



Electric Energy Systems University Enterprise Training Partnership

<http://www.ees-uetp.com/>

EES-UETP course

Control of power systems dominated by power electronic converters

Barcelona, Spain – 19-22 May 2020

Location: ETSEIB, Av. Diagonal, 647, 08028 Barcelona, Spain

Organizers

CITCEA-UPC, Technical University of Catalonia, BarcelonaTECH, Barcelona, Spain

Coordinators

Eduardo Prieto-Araujo (CITCEA-UPC)

Oriol Gomis-Bellmunt (CITCEA-UPC)

Marc Cheah-Mane (CITCEA-UPC)

Description of the course

Power systems are witnessing a very important penetration of power electronics. Future power networks will be dominated by power electronics, and this implies start changing traditional approaches on how to understand, analyze and engineer power systems. The course presents an overview on the current challenges and solutions, while acknowledging that there are still many open questions which are being addressed by numerous researchers worldwide.

The course is structured on different lectures covering the main principles and methods for analysis of power systems dominated by power electronic converters. Different application examples are analyzed and discussed. Students will also follow some practical sessions where they will develop small models and will be able to apply the theoretical concepts studied.

Course program

Time	Day 1 – Introduction and basic principles and methods		7 h
9:00-10:00	Registration and welcome		1h
10:00-11:00	Introduction, concepts and definitions Principles of system modeling and control	Oriol Gomis (UPC)	1 h
11:00-12:00	Methods for analysis of systems dominated by power electronics. State-space modeling and tools.	Eduardo Prieto (UPC)	1 h
12:00-13:45	Methods for analysis of systems dominated by power electronics. Impedance-based modeling. Stability analysis.	Massimo Bongiorno (Chalmers)	1h 45 min
13:45-14:45	Lunch		1h
14:45-16:15	Overview of AC-DC converter hardware	Adrià Junyent (Imperial College)	1h 30 min
16:15-17:00	Modeling of lines and cables for interaction studies with power electronic converter	Jef Beerten (KU Leuven)	45 min
17:00-18:00	Converter interactions in hybrid AC/DC power systems	Jef Beerten (KU Leuven)	1h

	Day 2 – Power electronics dominated systems and weak networks		6 h
9:00-10:00	Fundamentals on grid forming	Xavier Guillaud (EC Lille)	1 h
10:00-11:00	Control of Low-Inertia Power Systems (Part I)	Florian Dörfler (ETH)	1 h
11:00-11:30	Coffee break		30 min
11:30-12:30	Control of Low-Inertia Power Systems (Part II)	Florian Dörfler (ETH)	1 h
12:30-13:30	VSC connected to weak networks	Agustí Egea (Univ. of Strathclyde)	1 h
13:30-14:30	Lunch		1h
14:30-16:30	Practical exercises	UPC	2 h

	Day 3 – Applications day		6 h
9:00-10:00	Case study: islands dominated by power electronics	Marc Cheah (UPC)	1 h
10:00-11:00	Virtual Inertia and Virtual Synchronous Machines. Application to HVDC transmission. (Part I)	Jon Are Suul (SINTEF)	1 h
11:00-11:30	Coffee break		30 min
11:30-12:30	Virtual Inertia and Virtual Synchronous Machines. Application to HVDC transmission. (Part II)	Jon Are Suul (SINTEF)	1 h
12:30-13:30	To be confirmed	-	1 h
13:30-14:30	Lunch		1h
14:30-16:30	Practical exercises	UPC	2 h

	Day 4 – Industrial day		5 h
9:00-10:00	The use of real time simulation to de-risk and manage HVDC and FACTS schemes.	Hani Saad (RTE)	1h
10:00-11:00	Considerations on functional requirements for next-generation power electronic assets	Simon Wenig (TransnetBW)	1h
11:00-11:30	Coffee break		30 min
11:30-12:30	Interaction assessment between HVDC & power electronic components in AC network	Rodrigo Teixeira (Siemens)	1h
12:30-13:30	System operation in power electronics-dominated system	Carmen Longás (REE)	1h
13:30-14:30	Manufacturer		1h
13:30-14:30	Lunch		1h

Instructors

Dr Jef Beerten (KU Leuven)

Prof Massimo Bongiorno (Chalmers)

Dr Agustí Egea (Strathclyde University)

Prof Xavier Guillaud (EC Lille)

Dr Jon Are Suul (SINTEF)

Dr Florian Dörfler (ETH)

Dr Adrià Junyent (Imperial College)

Dr Hani Saad (RTE)

Dr Simon Weing (TransnetBW)

Dr Rodrigo Teixeira (Siemens)

Carmen Longás (REE)

Dr Marc Cheah (CITCEA-UPC)

Dr Eduardo Prieto-Araujo (CITCEA-UPC)

Prof Oriol Gomis-Bellmunt (CITCEA-UPC)

Venue

ETSEIB-UPC, Av. Diagonal, 647, 08028 Barcelona, Spain

Link: <https://goo.gl/maps/7d3A66zATiZjE2Mw8>

Registration

The course fees include lectures attendance, documentation (digital and paper), coffee breaks and lunches.

Members of the EES-UETP: 450 EUR

University non-members of the EES-UETP: 1100 EUR

Industry non-members of the EES-UETP: 1835 EUR

This course is organized within the framework of the EES-UETP Consortium.

More information on this course shall be available very soon at:

<http://www.ees-uetp.com/upcoming.php>

Registrations are limited! You can register at: <https://forms.gle/qTAh7USEYvbecsqF8>

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