MEC 3105: DYNAMIC SYSTEMS ENGINEERING

Hours per semester				Weighted total mark	Weighted exam mark	Weighted continuous assessment mark	Credit unit
LH	PH	TH	CH				CU
60	00	60	60	100	60	40	4

Course Description

This course introduces systems thinking, analysis and design. It covers modeling of dynamic systems, their analysis by analytical and numerical methods as well as their simulation by use of digital computers.

Course Objectives

At the end of this course, a student should be able to:

- Explain the role of modeling in dynamic systems analysis and design (mechanical and electrical)
- Model various forms of engineering systems
- Use Laplace Transform techniques to analyze the behavior of dynamic systems.
- Use computer software such as *MATLAB or Scilab* for engineering systems analysis and design.

Course Content

Introduction to Dynamic Systems: Definition of dynamic system**(4 Hours)**

- Modelling
- Types of models

(14 Hours)

- Modelling procedure

Input/output Modeling of Physical Systems

- Mechanical Systems
- Electrical Systems
- Electro-mechanical Systems
- Fluid Systems
- Thermal Systems

(6 Hours) (12 Hours)

- Mixed Systems

State Space Modeling of systems

Determination of System Behavior

- Time domain

(4 Hours)

- Plotting

Applications

- Mechanical vibrations
- Shock absorbers

Characterization of System Behaviour

- Time constant
- Rise time
- Natural frequencies

(45 Hours)

- Damping ratio

Practicals and hands-on use of software

- *Use of Scilab* or*Matlab* in the analysis of dynamic systems

Mode of Delivery

The course will be taught by using lectures and tutorials

Assessment

Course work (assignments, practicals and tests) and final examination and their

relative contributions to final grade are shown as follows:

Requirement	**Percentage contribution**
Course work	40%
Final examination	60%
Total	100%

References

[1] Hargreaves , Martin (1996). Engineering Systems: Modelling and Control. Addison Wesley Longman Limited. ISBN 0-582-23419-0

[2] Dukkipat, Rao. V (2005). Engineering System Dynamics. Narosa Publishing House ISBN 81-7319-556-0

[3] Palm III, William J. (2005). System Dynamics. McGraw Hill, Higher Education. ISBN 0-256-11449-8

[4] Cochn, Ira and Plass Jr., Harold J. (1990). Analysis and Design of Dynamic Systems. HarperCollins Pubishers Inc. ISBN 0-06-041314-X

[5] Cha, Philip D; Rosenberg, James J. and Dym, Clive L. (2000). Fundamentals of Modeling and Analyzing Engineering Systems. Cambridge University Press. ISBN 0-52159463-4