GAU, Faculty of Engineering

Course Unit Title	Feedback Control Systems
Course Unit Code	EEN304
Type of Course Unit	Compulsory
National Credits	4
Level of Course Unit	3th Year BSc
Number of ECTS Credits Allocated	6 ECTS
Theoretical (hour/week)	4
Practice (hour/week)	-
Laboratory (hour/week)	-
Year of Study	3
Semester when the course unit is delivered	6
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisities and co-requisities	EEN303, EEN307
Recommended Optional Programme Components	Assinments, E-learning(solution of examples)

Objectives of the Course

- Analysis of the effects of Feedback on the performances of Control Systems
- Mathematical modelling by use of Laplace and z-transforms
- Analysis the roots of characteristic equations by use of root-locus technique.
- Analysis of Impulse response and transfer functions of linear systems
- Analysis of stability of control systems

Learning Outcomes

When this course has been completed the student should be able to		Assesment.
1.	apply Laplace and Z-transforms for the solution of Linear systems. to model the physical systems.	1
2.	model the physical systems.	1
3.	find the transfer functions of systems im terms of impulse response and differential equations.	1
4.	analyse the stability of the systemsby use of Routh-Hurwith criterion.	1
2.	apply Nyquist criterion to check stability of control systems.	3

Assesment Methods: 1. Written Exam, 2. Assignment 3. Project/Report, 4.Presentation, 5 Lab. Work

Course's Contribution to Program

		CL
1	Ability to understand and apply knowledge of mathematics, science, and engineering	4
2	Ability to design and conduct experiments as well as to analyze and interpret data	5
3	Ability to work in multidisciplinary teams while exhibiting professional responsibility and ethical conduct	2
4	Ability to apply systems thinking in problem solving and system design	4
5	Knowledge of contemporary issues while continuing to engage in lifelong learning	
6	Ability to use the techniques, skills and modern engineering tools necessary for engineering practice	3
7	Ability to express their ideas and findings, in written and oral form	4
8	Ability to design and integrate systems, components or processes to meet desired needs within realistic constraints	1
9	Ability to approach engineering problems and effects of their possible solutions within a well structured, ethically responsible and professional manner	3
10	Strong foundation on the fundamentals of Electrical and Electronics Engineering such as Circuit Theory, Signals, Systems, Control and Communications, which are necessary for successful practice in the field	5
11	Awareness on the contemporary requirements, methods and applications of the Electrical and Electronics Engineering	3

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate 4: High, 5:Very High)

Course Contents			
Week			Exams
1	Chapter 1	Introduction	
2	Chapter 1	Effects of feedback on Control Systems Performances.	
3	Chapter 2	Laplace and Z-transforms applied for Systems Solution.	
4	Chapter 3	Impulse response and transfer functions of linear systems.	
5	Chapter 3	Signal-Flaw graphs, Gain formula. Block diagrams.	Quiz 1
6	Chapter 4	Mathematical modelling of physical systems	
7	Chapter 4	DC motors based Feedback Control Systems.	
8		Supervision	Midterm
9	Chapter 4	Operational Amplifiers based controllers and Sun-Seeker Systems.	
10	Chapter 5	State variable analysis. State transition equations.	
11	Chapter 6	Stability of Linear Control Systems. S-plane	
12	Chapter 6	Routh-Hurwith criterion	Quiz 2
13	Chapter 7	Root-Locus Analysis.	
14	Chapter 8	Nyquist stability criterion.	
15	Chapter 9	Time-Domain analysis of Control Systems	
16		Final Exam	Final Exam

Recommended Sources

Textbook: Automatic Control Systems. F. Golnaraghi , Benjamin C. Kuo, 9th edition, JOHN WILEY & SONS, INC. 2009. (Other editions are also useful).

Supplementary Material (s):

Modern Control Systems. Richard C. Dorf, Robert H. Bishob. Prentic Hall, 2001.

Automatic Control Systems. Benjamin C. Kuo. 7th edition,Prentic Hall,1995.

Any book related with the Automatic Control Systems.

ASSESSMENT

Attendance& E-learning	5%
Quiz-1	10%
Midterm Exam (Written)	30%
Quiz-2 (Written)	10%
Final Exam	45%
Total	100%

ECTS Allocated Based on the Student Workload

Activities	Number	Duration (hour)	Total Workload(hour)
Course duration in class (including the Exam week)	15	4	60
Labs and Tutorials	-	-	-
Assignments	2	6	12
Project/Presentation/Report Writing	-	-	-
E-learning Activities	10	3	30
Quizzes	2	6	12
Midterm Examination	1	12	12
Final Examination	1	14	14
Self Study	14	3	42
ECTS Credit of the Course			182/30 = 6,06≅6