ENG319 Analogue Control System Design

Level: 3
Credit Units: 5 Credit Units
Language: ENGLISH
Presentation Pattern: EVERY JAN

Synopsis:

This course covers aspects of analogue control system design and modeling. Topics in the course include analogue mathematical modeling of control/feedback systems; classical control system analysis and frequency domain design techniques taking into consideration aspects of stability and performance.

The Aims of this course are to teach students the basics of classical control theory to evaluate systems stability and performance and when required to design controllers to stabilise and to improve performance of systems and on the practical implementations of feedback control systems.

Students will spend approximately 120 hours on a progressive basis to master the concepts and practice of control systems design in a Blended Learning mode. In addition, all face-to-face laboratory sessions provide students an opportunity to apply the concepts they have learnt.

This course provides students with the analytical tools to understand systems from a control engineering perspective and the tools and technologies to solve such problems.

It guides students to identify relevant system properties and parameters and to formulate mathematical models that allow the use of classical control theory to evaluate system performances and to design feedback control solutions to meet performance specifications.

It can be applied to sensors and transducer systems, to modelling and understanding of biomedical systems as well as in the manufacturing of batch products (pharmaceutical and drugs), discrete components and systems (disk drives, automation and MEM) and flow processes (petrol-chemical and oil and gas).

Students will also be introduced to Computer Simulation Design Tools such as Matlab and the associated Quanser Servomotor System.

Topics:

- Introduction to Control Systems. Mathematical models of Systems.
- State Variable Models. Feedback Control Systems Characteristics.
- The Performance of Linear Feedback systems.
- The stability of Linear Feedback Systems.
- Frequency Response Methods. Stability in the Frequency Domain.
- The Design of Feedback Control Systems.

Textbooks:

Dorf, R C, Bishop, R H: Modern Control Systems 13th edition Pearson (Global edition)
ISBN-13: 9781292152974

Dorf, R C, Bishop, R H: Modern Control Systems 13th edition Pearson (Global edition)
ISBN-13: 9781292152974-AA

Learning Outcome:

- Discuss the basic control theory, Laplace transform, transfer function and state-space equation of control systems.
- Examine the feedback analogue control systems using transient and steady-state responses.
- Determine the transfer function, stability, gain and other parameters of open and closed-loop analogue control systems.
- Calculate phase-margin, settling time, overshoot and other parameters associated with analogue control systems.
- Draw the signal flow graph/ Nyquist plot/ Bode plot for analogue control systems.
- Design an analogue control system meeting the required specifications.
- Use software tools to study analogue control system design.

Assessment Strategies:

Continuous Assessment Component	**Weightage (%)**
PRE-CLASS QUIZ	2
CLASS TEST	8
PRE-CLASS QUIZ	2
CLASS TEST	8
PRE-CLASS QUIZ	2
LAB TEST	8
Sub-Total	**30**

Examinable Component	**Weightage (%)**
Written Exam	70
Sub-Total	**70**

Weightage Total	**100**