Universidad
Carlos III de Madrid
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COURSE: MODELLING AND CONTROL OF POWER ELECTRONICS SYSTEMS		
MASTER: ELECTRONIC SYSTEMS ENGINEERING AND APPLICATIONS (3 ECTS)	YEAR: 2025-2026	TERM: 2st

WEEKLY PLANNING							
WEEK	**SESSION**	**DESCRIPTION**	**GROUP (mark X)**		**Special room for session (computer classroom, audio-visual classroom…)**	**WEEKLY PROGRAMMING FOR STUDENT**	
			LECTURES	SEMINARS/LAB[1]		DESCRIPTION	CLASS HOURS	HOMEWORK HOURS (Max. 7h week)
1	1	**1. Modeling and control introduction for power converters and systems.**	x			Previous reading Answering questions about background	1,5	4
1	2	**2. Dynamics of power converters.**	x		COMPUTER CLASSROOM	Study of topics developed	1,5	
2	3	**3. Modeling and control oriented to converter-level design** Simulation-oriented modeling	x			Study of topics developed	1,5	5
2	4	Modeling based on injected-absorbed-current dynamic analysis method	x			Study of topics developed	1,5	
3	5	Control loop design	x			Study of topics developed	1,5	5

3	6	**Exercise I**: Modeling of a Buck DC-DC converter with voltage mode control loop **Exercise II**: Modeling and control of a Boost DC-DC converter with average current mode control loop	X			Make and review exercises	1,5	
4	7	**Exercise III**: Adapter for battery charge in mobile phone applications	x		COMPUTER CLASSROOM	Make and review exercises	1,5	5
4	8	Modelling and control of Multiphase converters **Exercise IV**: Multiphase converter for high performance microprocessors.	x		COMPUTER CLASSROOM	Study of topics developed Make and review exercises	1,5	
5	9	**4. Modeling and control oriented to system-level design**: Behavioral modeling, system stability and Control loop design. **Exercise V**: Power distribution system for telecommunication application.	x		COMPUTER CLASSROOM	Study of topics developed Make and review exercises	1,5	5
5	10	**5. Modulation, modeling and control of Inverters** Inverter concepts and inverter topologies Basic Output Voltage Control: Square wave operation Fundamentals of PWM modulation Advanced Modulation Techniques	x			Study of topics developed	1,5	
6	11	**Exercise VI**: Modelling and control of Single-Phase Voltage Source Inverters.	x			Make and review exercises	1,5	5
6	12	**Exercise VII**: Three-phase inverter with d-q control for renewable energy applications	x			Make and review exercises	1,5	
7	13	Digital control (I)	x		COMPUTER CLASSROOM	Study of topics developed	1,5	5
7	14	Digital control (II)	x		COMPUTER CLASSROOM	Study of topics developed	1,5	
		[1] **A maximum of 1-2 lab sessions**				**Subtotal 1**	21	34
						Total 1 *(Hours of class plus student homework hours between weeks 1-7)*	55	

1-7		Tutorials, handing in, etc					10	
8		Assessment					3	7
						Subtotal 2	3	17
						Total 2 *(Hours of class plus student homework hours at week 8)*	20	

TOTAL *(Total 1 + Total 2)*	75