ELEC216P Programming and Control Systems

Aims

Programming:

The aim of this course is to extend the students' programming skills and introduce them to Java-based object-oriented design and programming, providing the foundations for design and programming in any other object-oriented environment.

Control:

To provide a fundamental understanding of feedback control systems in terms of transient and steady state response and stability; to enable the study of feedback control systems with Laplace, Nyquist and Bode plots.

Syllabus

Programming:

Introduction
Java and the Java Virtual Machine, portability, key differences to C/C++

Random numbers
Random number generation, use in simulation

Exceptions
Programming language support for exceptions, failsafe programs

Classes and objects
Instance variables, methods, encapsulation, instantiation, static members

Inheritance and polymorphism
Inheritance hierarchies, extensibility, polymorphism, abstract methods & interfaces

Data structures
Arrays, list, queue, stack, trees

Recursion
Methods calling themselves, recursive applications, recursion vs iteration

Threads and concurrency
Concurrent program execution, the Thread class, synchronisation

Algorithms and complexity
Search and sort algorithms, computational complexity
**Control:**

An introduction to control systems, including:

“Classical” control theory; feedback control; transfer function analysis; stability criteria – Root locus, Bode, Nyquist, Routh Hurwitz; application of Laplace transforms; electronic devices; mathematical modelling.

The course starts from first principles of Newtonian translational and rotational dynamics as well as KVL/KCL circuit laws and elaborates on the state-space derivation, Laplace transform and related tools for the stability and control.

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<th>Prerequisites</th>
<th>ENGS103P: Modelling and Analysis</th>
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<tr>
<td></td>
<td>ELEC101P: Introduction to Electronic Engineering</td>
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<td>ELEC106P: Programming I</td>
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<td>Core for</td>
<td>All</td>
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<tr>
<td>Taught by</td>
<td>Prof. George Pavlou (Programming)</td>
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<td>Dr Yiannis Andreopoulos (Control Systems)</td>
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**Assessment**

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<thead>
<tr>
<th>Weighting</th>
<th>Examination (80%), Coursework (20%)</th>
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<tr>
<td>Coursework</td>
<td>Control Systems Laboratory Report (10%)</td>
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<td>Programming Assignments (10%)</td>
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