Arab Academy for Science, Technology & Maritime Transport
College of Engineering & Technology
Electrical & Control Engineering Department

University/Academy: Arab Academy for Science, Technology & Maritime Transport
Faculty/Institute: College of Engineering & Technology
Program: B.Sc. Mechanical Engineering

Form no. (12)
Course Specification

1- Course Data

Course Code: **EE418**	Course Title: **Automatic Control Engineering**		Academic Year/Level: **4th** year / **7th** semester
Specialization: **Computer/ Electronics/ Mechatronics**	No. of Instructional Units	Lecture	Practical
	3 Credits	**2 Hrs.**	**2 Hrs.**

2- Course Aim

- Stability concept and time domain analysis using time and frequency response
- Modeling and analysis of simple physical system are investigated
- To study controller units, their type analysis and tuning.

3- Intended Learning Outcome

a- Knowledge and Understanding	K1. Explain the open and closed loop control systems with the understanding of the positive and negative feedback systems. K3.Classify the control systems and show model physical systems in time and frequency domain. K5. Studying different methods like Root locus techniques, Nyquist and Bode diagrams and demonstrate the block diagram reduction and signal graph method using several examples and compare their results K10. Showing how to perform stability analysis and the effect of disturbances on the system.
b- Intellectual Skills	I1. Apply some examples on the Laplace transformation and modeling some mechanical and electrical systems. I5. Demonstrate the block diagram reduction and signal graph method using several examples and compare their results. In addition to the analysis of the second order system response after applying unit step input. I2. Demonstrate the root locus method showing the location of the zeros and poles and define the system gains margins and its stability. Also, use the Bode plots and the Nyquist plots with some examples to show its gain and phase margins.

c- Professional Skills	P1. Experiment rotatory position control systems in the laboratory. P2. Solve some examples using the Matlab tool box for block diagram reduction method and signal flow graph, and communicated with the other students. Test the impulse, step and ramp inputs on several transfer functions using Matlab and explain the output response. P4. Applying the tuning methods on physical experiments in the laboratory. P6. Use the Matlab toolbox for experiment the Root locus techniques, Bode plots and Nyquist plots method. P12. Experiment the effect of the PID control parameters on the closed loop systems using Matlab.
d- General Skills	G1. Communicate with other students in modeling the physical systems, and practice the Laplace transformation. Communicate with other students to reach the understanding of stability analysis and the maximum and minimum limits of the system gain values. G4. Practice the Block diagram reduction and signal flow graph for several hard examples, sketch the plotted output for different inputs applying on some transfer functions, and practice the method on several transfer function to illustrate the understanding of the parameters values.

4- Course Content

Week Number 1: Introduction to open loop and closed loop control system.
Week Number 2: Control system classification.
Week Number 3: Block diagram. System transfer function and signal flow graph. Standard input signal.
Week Number 4: Time domain specifications
Week Number 5: Modeling of some physical systems.
Week Number 6: Time response of first and second order systems
Week Number 7: 7th week exam
Week Number 8: Importance of feedback, sensitivity to parameter variations.
Week Number 9: System stability and effect of disturbance
Week Number 10: Error analysis and error constants
Week Number 11: Root locus techniques
Week Number 12: 12th week exam
Week Number 13: Frequency domain analysis (Nyquist- Bode) Analog controllers
Week Number 14: Controller tuning.
Week Number 15: Revision
Week Number 16: Final exam

5- Teaching and Learning Methods

- Lectures
- Tutorials
- Reports & sheets
- Laboratories
- Seminars

6-Teaching and Learning Methods for Students with Special Needs

- Lectures
- Tutorials
- Reports & sheets
- Laboratories
- Seminars

Academic Support:

- The general academic advisor appoints an academic supervisor for handicapped students.

Continuous follow ups are made for handicapped students after each assessment to evaluate their academic level of achievement

7- Student Assessment:

Quiz (to asses part of the 7th and 12th week evaluation) Report (to asses part of practical evaluation)	
a- Procedures used:	Written Examinations to asses The Intended Learning Outcomes Class Activities (Reports, Discussions, ------) to asses The Intellectual Skills
b- Schedule:	**Assesssment 1** **3rd Week** **Assesssment 2** **4th Week** **Assesssment 3** **5th Week** **Assesssment 4** **7th Week** **Assesssment 5** **10th Week** **Assesssment 6** **11th Week** **Assesssment 7** **12th Week**
c- Weighing of Assessment:	7th Week Examination 30% 12th Week Examination 20% Final-term Examination 40% Semester Work 10% Total 100%

8- List of References:

a- Course Notes	Subjected in documentation
b- Required Books (Textbooks)	K.OGATA, "Modern Control Engineering", Pearson /Prentice-Hall.4ED.2002
c- Recommended Books	- Y. El Gamal A.Amer, "Introduction to Control Engineering", AAST 1988 - Nagrath 80 Gapal, "Control System Engineering", John Wiely & Son, NY 1982 - K.O.Gatw, "Modern Control Engineering", Prentice Hall New Delhi, 1984
d- Periodicals, Web Sites, ..., etc.	

Course coordinator: **Program Manager:**