Electric Energy Systems University Enterprise Training Partnership

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

EES-UETP course

Control of power systems dominated by power electronic converters

Date

Barcelona, Spain – 29 Nov (Tuesday) - 2 Dec 2022 (Friday)

Slides link

https://www.dropbox.com/sh/mymiz1q1rytnlm9/AADVyK-1y730FzkECfZy4v0ka?dl=0

Venue

Lectures room (Main course location)
ETSAB-UPC, Av. Diagonal, 649, 08028 Barcelona, Spain
Room: Sala de graus (Graus room)
Link: https://goo.gl/maps/kYLw5T7fQur1sS3s6

Exercises room (only Wednesday/Thursday afternoon)
ETSEIB-UPC, Av. Diagonal, 647, 08028 Barcelona, Spain
Link: https://goo.gl/maps/7d3A66zATiZjE2Mw8
Rooms: LS.6 (L building, Floor -1) and Schneider Lab Room (H building, 2nd floor)

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 – 29/11 – Introduction and basic principles and methods	Speaker	7 h
9:00-10:00	Registration and welcome		1h
10:00-10:05	Course introduction	Eduardo Prieto (UPC)	5 min
10:05-11:00	Introduction to renewables and power electronics dominated power systems	Oriol Gomis (UPC)	55 min
11:00-11:30	Coffee break		30 min
11:30-12:30	Overview of AC-DC converter hardware	Adrià Junyent (Imperial College)	1h
12:30-13:30	Converter interactions in hybrid AC/DC power systems	Jef Beerten (KU Leuven)	1h
13:30-14:30	Lunch		1h
14:30-16:00	Methods for analysis of systems dominated by power electronics. State-space modeling and stability analysis.	Eduardo Prieto (UPC)	1h 30 min
16:00-17:00	Methods for analysis of systems dominated by power electronics. Impedance-based modeling.	Marc Cheah (UPC)	1h
17:00-18:00	EMT and Phasor simulation of grids dominated by power electronics and renewable generation	Vinicius Lacerda (UPC)	1h

	Day 2 – 30/11 – Power electronics dominated systems and weak networks	Speaker	6 h
8:30-9:30	Fundamentals on grid forming	Xavier Guillaud (EC Lille)	1 h
9:30-10:30	Control of Low-Inertia Power Systems	Linbin Huang (ETH Zürich)	1 h
10:30-11:00	Coffee break		30 min
11:00-12:00	Frequency dynamics in power electronics dominated networks	Carlos Collados (UPC)	1 h
12:00-13:00	VSC connected to weak networks	Agustí Egea (Univ. of Strathclyde)	1 h
13:00-14:00	Lunch		1h
14:00-16:00	Practical exercises	UPC	2 h

	Day 3 – 1/12 – Applications day	Speaker	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.	Jon Are Suul (SINTEF)	1 h
11:00-11:30	Coffee break		30 min
11:30-12:30	Challenges of power systems dominated by inverter-based generation together with conventional power plants	Julian Freytes (EDF)	1 h
12:30-13:30	Onsite test of BESS in Grid Forming Operation to Energize Islanded System including a Wind Farm - Experience ad EMT studies	Hani Saad (ACDCtransient)	1 h
13:30-14:30	Lunch		1h
14:30-16:30	Practical exercises	UPC	2 h

	Day 4 – 2/12 – Industrial day	Speaker	5 h
9:00-10:00	The use of real time simulation to de-risk and manage HVDC and FACTS schemes.	Pierre Rault (RTE)	1h
10:00-11:00	Considerations on functional requirements for next-generation power electronic assets	Simon Wenig (Mosaic Grid Solutions)	1h
11:00-11:30	Coffee break		30 min
11:30-12:30	Studies for interaction of power electronics from multiple vendors in power systems	Alejandro Bayo (Siemens Energy)	1h
12:30-13:30	Mitigating harmonic stability risks in HVDC interconnections	Omar Jasim (GE Grid Solutions)	1h
13:30-14:30	Modular Multilevel converter for Power Quality: Overview of control strategy, functionalities, and applications	Gianluca Postiglione (Nidec Asi)	1h
14:30-15:30	Lunch		1h

Instructors

Dr Jef Beerten (KU Leuven)

Prof Massimo Bongiorno (Chalmers U)

Dr Agustí Egea (Stratchlyde University)

Prof Xavier Guillaud (EC Lille)

Dr Jon Are Suul (SINTEF)

Dr Linbin Huang (ETH Zürich)

Dr Adrià Junyent (Imperial College)

Dr Omar Jasim (GE)

Dr Gianluca Postiglione (Nidec Asi)

Dr Pierre Rault (RTE)

Dr Hani Saad (ACDCtransient)

Dr Simon Wenig (Mosaic Grid solutions)

Dr Alejandro Bayo (Siemens)

Dr Julian Freytes (EDF)

Mr Carlos Collados (CITCEA-UPC)

Dr Vinícius Lacerda (CITCEA-UPC)

Dr Marc Cheah (CITCEA-UPC)

Dr Eduardo Prieto-Araujo (CITCEA-UPC)

Prof Oriol Gomis-Bellmunt (CITCEA-UPC)

Registration

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

Members of the EES-UETP: 490 EUR

University non-members of the EES-UETP: 1200 EUR

Industry non-members of the EES-UETP: 2000 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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