UNIVERSITÀ DEGLI STUDI DI PALERMO

SCHOOL	POLYTECHNIC SCHOOL
ACADEMIC YEAR	2016/2017
SECOND CYCLE (7TH LEVEL) COURSE	AEROSPACE ENGINEERING
SUBJECT	AUTOMATIC CONTROL
TYPE OF EDUCATIONAL ACTIVITY	C
AMBIT	20907-Attività formative affini o integrative
CODE	02190
SCIENTIFIC SECTOR(S)	ING-INF/04
HEAD PROFESSOR(S)	D'IPPOLITO FILIPPO Ricercatore Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	9
INDIVIDUAL STUDY (Hrs)	144
COURSE ACTIVITY (Hrs)	81
PROPAEDEUTICAL SUBJECTS	
YEAR	1
TERM (SEMESTER)	2° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**D'IPPOLITO FILIPPO** Monday 09:00 10:00 DEIM - Edificio 10 Wednesday 09:00 10:00 DEIM - Edificio 10 Friday 09:00 10:00 DEIM - Edificio 10

DOCENTE: Prof. FILIPPO D'IPPOLITO

TEACHING METHODS	Lectures, exercises in the classroom
ASSESSMENT METHODS	A semi-structured written test lasting 3 hours, aimed at ascertaining the required skills and abilities. The well defined and clear stimuli allow to formulate independently the answer, and are structured so as to ensure comparability. Their structure includes: a) short answers, b) open-ended answer that meet constraints such as to make them comparable with the predetermined correction criteria.
LEARNING OUTCOMES	Knowledge and understanding The course of Automatic Control is a basic course in the analysis of dynamical systems and the design of control systems for any kind of real systems. The student, at the end of the course, will have gained a new approach to address and solve engineering problems of considerable importance from the application point of view. This approach is based on the construction of a mathematical model of the system under study, the experimental validation of this model, on the identification and verification of different properties of the model also useful in order to determine the suitable techniques for the design of the control system, on the validation the performance of the control system by means of digital simulation experiments performed on a Personal Computer using appropriate software tools and, finally, on the experimental verification of the prototype using the rapid prototyping devices for the implementation of the controlling of the control system itself. Applying knowledge and understanding The student will be able to use the acquired methodologies for the engineering study of real systems that can be described by mathematical models and linear time-invariant also to more inputs and outputs (MIMO). It will, also, be able to design controllers both in the time domain based on elementary correction networks by synthetic techniques and in the s domain. Making judgments The student will be able to check the properties of the model under study and, consequently, to assess the actions required to achieve the ultimate goals of his study are to build a control system to meet specific project assigned. communication skills The communication skills of the student will be highlighted by the open-ended answers. Learning ability The course also aims to stimulate student interest in the systematic approach used in the treatment of the various topics covered by the course itself. The student will acquire the methodology of the study will definitely be able to face and solve complex problems in the workplace.
EDUCATIONAL OBJECTIVES	The course objectives are those of the study of real systems using an approach based on a mathematical model of the system. This model is used both to evaluate the dynamic behavior and by means of PC simulation software environment dedicated scheme, usually the Matlab-Simulink environment, is to define and evaluate important aspects of the real system of the same behavior from the definition and study of certain properties of the model, among which are of fundamental interest in the stability, controllability, the observability, the steady-state and transient behaviour. The mathematical model is also used for the design of a controller to associate with the real system so that the whole system is able to achieve predetermined performance.
PREREQUISITES	Basic knowledge of mathematics and physics. In particular: Complex numbers, matrix algebra, differential equations.
SUGGESTED BIBLIOGRAPHY	Bolzern-Scattolini-Schiavoni, Fondamenti di controlli automatici 4/ed, McGraw Hill, 2008, ISBN: 9788838668821

SYLLABUS

Hrs	Frontal teaching
6	Introduction; Mathematical modeling
4	Study of linear and time-invariant models in time domain
2	Linearization, discretization and Lyapunov stability
2	Linear time invariant, discrete time models
2	Study of linear and time-invariant models in the Laplace domain
8	Model properties: reachbility, observability, stability
8	State observers. Output feedback control

SYLLABUS

Hrs	Frontal teaching
6	Frequency responce, global links
2	Open loop and closed loop control systems
2	Nyquist criterion
4	Steady state and transient behaviour of tracking and regulation systems
2	Hall and Nychols diagrams
2	Lead-lag-net based frequency domain control systems design
2	PID control
4	Root locus and Laplace domain control system design

Hrs	Practice
4	Laplace transform: theory and exercises
2	mathematical modelling
10	Study of linear and time-invariant models in time, Laplace and frequency domain
1	Model properties: reachbility, observability, stability
1	Nyquist criterion
3	Output feedback control design
3	Lead-lag-net based frequency domain control systems design
2	Laplace domain control systems design