal the score.

Note that according to “Policy Governing Academic Integrity” in the SDSM&T Undergraduate Catalog, the instructor of record for this course has discretion of how acts of academic dishonesty are penalized, subject to the appeal process, and that “Penalties may range from requiring the student to repeat the work in question to failure in the course” (72-73).

Work will be due on at the start of class on the due date unless otherwise stated. Late work will receive up to ½ credit within one week of due date, i.e. up to the start of class one week later. After that time, late homework will not be accepted without the permission of the instructor.

Freedom in learning

Under Board of Regents and University policy student academic performance may be evaluated solely on an academic basis, not on opinions or conduct in matters unrelated to academic standards. Students should be free to take reasoned exception to the data or views offered in any course of study and to reserve judgment about matters of opinion, but they are responsible for learning the content of any course of study for which they are enrolled. Students who believe that an academic evaluation reflects prejudiced or capricious consideration of student opinions or conduct unrelated to academic standards should contact the dean of the college which offers the class to initiate a review of the evaluation.

Electronic Devices Policy.

Please turn off your cell phone before class starts. No text messaging in class. No headphones. If you wish to use a laptop in this class for purposes of note taking, is acceptable. No other use of any other electronic/computer media is allowed during class time.

ADA Statement

Students with special needs or requiring special accommodations should contact the instructor, (Dr. Charles R. Tolle, at 394-6133 or by email at charles.tolle@sdsmt.edu) and/or the campus ADA coordinator, Jolie McCoy, at 394-1924 at the earliest opportunity.

COURSE OUTCOMES:

Upon completion of this course, students should demonstrate the ability to:

1. Apply fundamental continuous-time and discrete-time signal properties: e.g. causality, linearity, and time-invariance to signals.
2. Solve linear discrete-time difference equations by recursion, and find complete solutions when possible.
3. Solve linear first-order continuous-time differential equations, and find the complete solutions when possible.
4. Apply or use the convolution representation for linear, time-invariant continuous-time and discrete-time systems to find the response of systems to input signals.
5. Be able to convolve continuous-time and discrete-time signals.
6. Be able to compute the Fourier series for continuous-time periodic signals, and the Fourier transform (and inverse) for simple aperiodic continuous-time signals (including the use of the various properties of the Fourier transform).
7. Apply or use frequency-domain analysis (i.e., Fourier series and transform) to find the response of systems to periodic and aperiodic continuous-time signals.
8. Apply the properties of ideal filters to find the output of the filter to input signals.
9. Apply or use the principles of sampling and resulting consequences in the frequency domain.
10. Be able to compute both the discrete-time Fourier transform (DTFT) and discrete Fourier transform (DFT) of discrete-time signals as well as their inverses, including the use of the various properties of the DTFT and DFT.
11. Be able to compute both the z-transform and inverse z-transform of discrete-time signals, including the use of the various properties of the z-transform.
12. Be able to compute the z-transform transfer function of discrete-time systems.
13. Apply or use frequency-domain analysis (i.e., DTFT, DFT, and z-transform) to find the response of discrete-time systems to discrete-time signals.

RELATION OF COURSE TO PROGRAM OUTCOMES:

These course outcomes fulfill the following program outcome:

(a) An ability to apply knowledge of mathematics, science, and engineering.
(b) An ability to design and conduct experiments, as well as to analyze and interpret data.
(c) An ability to design a system, component, or process to meet desired needs.
(d) An ability to function on multi-disciplinary teams.
(e) An ability to identify, formulate, and solve engineering problems.
(f) An understanding of professional and ethical responsibility.
(g) An ability to communicate effectively.
(h) The broad education necessary to understand the impact of engineering solutions in a global and societal context.
(i) A recognition of the need for, and an ability to engage in life-long learning.
(j) A knowledge of contemporary issues.
(k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
The following table indicates the relative strengths of each course outcome in addressing the program outcomes listed above (on a scale of 0 to 4 where 4 indicates a strong emphasis)

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**Prepared By:**