SYLLABUS

SUBJECT : CONTROL TECHNIQUES

1. Identification of Subject:

Name of Subject   : Control Techniques
Code of Subject   : CTRL-2300
SKS / ECTS   : 3/ 5
Semester   : 4
Study Program   : MTE, MEE
Lecturer   : Kirina Boediardjo, ST, Msc.

2. Competency

After studying the Control Techniques course, the student able to:

1. Explain the basic ideas about open-loop and closed-loop system
2. Understand the representation of control system using approaches : transfer function, block diagram and state space.
3. Apply mathematical modeling to the mechanical and electrical system.
4. Simplify the complex block diagram, also for a MIMO-system
5. Understand system response analysis for first and second-order system, steady state error analysis for feedback system
6. Apply Routh's stability analysis
7. Develop a control system using Proportional controller , Integral controller and Derivative controller to improve system performance
8. Use computational tool (with Matlab/Scilab) to simulate the control system.

3. Description of Subject:

The subject introduces the the basic ideas about open-loop and closed-loop system. The course starts with the introduction the representation of control system using approaches : transfer function, block diagram and state space. Mathematical modeling to the mechanical and electrical system are also introduced. The course continues with reducing system differential equation into simple transfer function, simplification of block diagram, representation of multiple-input-multiple-output system using block diagram. Next the system response will be explain, in which the students must be analyze the first and second order system, transient response analysis, steady state errors in feedback control system. Routh's stability criterion will also be discussed, as well as effect of zeroes and poles on stability, using Proportional controller , Integral controller and Derivative controller to

File: *CTRL-2300-Control_Technique.doc*

QT 06.02/Rev.00

improve system performance. Furthermore, within the topics, the students will be guided on how to do computation and simulation using computational tool, such as Matlab or Scilab.

4. Learning Approach

Approach	: Combination of Expository - inquiry and colaborative
Method	: Discussion, question answer, sample problem, group work
Student Task	: Home work, presentation
Media	: LCD projector, Teaching Aids (components), Simulation SW, film.

5. Evaluation

a) Absence maximum   : 25%
b) Participation in discussion   :   5 points
c) Homework, Classwork   :   5 points
d) Presentation, Simulation   : 10 points
e) Daily Quiz   : 20 points
f)   Final Examination   : 60 points

Total   : 100 points

6. Contents/ Topics of Lecturing:

Week	Content/ Topics of Lecturing	Text Book Chapter	Remark
1	**Introduction to control technique :** Lecture objectives, goals. Introduction to definition and terms, basic concepts, examples, brief comparison.	Ch1	
2	**System representation:** Terms and basics, transfer function representation, block diagram representation, state-space representation, examples, brief comparison.	Ch2	Quiz
3	**Mathematical foundation :** Revision on complex numbers and its relationship to Laplace transform, definition and notation of Laplace transform, using Laplace transform to solve differential equation	Ch2	
4-6	**Mathematical modeling:** Designing the model for common mechanical system, Designing the	Ch3	Exercise Quiz

File: *CTRL-2300-Control_Technique.doc*

3/4

	model for common electrical system		
7-8	**Transfer function and block diagram:** Reducing system differential equation into simple transfer function, simplification of block diagram, representation of multiple-input-multiple-output system using block diagram	Ch4	Exercise Quiz
9-11	**System response:** Response analysis of first order system, Response analysis of second order system, transient response analysis, steady state errors in feedback control system **Stability analysis:** Routh's stability criterion, effect of zeroes and poles on stability, using Proportional controller , Integral controller and Derivative controller to improve system performance	Ch6	Exercise Quiz
12-13	**Computational tool using Matlab / Scilab:**		Exercise
14	**Review, Discussion and Tutorial:**		
15	**Final Examination**		

7. Book Reference:

a) **Main Text Book:** *"Modern Control Engineering- Fifth Edition"*, **Author**: Katsuhiko Ogata, **Publisher**: Pearson Education, Inc, ISBN: 13 : 978-0-13-713337-6

b) **Supplement Textbooks:**

   -