North South University

Department of Electrical and Computer Engineering

EEE 342/ETE418 Control Engineering

Fall 2019

Course Outline

1. Basic Information
   1. Course Description

This course introduces the basics of systems, modeling and control. Focusing on linear and time-invariant systems, this course provides analytical tools to evaluate stability and performance (transient and steady state response) of those systems. It considers systems represented in frequency domain (transfer function) as well as time-domain (differential equations, state-space representations). Various design tools are taught including PID controllers.

* 1. Course Content
     1. The basics of systems, modeling and control
     2. The linear and time-invariant systems
     3. System stability and performance
  2. Course Information
     1. Junior level undergraduate course
     2. Credit hours: 3 hours of classroom contact and 6 hours of self-study per week.
     3. Two classes per week having 1.5 hours of duration
     4. Tutorial moderated by teaching assistant (if available)
     5. The course requires knowledge
        1. Signals and systems
        2. Fourier and Laplace transform
        3. System: model, properties, responses.
  3. Prerequisite courses
     1. EEE 221 Signals and Systems
  4. Faculty
     1. Name: Dr. Touhidur Rahman, Associate Professor, ECE, Initial: ToR
     2. Room No: SAC 921
     3. Phone: +880-2-55668200 ext. 6187
     4. Email: [touhidir.rahman01@northsouth.edu](mailto:touhidir.rahman01@northsouth.edu)
     5. Office hours for fall 2019:

Sunday 8.30AM – 9.30AM

Monday 8.30AM – 9.30AM

Tuesday 8.30AM – 9.30AM

Wednesday 8.30AM – 9.30AM

Thursday 8.30AM – 11.00AM

* 1. Class hours & Room
     1. Section 1: MW 9.40AM – 11.10AM – SAC 205
     2. Section 2: MW 1.00PM – 2.30PM – SAC 513
  2. Text Book
     1. Norman S. Nise, Control System Engineering, 6th Edition, John Wiley & Sons
  3. Reference Book
     1. Franklin, Powell, Emami – Naeini, Feedback Control of Dynamic Systems, 7th Edition, Pearson
  4. Google classroom: EEE342ETE418FALL2019
     1. Code: l1fl7gl

1. Course Objectives
   1. Course objectives
      1. To acquaint the students with basic methods of modeling of electrical, mechanical and other dynamic systems.
      2. To introduce analysis techniques of linear time-invariant systems (LTI) in both time-domain and frequency-domain.
      3. To introduce control techniques to design a feedback control system in both time-domain and frequency-domain.
      4. To provide graphical analysis and design tools such as pole zero maps, block diagram reduction, Bode Plots, Root Locus – all applied to examples of real-world systems.
      5. To instill simulation (eg. Simulink, MATLAB) and hardware skills with application to control engineering.
2. Outcomes
   1. Program Outcomes (PO): The program outcomes are described in the following web link:
      1. BSEE: <http://ece.northsouth.edu/undergraduate/academics/programs/bs-eee/>
      2. BSETE: <http://ece.northsouth.edu/undergraduate/academics/programs/bs-ete/>
   2. Course Outcome (CO): The course outcomes are described in the following web link:
      1. BSEE: <http://ece.northsouth.edu/undergraduate/academics/programs/bs-eee/>
      2. BSETE: <http://ece.northsouth.edu/undergraduate/academics/programs/bs-ete/>
3. Course Assessment
   1. Teaching / Learning Strategies
      1. Lectures
         1. Attend all classes punctually
         2. Learn methods that are not precise in the textbook
         3. Follow worked examples taught in the class and provided in the textbook
         4. Solve exercises from the textbook and innovative problems in the assignments
      2. Tutorials and group Work
         1. Contact teaching assistant (if available) whenever required
         2. Come to tutorial sessions (if offered)
         3. Work with peers to solve problems, discuss with friends
      3. Private study
         1. Review lecture materials and textbook
         2. Perform model test by yourself
   2. Assessment
      1. Frequent quizzes will be taken to check if you are following the lectures attentively and to check the basic knowledge
      2. In-class exams duration around 30 minutes will be taken to check your ability in solving a problem following a certain method
      3. Midterm exam and final exam will contain comprehensive problems to assess complete understanding
   3. Evaluation

|  |  |  |
| --- | --- | --- |
| Distribution of numerical scores | | |
| Item | % |  |
| Class Attendance | 5 | Attendance of 80% and above of all classes equals to 5% of grade points;  Attendance of 40% and under of all classes equals to 0% of grade points;  40% - 80% of attendance of all classes will be scaled appropriately towards grade points. |
| Quiz | 25 | Total of 7 quizzes, best 2 out of quiz # 01-04 and best 2 out of quiz # 05 – 07 will be counted toward grade points. |
| Assignment | 25 | Total of 7 assignments, best 2 out of assignment # 01-04 and best 2 out of assignment # 05 – 07 will be counted toward grade points. |
| Midterm | 20 | One and half hour |
| Final | 25 | One and half hour |

* 1. Grading Policy

Generally, NSU grading policy will be followed. However, minor deviation is still possible depending on the situation.

* 1. Exam Policy

No makeup for quiz and assignment is possible. MAKE UP FOR MIDTERM OR FINAL EXAM WILL BE ARRANGED UNLESS AN ABSOLUTELY UNAVAOIDABLE VALID REASON FOR ABSENCE IS FOUND. For such unavoidable circumstances, written explanation of the situation must be submitted before the exam. If any quiz or midterm exam cannot be held on the due date the exam will be automatically shifted to the very next available class, unless otherwise announced.

1. Code of Conduct
   1. It is highly requested to maintain discipline in the class like not to be late, refrain from making noise during lecture time, not to leave the class early.
   2. Adopting unfair means in the exams will be considered as a serious offence and the student shall be placed to the university disciplinary committee.
   3. All materials should be neat and clear, and demonstrate professionalism
   4. Direct duplication of the work of another is a big offence
   5. Paraphrasing another person’s work with very minor changes keeping the meaning is also plagiarism.
2. Lecture Schedule

\*One day = 1.5 lecture hours, total 24 lectures = 36 lecture hours

Lecture Schedule

|  |  |  |
| --- | --- | --- |
| Lecture # | Topic | Chapter # |
| 1 | Introduction | Chapter 01 |
| 2 | Modeling in the frequency domain | Chapter 02 |
| 3 |
| 4 | Quiz #01 on chapter 01 & 02 – 30 minutes  Modeling in the time domain  Assignment #01 on chapter 01 & 02 | Chapter 03 |
| 5 | Modeling in the time domain |
| 6 | Quiz #02 on chapter 03 – 30 minutes  Time response  Assignment #01 on chapter 03 | Chapter 04 |
| 7 | Time response |
| 8 | Quiz #03 on chapter 04 – 30 minutes  Reduction of multiple subsystems  Assignment #01 on chapter 04 | Chapter 05 |
| 9 | Reduction of multiple subsystems |
| 10 | Quiz #04 on chapter 05 – 30 minutes  Stability  Assignment #01 on chapter 05 | Chapter 06 |
| 11 | Stability |
| 12 | Quiz #05 on chapter 06 – 30 minutes  Steady state errors  Assignment #01 on chapter 06 | Chapter 07 |
| 13 | Steady state errors |
| 14 | Midterm exam, chapter 01 – 07 |  |
| 15 | Root locus techniques | Chapter 08 |
| 16 |
| 17 | Design via root locus | Chapter 09 |
| 18 |
| 19 | Quiz #06 on chapter 08 & 09 – 30 minutes  Frequency response techniques  Assignment #06 on chapter 08 & 09 | Chapter 10 |
| 20 | Frequency response techniques |
| 21 | Design via frequency response | Chapter 11 |
| 22 |
| 23 | Quiz #07 on chapter 10 & 11 – 30 minutes  Design via steady state space  Assignment #07 on chapter 10 & 11 | Chapter 12 |
| 24 | Design via steady state space |
|  | Final exam | TBD |

This is a tentative schedule. All effort will be made to follow this schedule. However, in case of unavoidable situation and government holidays this schedule may be modified. All students will be notified of any change as soon as possible in advance.