ECE 428
Analog Filter Design
Fall 2018

Instructor:	Dr. George L. Engel (EB 3009)
Time:	M, W (3:00 pm - 4:15 pm)
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Course Description

Fundamentals of active filter synthesis; first and second order circuit synthesis; standard low pass filters: Butterworth, Chebyshev, Inverse Chebyshev, Cauer, Bessel; frequency transformations; sensitivity analysis; noise analysis. Prerequisites: ECE 326 and ECE 352.

Grading Policy

Exam #1	20 %
Exam # 2	20 %
Exam # 3	20 %
Midterm Project	20 %
Final Project	20 %

Final Grade

A	90 - 100 %
B	80 - 89 %
C	70 - 79 %
D	60 -69 %
F	0 - 59 %

Administrative Issues

Students are expected to be familiar with and follow the Student Academic Code. It is included in the SIUE Policies and Procedures under Section 3C2. Students are expected to use SIUE email addresses in communications related to the course of study and other university activities. It is expected of students to check their email at least on a weekly basis.

Based on University Class Attendance Policy 1I9: It is the responsibility of students to ascertain the policies of instructors with regard to absence from class, and to make arrangements satisfactory to instructors with regard to missed course work. Failure to attend the first session of a course may result in the student's place in class being assigned to another student.

Students needing accommodations because of medical diagnosis or major life impairment will need to register with Accessible Campus Community and Equitable Student Support (ACCESS) and complete an intake process before accommodations will be given. Students who believe they have a diagnosis but do not have documentation should contact ACCESS for assistance and/or appropriate referral. The ACCESS office is located in the Student Success Center, Room 1270. You can also reach the office by e-mail at myaccess@siue.edu or by calling 618-650-3726. For more information on policies, procedures, or necessary forms, please visit the ACCESS website at `www.siue.edu/access`.

Homework will be assigned on a regular basis. Students must hand in homework by assigned due date.

Required Texts

Design of Analog Filters, Second Edition
Oxford University Press, 2010
Rolf Schaumann, Haiqiao Xiao, and Marc Van Valkenburg
ISBN Number: 978-0-19-537394-3

ECE428 Lecture Schedule

M Aug 20	1.0 INTRODUCTION 1.1 Fundamentals
W Aug 22	1.2 Types of filters 1.3 Why analog?
M Aug 27	1.4 Circuit elements and scaling 1.5 Circuit simulation and modeling
W Aug 29	2.0 OPERATIONAL AMPLIFIERS 2.1 Operational amplifier models 2.2 Op amp slew rate
M Sep 03	*** LABOR DAY (NO CLASS) ***
W Sep 05	2.3 Inverting and non-inverting gain amps 2.4 Analyzing op amp circuits 2.5 Block diagrams and feedback
M Sep 10	3.0 FIRST-ORDER FILTERS 3.1 Bilinear transfer function and its parts 3.2 Realization with passive elements
W Sep 12	3.3 Bode plots 3.4 Active realizations 3.5 The effect of A(s) 3.7 And now design!
M Sep 17	4.0 SECOND-ORDER FILTERS 4.1 Design parameters Q and ω_0 4.2 Second-order circuit 4.3 Frequency response of lowpass and bandpass circuits
W Sep 19	4.4 Integrators and the effect of A(s) 4.5 Other biquads (Sallen-Key) 4.5 Other biquads (SAB) 4.5 Other biquads (Rauch)
M Sep 24	5.0 SECOND-ORDER FILTERS WITH ARBITRARY TRANSMISSION ZEROS 5.1 By using summing 5.2 By voltage feed-forward 5.3 Cascade designs re-visited
W Sep 26	*** Exam 1 (Chapters 1, 2, and 3) ***

M Oct 01	5.0 SECOND-ORDER FILTERS WITH ARBITRARY TRANSMISSION ZEROS 5.1 By using summing 5.2 By voltage feed-forward 5.3 Cascade designs re-visited
W Oct 03	6.0 LOWPASS FILTERS WITH MAXIMALLY FLAT MAGNITUDE 6.1 The ideal lowpass filter
M Oct 08	6.3 Butterworth pole locations
W Oct 10	6.4 Butterworth filter design
M Oct 15	6.4 Butterworth filter design
W Oct 17	7.0 LOWPASS FILTERS WITH EQUAL RIPPLE 7.2 Chebyshev magnitude response
M Oct 22	7.3 Location of Chebysehv poles 7.4 Comparison of maximally flat and equi-ripple responses
W Oct 24	7.5 Chebyshev filter design
M Oct 29	*** Exam 2 (Chapters 4, 5, and 6) ***
W Oct 31	9.0 FREQUENCY TRANSFORMATION 9.1 Lowpass-to-highpass transformation 9.2 Low-pass-to-bandpass transformation
M Nov 05	9.3 Low-pass-to-band-elimination transformation
W Nov 07	12.0 SENSITIVITY
M Nov 12	12.1 Definition of Bode sensitivity
W Nov 14	12.2 Second-order sections
M Nov 19	**** THANKSGIVING BREAK ****
W Nov 21	**** THANKSGIVING BREAK ****
M Nov 26	18.0 NOISE 18.1 Noise descriptions
W Nov 28	18.3 Specific noise sources
M Dec 03	18.4 Noise Analysis
W Dec 05	18.4 Noise analysis