Syllabus
Course description

Course title	Fundamentals of programming for control
Course code	46050
Scientific sector	Ing-inf 04
Degree	PhD programme Advanced System Engineering (1st year)
Semester	I
Year	I
Academic year	2020-2021
Credits	3
Modular	No

Total lecturing hours	30
Attendance	Attendance of lectures is strongly recommended but is not required
Prerequisites	None
Course page	

Specific educational objectives	The course provides an introduction to python programming techniques applied to the basic principles of automatic control. Examples and exercises that use python to solve problems in controls and robotics will be given. More specifically, Python programming: strings and string manipulation, comments, functions, tuples, lists, aliasing, dictionaries, testing, debugging, exceptions, assertions, creating python classes and data types, for loops, while loops, 2D lists and loops, plotting graphs, input from files, modules, matrix operations, solving linear differential equations programatically, tuples, Introduction to linear control theory: Systems, states, Dubin's car example, solution of uncontrolled and controlled systems, Basic PID control, peak and time related criterea, ziegler-nichols tuning, stability: phase plots, Lypanov's method, perturbations, root locus, using python for desinging a phase-lag controller, reference trajectories, path following PID, trajectory tracking, the soft landing problem, Optimal control: time optimal, terminal control, linear regulator with quadratic costs, processing sensor information through python.

Learning outcomes	<u>Knowledge and understanding</u> 1. Basic software design procedures

	2. How to program in Python 3. Basics of linear control: controllability, optimization, stability 4. Basics of modelling and simulation Applying knowledge and understanding Writing programs for lab exercises during the lectures Making judgements Choosing the right data type and programming approaches Communication skills Writing lab reports will require presenting information and ideas in clear language Learning skills Basic foundatsions for further study in Engineering

Assessment	Form	%
	Exercise	40
	Final exam	60
Assessment language	English	
Evaluation criteria and criteria for awarding marks	In-class exercises: completeness and correctness of answers, level of understanding Written final exam: Completeness and correctness of answers	

Required readings	Notes will be provided on OLE
Supplementary readings	Additinal books may be recommended during the course