University/Academy: Arab Academy for Science and Technology & Maritime Transport
Faculty/Institute: College of Engineering & Technology
Program: Computer/Electronics/Mechanical/Marine Engineering

Form no. (12)
Course Specification

1- Course Data

Course Code:	**Course Title:**	**Academic Year/Level:**
EE 418	Automatic Control Systems	3

Specialization:	**No. of Instructional Units:**	
Computer/Electronics/ Mechanical/Marine	3	**Lecture** 2 **Practical** 2

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	Explain the open and closed loop control systems with the understanding of the positive and negative feedback systems. Classify the control systems and show model physical systems in time and frequency domain. Showing how to perform stability analysis and the effect of disturbances on the system. Studying different methods like Root locus techniques, Nyquist and Bode diagrams. Explaining the controller and how to tune its parameters.

b- Intellectual Skills	Apply some examples on the La Place transformation and Modeling some mechanical and electrical systems. Demonstrate the block diagram reduction and signal graph method using several examples and compare their results Demonstrate the block diagram reduction and signal graph method using several examples and compare their results. In addition to the analysis of the response of second order system after applying unit step input. Demonstrate the root locus method showing the location of the zeros and poles. Show the how the root locus method define the system gains margins and its stability. Use the Bode plots and the Nyquist plots with some examples to show its gain and phase margins.
c- Professional Skills	Experiment rotatery position control systems in the laboratory. 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. Use the Matlab toolbox for experiment the Root locus techniques, Bode plots and Nyquist plots method. Experiment the effect of the PID control parameters on the closed loop systems using Matlab. Applying the tuning methods on physical experiments in the laboratory.

d- General Skills	Communicate with other students in Modeling the physical systems, and practice the La Place transformation 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. Practice the method on several transfer function to illustrate the understanding of the parameters values. Communicate with other students to reach the understanding of stability analysis and the maximum and minimum limits of the system gain values.
4- Course Content	*Week Number 1:* Introduction to control system. *Week Number 2:* Differential equation of physical systems. *Week Number 3:* Block diagram models using MATLAB. *Week Number 4:* Signal flow graph models using MATLAB. *Week Number 5:* Test input signals. *Week Number 6:* Performance of 1st and 2nd order system. *Week Number 7:* 7th week exam + Effect of 3rd pole and a zero on the 2nd order system. *Week Number 8:* Stability concept Routh- Hurwitz stability criterion. *Week Number 9:* Root locus techniques. *Week Number 10:* Bode plots. *Week Number 11:* Nyquist plots. *Week Number 12:* 12thweek + Approaches to system design, advantage of feedback. *Week Number 13:* Approaches to system design, advantage of feedback. *Week Number 14:* Analog controllers. *Week Number 15:* Analog controllers (2). *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
7- Student Assessment:	Written Examinations to asses The Intended Learning Outcomes Class Activities (Reports, Discussions, ------) to asses The Intellectual Skills
a- Procedures used:	Written Examinations to asses The Intended Learning Outcomes Class Activities (Reports, Discussions, ------) to asses The Intellectual Skills

b- Schedule:	**Assessment 1**	**7th Week Written Exam**
	Assessment 2	**12th Week Written Exam**
	Assessment 3	**Continuous Assessments**
	Assessment 4	**16th Week Final Written Exam**
c- Weighing of Assessment:	**7th Week Examination**	**30 %**
	12th Week Examination	**20 %**
	Final-term Examination	**40 %**
	Oral Examination	**0 %**
	Practical Examination	**0 %**

	Semester Work **10 %** **Total** **100%**
8- List of References:	- 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
a- Course Notes	
b- Required Books (Textbooks)	Benjamin C.Kuo, "Automaic Control Systems", Prentice Hall, Inc, latest edition.
c- Recommended Books	
d- Periodicals, Web Sites, ..., etc.	

Course Instructor: **Head of Department:**

Program Manager: