





Joint European Summer School on Fuel Cell, Electrolyser, and Battery Technologies JESS 2016

12 – 16 September 2016 (Introductions) and 19 – 23 September 2016 (Specialisation Classes)

Hotel Amarilia, Athens, Greece



update 12-08-2016

INTRODUCTION

The Joint European Summer School JESS 2016 will be held in Vouliagmeni, close to the beautiful city of Athens. Once again it will provide highly condensed high level courses on selected topics of fuel cells, electrolyser, and battery technologies, this year adding a Modelling Master Class, and modules on Business Development and Fuel Cell Vehicles.

The increase in energy production from renewable sources creates a demand for energy storage technologies. Storage and conversion can be accomplished electrochemically, in batteries or chemically through electrolysis and fuel cells. Therefore, these technologies are predestined to play a major role in the energy production infra-structure of the near future.

During the Summer School, the main focus will be on the technological aspects. Starting from the fundamental principles of electrochemistry and thermodynamics, the entire spectrum of materials, design and balance of plant will be covered both from an engineering point of view as well as from a modelling and market development perspective. In addition to the lectures, the participants will be asked to join in student projects where the content of the lectures can be applied to a case study to be presented at the end of the week.

<u>Week 1</u> offers the three introductory courses to high and low temperature fuel cells and electrolysers, and the battery technology course. These courses are accredited at the three universities organizing the Summer School and carry 3 ECTS points (see below).

<u>Week 2</u> offers the three specialised courses in Modelling (Master Class), Fuel Cell Vehicles and Business Development. These courses are not accredited (yet).

The two weeks are conducted independently of each other and students can choose the most appropriate courses to their studies.

The Summer School targets an audience of university students and young professionals within the fields of fuel cells, hydrogen production and batteries. The lectures are designed for MSc-students, PhD-students, and Post-Doctoral researchers. More experienced researchers and engineers wishing to review the technologies addressed and expand their knowledge, for instance, to possibly suit a newly acquired position, will also greatly benefit from attending. The topical content is tailored to the needs of a diverse audience: newcomers to the field, experienced students, and young professionals working at the forefront of fuel cell and battery applications.

The school draws on the knowledge and expertise of a selected group of lecturers currently working at the leading edge of fuel cell, hydrogen, battery, and market research and development in Europe and associated to universities, national research centres and industry.

Informal networking is a key element of science and scientific work in general. The Joint European Summer School on Fuel Cell, Electrolyser and Battery Technologies offers ample opportunity for networking between young professionals and eminent scientists. Students are given a mini-project to work on in small teams and asked to give a short introduction to themselves and the research work they are doing (or expect to be doing).

CERTIFICATE OF ATTENDANCE

A Certificate of Attendance shall be issued to all students of the Joint European Summer School on Fuel Cell, Electrolyser and Battery Technologies. This Certificate of Attendance can also be used for acquiring CPD points. The courses of the first week are accredited at the universities of Aachen and Birmingham as well as the Danish Technical University. On taking the optional final exam of their respective course, students can gain 3 ECTS points.

ORGANISING COMMITTEE

Prof Rüdiger-A. Eichel (Forschungszentrum Jülich, Germany)

Prof Jens Oluf Jensen (DTU Energy Conversion, Denmark)

Prof Robert Steinberger-Wilckens (U Birmingham, United Kingdom)

LOCATION & VENUE

Athens is the capital and largest city of Greece. Athens dominates the Attica region and is one of the world's oldest cities, with its recorded history spanning around 3,400 years. Classical Athens was a powerful city-state. A centre for the arts, learning and philosophy, home of Plato's Academy and Aristotle's Lyceum, it is widely referred to as the cradle of Western civilization and the birthplace of democracy, largely due to the impact of its cultural and political achievements during the 5th and 4th centuries BC in later centuries on the rest of the then known European continent. The heritage of the classical era is still evident in the city, represented by ancient monuments and works of art, the most famous of all being the Parthenon, considered a key landmark of early Western civilization. The city also retains Roman and Byzantine monuments, as well as a smaller number of Ottoman monuments. It is home to two UNESCO World Heritage Sites, the Acropolis of Athens and the medieval Daphni Monastery. Landmarks of the modern era, dating back to the establishment of Athens as the capital of the independent Greek state in 1834, include the Hellenic Parliament (19th century) and the Athens Trilogy, consisting of the National Library of Greece, the Athens University and the Academy of Athens.

The hotel hosting the school is located only steps away from a sandy beach in the Vouliagmeni aera, 17 km from Athens city centre and 19 km from Athens international airport. All rooms have individual controlled A/C, free WiFi internet access, hairdryer, mini fridge, LCD TV and DVD player. More details can be found at http://www.amarilia.gr/. Participants wishing to arrive early or stay longer should make their own arrangements with our contact and cooperating partner: Panhellas Tourism & Congress (Mrs Manuela Drape Stathoglou, Mail: manuela@panhellas.gr, Tel: 0030 2810 300847, Fax: 0030 2810 300848).

Reaching Amarilia Hotel from Athens international airport 'Eleftherios Venizelos'

By bus

There is 24-hour bus service at the arrivals terminal in Athens international airport (Eleftherios Venizelos). The trip to the closest bus station to Amarilia Hotel (named 'Pigadakia') takes approx. 35-40 minutes and the cost is € 5,00. From the bus station 'Pigadakia' you turn left on the main avenue and walk 10 minutes before you arrive at Amarilia Hotel, on the right side of the main avenue.

By car

You drive on the highway until the KOROPI - MARKOPOULO sign and you exit to the left. Then you follow the signs to GLYFADA and drive along the Vari - Koropi Avenue at the end of which there is a sign VOULIAGMENI where you turn left. After 300m, you reach a traffic light; you turn right in the small street 15m after the traffic lights, then right in the first street and then right to Agiou Nikolaou street. This is VOULIAGMENI area and it is where our hotel is located. The distance from the Airport is 19km (20 minutes driving distance).

CORRESPONDENCE

Student registration and financial matters

1st week: JESS@fz-juelich.de; Phone +49 2461 61-2244, Fax +49 2461 61-9550

2nd week: J.C.Hooper@bham.ac.uk; Phone: +44 121 414 5275

Lecturers/other information - jo.mertens@fz-juelich.de, Phone +49 2461 61-6706

PARTICIPATION FEE

To register, fill in one of the forms attached at the end of this document, scan, and send to the e-mail addresses on the form. Or follow the registration links on the web site

http://www.jess-summerschool.eu/JESS-2016

The registration fee is 1.280,- €/week and covers tuition fees, accommodation in single room (double room occupancy = 1.150,- €) from 11 to 17 Sept, resp. 18 to 24 Sept, full board, banquet and excursion.

The deadline for registration is 31 August 2016.

CANCELLATION POLICY

To cancel your registration with JESS, send an email stating your intent to

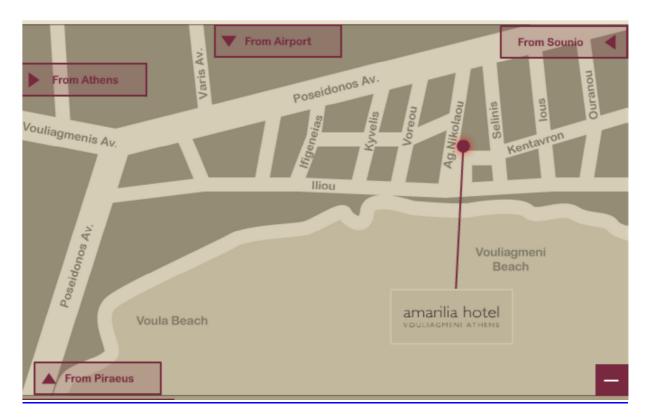
<u>JESS@fz-juelich.de</u> (1st week) <u>i.c.hooper@bham.ac.uk</u> (2nd week)

Refunds will be subject to a cancellation fee. If your request arrives by 01 September 2016, the registration fee will be refunded after the school applying a cancellation fee of 350,00 € of the processed registration fee. No reimbursement will be made for cancellations received after 01 September 2016.

To cancel any additional services booked with Panhellas (see below), please direct your request to Panhellas directly at the address(es) shown.

LIABILITY

The school secretariat and organizers cannot accept liability for personal accidents, loss of or damage to private property of participants and/or accompanying persons, either during, or directly arising from the JESS 2016. Participants should make their own arrangements with respect to health and travel insurance.



JESS 2016 - Programme WEEK 1

			Joint lectures			
Module 1 Module 2	Introduction to SOFC / SOEC		Introduction to LT Fuel Cells and Electrolysers			
lodule 3			Introduction to L1 Fuel Cells and Electrolysers		Introduction to Batteries	
Sunday	11 Sep 2016	Arrival				
londay	12 Sep 2016					
	12 Sep 2010					
18:00 08:30	Registration					
18:30 09:00 19:00 09:45			Welcome and General Introduction Sustainable and Renewable Energy Future	Jens Oluf Jensen (DTU) Rüdiger-A. Eichel (FZJ)		
09:45 10:00	coffee break		coffee break Introduction to Batteries	Rüdiger-A. Eichel (FZJ)	coffee break	
10:00 11:15 11:15 11:30	break		break		break	
11:30 12:45			Introduction to Fuel Cells and Electrolysis	Robert Steinberger-Wilckens (U Bham)		
13:00 14:00	lunch					
6:00 17:30			Thermodynamics and Efficiency of Electrochemical Cells	Jens Oluf Jensen (DTU)		
17:30 18:00 18:00 19:30	coffee break		Introduction to Solid State Chemistry & Ionics	Rüdiger-A. Eichel (FZJ)	сопее вгеак	
19:30 19:45			Introduction to the Students' Project	Robert Steinberger-Wilckens (U Bham)		
19:45 21:15	welcome reception / dinner					
1:15 22:00			Students' Presentations I	Jens Oluf Jensen (DTU)		
iesday	13 Sep 2016					
	Introduction to SOFC / SOEC		Introduction to LT Fuel Cells and Electrolysers		Introduction to Batteries	
8:30 09:45	Electrolyte materials for SOFC / SOEC	Alan Atkinson (ICL)	Electrolyte materials for LT fuel cells and electrolysers	Marcelo Carmo (FZJ)	Cell and Pack designs for batteries	Sébastien Martinet (CEA)
9:45 10:00 0:00 11:15	Coffee break Anode materials for SOFC / SOEC	Alan Atkinson (ICL)	coffee break Catalyst and kinetics for LT fuel cells and electrolysers I.	Lars Cleemann (DTU)	coffee break Manufacturing of batteries	Sébastien Martinet (CEA)
1:15 11:30	break		break		break	
1:30 12:45	Cathode materials for SOFC / SOEC	Alan Atkinson (ICL)	Catalyst and kinetics for LT fuel cells and electrolysers II.	Lars Cleemann (DTU)	System technology and safety for batteries	Sébastien Martinet (CEA)
3:00 14:00	lunch					
6:00 17:15	Cell and Stack designs for SOFC / SOEC	Ico Vinke (FZJ)	Cells, bipolar plates, and stacks for LT fuel cells	Lars Cleemann (DTU)	Anode materials for batteries	Karin Kleiner (TUM)
7:15 17:30	coffee break		coffee break		coffee break	
17:30 18:45 18:45 19:00	Manufacturing of SOFC / SOEC	lco Vinke (FZJ)	Cells, bipolar plates, and stacks for LT electrolysers	Marcelo Carmo (FZJ)	Cathode materials for batteries	Rüdiger-A. Eichel (FZJ)
19:00 20:15	work .		break Students' Presentations II	Jens Oluf Jensen (DTU)	JICAN	
0:30 21:30	dinner					
ednesday	14 Sep 2016					
	Introduction to SOFC / SOEC		Introduction to LT Fuel Cells and Electrolysers		Introduction to Batteries	
18:30 09:45 19:45 10:00	Exercise on materials / design	Ico Vinke (FZJ)	Hydrogen compression and storage	Jens Oluf Jensen (DTU)	All solid state batteries	Rüdiger-A. Eichel (FZJ)
0:00 11:15	coffee break System technology for SOFC	Ico Vinke (FZJ)	System design and operation for LT fuel cells	Jens Oluf Jensen (DTU)	Coffee break Metal-Air batteries	Rüdiger-A. Eichel (FZJ)
11:15 11:30	break Degradation in SOFC / SOEC	Anim Manage (DTI)	break System design and operation for LT electrolysers		break	
11:30 12:45	Degradation in SOPC / SOEC	Anke Hagen (DTU)	System design and operation for LT electrolysers	Marcelo Carmo (FZJ)	Exercise on materials (/ design)	Karin Kleiner (TUM)
13:00 14:00	lunch				_	
15:00 20:45			Excursion			
			Excursion			
21:00 22:00	dinner					
	dinner					
21:00 22:00 hursday	15 Sep 2016 Introduction to SOFC / SOEC		Introduction to LT Fuel Cells and Electrolysers		Introduction to Batteries	
nursday	15 Sep 2016 Introduction to SOFC / SOEC			Characters D. (I Dhaw)	Introduction to Batteries	
nursday 18:30 09:45	15 Sep 2016 Introduction to SOFC / SOEC		Characterisation Methods for Fuel Cell, Electrolyser and Battery Materials	Shangleng Du (U Bham)	Introduction to Batteries	
nursday 18:30 09:45 19:45 10:00 0:00 11:15	dinner 15 Sep 2016 Introduction to SOFC / SOEC		Characterisation Methods for Fuel Cell, Electrolyser and Battery Materials coffee break Exercise on Characterisation, Electrochemistry and Thermodynamics	Shangleng Du (U Bham) Shangleng Du (U Bham)	Introduction to Batteries coffee break	
18:30 09:45 19:45 10:00 0:00 11:15 1:15 11:30	dinner 15 Sep 2016 Introduction to SOFC / SOEC coffee break		Characterisation Methods for Fuel Cell, Electrolyser and Battery Materials coffee break Exercise on Characterisation, Electrochemistry and Thermodynamics break	Shangfeng Du (U Bham)	Introduction to Batteries coffice break break	
18:30 09:45 19:45 10:00 0:00 11:15 1:15 11:30	dinner 15 Sep 2016 Introduction to SOFC/SOEC coffee break break		Characterisation Methods for Fuel Cell, Electrolyser and Battery Materials coffee break Exercise on Characterisation, Electrochemistry and Thermodynamics		Introduction to Batteries coffee break break	
18:30 09:45 19:45 10:00 0:00 11:15 11:30 12:45	Introduction to SOFC / SOEC coffee break break		Characterisation Methods for Fuel Cell, Electrolyser and Battery Materials coffee break Exercise on Characterisation, Electrochemistry and Thermodynamics break	Shangfeng Du (U Bham)	Introduction to Batteries coffee break break	
8:30 09:45 9:45 10:00 0:00 11:15 1:15 11:30 1:30 12:45	Introduction to SOFC / SOEC coffee break break	Oliver Poudziech (StimFilm)	Characterisation Methods for Fuel Cell, Electrolyser and Battery Materials coffee break Exercise on Characterisation, Electrochemistry and Thermodynamics break	Shangleng Du (U Bham)	Introduction to Batteries coffee break break Electrolyte materials for batteries	Juan Maria Garcia Lastra (DTU)
08:30 09:45 09:45 10:00 10:00 11:15 11:15 11:30 11:30 12:45 13:00 14:00 16:00 17:00 17:00 17:15	Introduction to SOFC / SOEC coffee break break lunch System technology for SOEC coffee break	Oliver Posiziech (SunFire)	Characterisation Methods for Fuel Cell, Electrolyser and Battery Materials coffee break Exercise on Characterisation, Electrochemistry and Thermodynamics break Student project time Challenges for LT electrolysers coffee break	Shangleng Du (U Bham) n/a Marcelo Carma (FZJ)	Introduction to Batteries coffse break break Electrolyte materials for batteries coffse break	
08:30 09:45 19:45 10:00 10:00 11:15 11:30 12:45 13:00 14:00 16:00 17:00 17:15 18:30	Introduction to SOFC / SOEC coffee break break lunch System technology for SOEC coffee break Exercise on system technology	Oliver Positziech (SunFire) Robert Steinberger-Wilckens (U Bham)	Characterisation Methods for Fuel Cell, Electrolyser and Battery Materials coffee break Exercise on Characterisation, Electrochemistry and Thermodynamics break Student project time	Shangleng Du (U Bham)	Introduction to Batteries coffee break break Electrolyte materials for batteries coffee break Transport modelling of batteries break	Juan Maria Garcia Lastra (DTU) Juan Maria Garcia Lastra (DTU)
8:30 09:45 9:45 10:00 0:00 11:15 1:15 11:30 1:30 12:45 3:00 14:00 6:00 17:00 7:00 17:15 7:15 18:30	Introduction to SOFC / SOEC coffee break break lunch System technology for SOEC coffee break Exercise on system technology		Characterisation Methods for Fuel Cell, Electrolyser and Battery Materials coffee break Exercise on Characterisation, Electrochemistry and Thermodynamics break Student project time Challenges for LT electrolysers coffee break	Shangleng Du (U Bham) n/a Marcelo Carma (FZJ)	coffee break	
18:30 09:45 19:45 10:00 10:00 11:15 11:15 11:30 11:30 12:45 3:00 14:00 17:00 17:15 18:30 18:45 18:45 19:45	Introduction to SOFC / SOEC coffee break break lunch System technology for SOEC coffee break Exercise on system technology break		Characterisation Methods for Fuel Cell, Electrolyser and Battery Materials coffee break Exercise on Characterisation, Electrochemistry and Thermodynamics break Student project time Challenges for LT electrolysers coffee break Challenges for LT fuel cells break	Shangleng Du (U Bham) n/a Marcelo Carmo (FZJ) Lars Cleemann (DTU)	coffee break	
18:30 09:45 19:45 10:00 10:00 11:15 11:30 12:45 3:00 14:00 14:00 15:7:00 17:15 18:30 18:45 18:45 19:45	Introduction to SOFC / SOEC coffee break break lunch System technology for SOEC coffee break Exercise on system technology break dinner		Characterisation Methods for Fuel Cell, Electrolyser and Battery Materials coffee break Exercise on Characterisation, Electrochemistry and Thermodynamics break Student project time Challenges for LT electrolysers coffee break Challenges for LT fuel cells break	Shangleng Du (U Bham) n/a Marcelo Carmo (FZJ) Lars Cleemann (DTU)	coffee break	
8:30 09:45 9:45 10:00 0:00 11:15 11:15 11:30 12:45 3:00 14:00 14:00 17:00 17:15 18:30 18:45 8:45 19:45	Introduction to SOFC / SOEC coffee break break lunch System technology for SOEC coffee break Exercise on system technology break dinner		Characterisation Methods for Fuel Cell, Electrolyser and Battery Materials coffee break Exercise on Characterisation, Electrochemistry and Thermodynamics break Student project time Challenges for LT electrolysers coffee break Challenges for LT fuel cells break Atomistic Modelling in fuel cell, electrolyser and battery research	Shangleng Du (U Bham) n/a Marcelo Carmo (FZJ) Lars Cleemann (DTU)	coffee break Transport modelling of batteries break	
18:30 09:45 18:30 09:45 19:45 10:00 10:00 11:15 11:30 12:45 11:30 12:45 11:30 14:00 11:30 14:00 11:30 14:00 11:30 14:00 11:30 14:00 11:30 14:00 11:30 14:00	Introduction to SOFC / SOEC coffee break break lunch System technology for SOEC coffee break Exercise on system technology break dinner 16 Sep 2016 Introduction to SOFC / SOEC	Robert Steinberger-Wilckens (U Bham)	Characterisation Methods for Fuel Cell, Electrolyser and Battery Materials coffee break Exercise on Characterisation, Electrochemistry and Thermodynamics break Student project time Challenges for LT electrolysers coffee break Challenges for LT fuel cells break Atomistic Modelling in fuel cell, electrolyser and battery research	Shangleng Du (U Bham) n/a Marcelo Carmo (FZJ) Lars Cleemann (DTU) Juan Maria Garcia Lastra (DTU)	coffee break Transport modelling of batteries break Introduction to Batteries	Juan Maria Garcia Lastra (DTU)
9:30 09:45 9:45 10:00 0:00 11:15 11:30 12:45 3:00 14:00 0:00 17:00	Introduction to SOFC / SOEC coffee break break tunch System technology for SOEC coffee break Exercise on system technology break dinner 16 Sep 2016 Introduction to SOFC / SOEC Exercise on degradation		Characterisation Methods for Fuel Cell, Electrolyser and Battery Materials coffee break Exercise on Characterisation, Electrochemistry and Thermodynamics break Student project time Challenges for LT electrolysers coffee break Challenges for LT fuel cells break Atomistic Modelling in fuel cell, electrolyser and battery research	Shangleng Du (U Bham) n/a Marcelo Carmo (FZJ) Lars Cleemann (DTU) Juan Maria Garcia Lastra (DTU) Lars Cleemann (DTU)	coffee break Transport modelling of batteries break	
8:30 09:45 9:45 10:00 0:00 11:15 11:15 11:30 12:45 3:00 14:00 7:700 17:15 7:700 17:15 8:30 18:30 8:30 18:45 8:45 19:45 0:00 21:00 11:15	Introduction to SOFC / SOEC coffee break break lunch System technology for SOEC coffee break Exercise on system technology break dinner 16 Sep 2016 Introduction to SOFC / SOEC	Robert Steinberger-Wilckens (U Bham)	Characterisation Methods for Fuel Cell, Electrolyser and Battery Materials coffee break Exercise on Characterisation, Electrochemistry and Thermodynamics break Student project time Challenges for LT electrolysers coffee break Challenges for LT fuel cells break Atomistic Modelling in fuel cell, electrolyser and battery research	Shangleng Du (U Bham) n/a Marcelo Carmo (FZJ) Lars Cleemann (DTU) Juan Maria Garcia Lastra (DTU)	coffee break Transport modelling of batteries break Introduction to Batteries	Juan Maria Garcia Lastra (DTU)
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18:30 09:45 19:45 10:00 11:15 11:30 12:45 10:00 14:00 11:00 12:45 10:00 14:00 11:00 14:00	Introduction to SOFC / SOEC coffee break break lunch System technology for SOEC coffee break Exercise on system technology break dinner 16 Sep 2016 Introduction to SOFC / SOEC Exercise on degradation coffee break	Robert Steinberger-Wilckens (U Bham) Anke Hagen (DTU)	Characterisation Methods for Fuel Cell, Electrolyser and Battery Materials coffee break Exercise on Characterisation, Electrochemistry and Thermodynamics break Student project time Challenges for LT electrolysers coffee break Challenges for LT fuel cells break Atomistic Modelling in fuel cell, electrolyser and battery research introduction to LT Fuel Cells and Electrolysers Application of LT fuel cells and electrolysers coffee break	Shangleng Du (U Bham) n/a Marcelo Carmo (FZI) Lars Cleemann (DTU) Juan Maria Garcia Lastra (DTU) Lars Cleemann (DTU) with Marcelo Carmo(FZI)	coffee break Transport modelling of batteries break Introduction to Batteries Beyond Lithium - resource-efficient batteries coffee break	Juan Maria Garcia Lastra (DTU) Juan Maria Garcia Lastra (DTU)
18:30 09:45 19:45 10:00 11:15 11:30 12:45 10:00 14:00 11:00 12:45 10:00 14:00 11:00 14:00	Introduction to SOFC / SOEC coffee break break lunch System technology for SOEC coffee break Exercise on system technology break dinner 16 Sep 2016 Introduction to SOFC / SOEC Exercise on degradation coffee break	Robert Steinberger-Wilckens (U Bham) Anke Hagen (DTU) Anke Hagen (DTU)	Characterisation Methods for Fuel Cell, Electrolyser and Battery Materials coffee break Exercise on Characterisation, Electrochemistry and Thermodynamics break Student project time Challenges for LT electrolysers coffee break Challenges for LT fuel cells break Atomistic Modelling in fuel cell, electrolyser and battery research introduction to LT Fuel Cells and Electrolysers Application of LT fuel cells and electrolysers coffee break	Shangleng Du (U Bham) n/a Marcelo Carmo (FZJ) Lars Cleemann (DTU) Juan Maria Garcia Lastra (DTU) Lars Cleemann (DTU) with Marcelo Carmo(FZJ) Jens Oluf Jensen (DTU)	coffee break Transport modelling of batteries break Introduction to Batteries Beyond Lithium - resource-efficient batteries coffee break Degradation and Lifetime-Prediction in batteries break	Juan Maria Garcia Lastra (DTU) Juan Maria Garcia Lastra (DTU) Karin Kleiner (TUM)
18:30 08:45 19:45 10:00 10:00 11:15 11:15 11:30 11:245 13:00 12:45 13:00 12:45 13:00 12:45 13:00 12:45 13:00 12:45 13:00 12:45 13:00 12:45 13:00 12:45 13:00 12:45 13:00 12:45 13:00 12:45 13:00 12:45 13:00 12:45 13:15 11:30 12:45 13:15 11:30 12:45	Introduction to SOFC / SOEC coffee break break lunch System technology for SOEC coffee break Exercise on system technology break dinner 16 Sep 2016 Introduction to SOFC / SOEC Exercise on degradation coffee break	Robert Steinberger-Wilckens (U Bham) Anke Hagen (DTU) Anke Hagen (DTU)	Characterisation Methods for Fuel Cell, Electrolyser and Battery Materials coffee break Exercise on Characterisation, Electrochemistry and Thermodynamics break Student project time Challenges for LT electrolysers coffee break Challenges for LT fuel cells break Atomistic Modelling in fuel cell, electrolyser and battery research introduction to LT Fuel Cells and Electrolysers Application of LT fuel cells and electrolysers coffee break	Shangleng Du (U Bham) n/a Marcelo Carmo (FZJ) Lars Cleemann (DTU) Juan Maria Garcia Lastra (DTU) Lars Cleemann (DTU) with Marcelo Carmo(FZJ) Jens Oluf Jensen (DTU)	coffee break Transport modelling of batteries break Introduction to Batteries Beyond Lithium - resource-efficient batteries coffee break Degradation and Lifetime-Prediction in batteries break Exercise on in-operando characterization & degradation	Juan Maria Garcia Lastra (DTU) Juan Maria Garcia Lastra (DTU) Karin Kleiner (TUM)
18:30 09:45 19:45 10:00 10:01 11:15 11:30 11:30 12:45 3.00 14:00 3.00 14:00 3.00 14:00 17:05 18:45 19:45 18:45 19:	Introduction to SOFC / SOEC coffee break break lunch System technology for SOEC coffee break Exercise on system technology break dinner 16 Sep 2016 Introduction to SOFC / SOEC Exercise on degradation coffee break	Robert Steinberger-Wilckens (U Bham) Anke Hagen (DTU) Anke Hagen (DTU)	Characterisation Methods for Fuel Cell, Electrolyser and Battery Materials coffee break Exercise on Characterisation, Electrochemistry and Thermodynamics break Student project time Challenges for LT electrolysers coffee break Challenges for LT fuel cells break Atomistic Modelling in fuel cell, electrolyser and battery research lintroduction to LT Fuel Cells and Electrolysers Application of LT fuel cells and electrolysers coffee break New trends in LT fuel cells and electrolysers break ECTS exams coffee break	Shangleng Du (U Bham) n/a Marcelo Carmo (FZJ) Lars Cleemann (DTU) Juan Maria Garcia Lastra (DTU) Lars Cleemann (DTU) with Marcelo Carmo(FZJ) Jens Oluf Jensen (DTU) Oliver Postziech (SunFire)	coffee break Transport modelling of batteries break Introduction to Batteries Beyond Lithium - resource-efficient batteries coffee break Degradation and Lifetime-Prediction in batteries break	Juan Maria Garcia Lastra (DTU) Juan Maria Garcia Lastra (DTU) Karin Kleiner (TUM)
nursday 10:30 09:45 10:00 10:00 11:15 11:15 11:30 11:30 12:45 13:30 14:30 12:45 13:30 14:30 12:45 13:30 14:30 12:45 13:30 14:30 13:30 14:30 13:30 14:30 13:30 14:30 13:30 14:30 13:30 14:30 13:30 14:30	Introduction to SOFC / SOEC coffee break break lunch System technology for SOEC coffee break Exercise on system technology break dinner 16 Sep 2016 Introduction to SOFC / SOEC Exercise on degradation coffee break	Robert Steinberger-Wilckens (U Bham) Anke Hagen (DTU) Anke Hagen (DTU)	Characterisation Methods for Fuel Cell, Electrolyser and Battery Materials Coffee break Exercise on Characterisation, Electrochemistry and Thermodynamics break Student project time Challenges for LT electrolysers coffee break Challenges for LT fuel cells break Atomistic Modelling in fuel cell, electrolyser and battery research introduction to LT Fuel Cells and electrolysers coffee break New trends in LT fuel cells and electrolysers break New trends in LT fuel cells and electrolysers break	Shangleng Du (U Bham) n/a Marcelo Carmo (FZJ) Lars Cleemann (DTU) Juan Maria Garcia Lastra (DTU) Lars Cleemann (DTU) with Marcelo Carmo(FZJ) Jens Oluf Jensen (DTU) Oliver Postziech (SunFire)	coffee break Transport modelling of batteries break Introduction to Batteries Beyond Lithium - resource-efficient batteries coffee break Degradation and Lifetime-Prediction in batteries break Exercise on in-operando characterization & degradation	Juan Maria Garcia Lastra (DTU) Juan Maria Garcia Lastra (DTU) Karin Kleiner (TUM)

				JESS 2016 - Programme WEEK 2			
Module 1 Module 2		Fuel Cell Vehicles		Joint lectures			
Module 3				Modelling Master Class		Fuel Cell & Hydrogen Business Development	
Sunday		18 Sep 2016	Arrival				
Monday		19 Sep 2016					
08:00	08:30	Registration					
08:30 09:00	09:00 09:45			Welcome and General Introduction Sustainable and Renewable Energy Future	Robert Steinberger-Wilckens (U Bham) Robert Steinberger-Wilckens (U Bham)		
09:00 09:45 10:00	10:00 11:15	coffee break		coffee break Introduction to Fuel Cell Vehicles & Markets	Ferdinand Panik (U Esslingen)	coffee break	
11:15 11:30	11:30 12:45	break		break Electromobility: Business Cases & Services	Robert Steinberger-Wilckens (U Bham)	break	
13:00	14:00	lunch					
	17:30	Fuel Cell Vehicles		Modelling Master Class		Fuel Cell & Hydrogen Business Development	
16:00 17:30	18:00	Status of FC passenger cars & buses coffee break Designing and building hydrogen fuel cell	Ferdinand Panik (U Esstingen) Thomas von Unwerth (U Chemnitz)	Basics of FC Modelling and Mathematical Tools pt. 1 coffee break Basics of FC Modelling and Mathematical Tools pt. 2	Alessio Alexiadis (U Bham) Alessio Alexiadis (U Bham)	Innovation Management coffee break Financing a business	Birgit Thoben (Bosch) Emma Vartolomei (AllStreet)
18:00	19:30	vehicles	monas von onwenn (o cheminz)	basics of FC modelling and mathematical Tools pt. 2	Alessio Alexadas (O Bilann)	ritationing a business	Ellina Valtoonei (Alistieel)
19:30	19:45			Introduction to the Students' Project	Robert Steinberger-Wilckens (U Bham)		
19:45		welcome reception / dinner					
21:15	22:00	20 Sep 2016		Students' Presentations I	students		
Tuesday		Fuel Cell Vehicles		Modelling Master Class		Fuel Cell & Hydrogen Business Development	
08:30 09:45	09:45 10:00	Drive Train Components (1) coffee break	Thomas von Unwerth (U Chemnitz)	Introduction to MATLAB	Alessio Alexiadis (U Bham)	Introduction to Business Development	James Wilkie (U Bham)
10:00	11:15	Lightweight structures for overall vehicle efficiency	Robert Steinberger-Wilckens (U Bham)	coffee break CFD Modelling	Murat Peksen (FZJ)	Creativity & Ideation	Birgit Thoben (Bosch)
11:15 11:30	11:30 12:45	break Vehicle Fuel Cells & Fuel Cell Systems	Ferdinand Panik (U Esslingen)	break Thermomechanical modelling	Murat Peksen (FZJ)	break Patents and Copyrights	James Wilkie (U Bham)
13:00		lunch		•			canal time to analy
16:00	17:15	Exercise 1	Ferdinand Panik (U Esslingen)	From 0d to 3d modelling	James Andrews (U Bham)	Exercise 1	James Wilkie (U Bham)
17:15	17:30	coffee break		coffee break	James Wilkie (U Bham)	coffee break	
17:30 18:15 18:30	18:15 18:30 19:45	break		Introduction to Fuel Cell Business Futures break Students' Presentations II	James Wilkie (U Bham) students	break	
	21:00	dinner		otacina i recentationa ii	SILUCIAIS		
Wednesda	-y	21 Sep 2016 Fuel Cell Vehicles		Modelling Master Class		Fuel Cell & Hydrogen Business Development	
08:30	09:45	21 Sep 2016 Fuel Cell Vehicles Hybrid vehicle drive trains	Robert Steinberger-Wilckens (U Bham)	Thermodynamical and Kinetics Modelling	James Andrews (U Bham)	Market Introduction Strategies	Birgit Thoben (Bosch)
08:30 09:45	09:45 10:00	Fuel Cell Vehicles	Robert Steinberger-Wilckens (U Bham) Robert Steinberger-Wilckens (U Bham)		James Andrews (U Bham) Murat Peksen (FZJ)		Birgit Thoben (Bosch) Birgit Thoben (Bosch)
08:30 09:45 10:00	09:45 10:00 11:15	Fuel Cell Vehicles Hybrid vehicle drive trains coffee break Vehicle Batteries		Thermodynamical and Kinetics Modelling colleg break Multiphysics modelling		Market Introduction Strategies coffee break Case Studies I: Ideation	
08:30 09:45	09:45 10:00 11:15	Fuel Cell Vehicles Hybrid vehicle drive trains coffee break		Thermodynamical and Kinetics Modelling		Market Introduction Strategies	
08:30 09:45 10:00	09:45 10:00 11:15 11:30 12:45	Fuel Cell Vehicles Hybrid vehicle drive trains coffee break Vehicle Batteries	Robert Steinberger-Wilckens (U Bham)	Thermodynamical and Kinetics Modelling colleg break Multiphysics modelling	Murat Peksen (FZJ)	Market Introduction Strategies coffee break Case Studies I: Ideation	Birgit Thoben (Bosch)
08:30 09:45 10:00 11:15 11:30 13:00	09:45 10:00 11:15 11:30 12:45 14:00	Fuel Cell Vehicles Hybrid vehicle drive trains coffee break Vehicle Batteries	Robert Steinberger-Wilckens (U Bham)	Thermodynamical and Kinetics Modelling colleg break Multiphysics modelling	Murat Peksen (FZJ)	Market Introduction Strategies coffee break Case Studies I: Ideation	Birgit Thoben (Bosch)
08:30 09:45 10:00 11:15 11:30	09:45 10:00 11:15 11:30 12:45 14:00	Fuel Cell Vehicles Hybrid vehicle drive trains coffee break Vehicle Batteries	Robert Steinberger-Wilckens (U Bham)	Thermodynamical and Kinetics Modelling coffee break Multiphysics modelling break Student project 1	Murat Peksen (FZJ)	Market Introduction Strategies coffee break Case Studies I: Ideation	Birgit Thoben (Bosch)
08:30 09:45 10:00 11:15 11:30 13:00	09:45 10:00 11:15 11:30 12:45 14:00 20:45	Fuel Cell Vehicles Hybrid vehicle drive trains coffee break Vehicle Batteries break Exercise 2 lunch dinner 22 Sep 2016	Robert Steinberger-Wilckens (U Bham)	Thermodynamical and Kinetics Modelling coffee break Multiphysics modelling break Student project 1 excursion	Murat Peksen (FZJ)	Market Introduction Strategies coffee break Case Studies I: Ideation break Funding Sources	Birgit Thoben (Bosch)
08:30 09:45 10:00 11:15 11:30 13:00 15:00 21:00	09:45 10:00 11:15 11:30 12:45 14:00 20:45	Fuel Cell Vehicles Hybrid vehicle drive trains coffee break Vehicle Batteries break Exercise 2 lunch	Robert Steinberger-Wilckens (U Bham)	Thermodynamical and Kinetics Modelling coffee break Multiphysics modelling break Student project 1 excursion Modelling Master Class	Murat Peksen (FZJ) Sludent	Market Introduction Strategies coffee break Case Studies I: Ideation	Birgit Thoben (Bosch)
08:30 09:45 10:00 11:15 11:30 13:00 21:00 Thursday 08:30 09:45	09:45 10:00 11:15 11:30 12:45 14:00 20:45 22:00	Fuel Cell Vehicles Hybrid vehicle drive trains coffee break Vehicle Batteries break Exercise 2 lunch dinner 22 Sep 2016 Fuel Cell Vehicles coffee break	Robert Steinberger-Wilckens (U Bham) Thomas von Unwerth (U Chemritz)	Thermodynamical and Kinetics Modelling coffee break Mailiphysics modelling break Student project 1 excursion Modelling Master Class Electromobility: System Modelling	Murat Peksen (FZJ) Student Robert Steinberger-Wilskers (U Bham)	Market Introduction Strategies coffee break Case Studies I: Ideation break Funding Sources Fuel Cell & Hydrogen Business Development	Birgit Thoben (Bosch) Emma Vartolomei (All'Street)
08:30 09:45 10:00 11:15 11:30 13:00 21:00 Thursday 08:30 09:45 10:00 11:15	09:45 10:00 11:15 11:30 12:45 14:00 20:45 22:00 09:45 10:00 11:15 11:30	Fuel Cell Vehicles Hybrid vehicle drive trains coffee break Vehicle Batteries break Exercise 2 llunch dinner 22 Sep 2015 Fuel Cell Vehicles coffee break FCV System Analysis WTW, TCO, LCA	Robert Steinberger-Wilckens (U Bham) Thomas von Unwerth (U Chemritz) Ferdinand Panik (U Esslingen)	Thermodynamical and Kinetics Modelling cottee break Multiphysics modelling break Student project 1 excursion Modelling Master Class Electromobility: System Modelling cottee break Exercise / Discussion	Murat Peksen (FZJ) Student Robert Steinberger-Wilchers (U Bham) Murat Peksen (FZJ)	Market Introduction Strategies coffee break Case Studies I: Ideation break Funding Sources Fuel Cell & Hydrogen Business Development coffee break Due Dilligence, Investment Decisions, Technology Deals	Birgit Thoben (Bosch) Emma Vartolomei (AllStreet) Silash Ruparell
08:30 09:45 10:00 11:15 11:30 13:00 21:00 Thursday 08:30 09:45 10:00 11:15	09:45 10:00 11:15 11:30 12:45 14:00 20:45 22:00 09:45 10:00 11:15 11:30 12:45	Fuel Cell Vehicles Hybrid vehicle drive trains coffee break Vehicle Batteries break Exercise 2 lunch dinner 22 Sep 2016 Fuel Cell Vehicles coffee break	Robert Steinberger-Wilckens (U Bham) Thomas von Unwerth (U Chemritz)	Thermodynamical and Kinetics Modelling coffee break Mailiphysics modelling break Student project 1 excursion Modelling Master Class Electromobility: System Modelling	Murat Peksen (FZJ) Student Robert Steinberger-Wilskers (U Bham)	Market Introduction Strategies coffee break Case Studies I: Ideation break Funding Sources Fuel Cell & Hydrogen Business Development	Birgit Thoben (Bosch) Emma Vartolomei (All'Street)
08:30 09:45 10:00 11:15 11:30 13:00 21:00 Thursday 08:30 09:45 10:00 11:15 11:30	09:45 10:00 11:15 11:30 12:45 14:00 20:45 22:00 11:15 11:30 12:45 14:00	Fuel Cell Vehicles Hybrid vehicle drive trains coffee break Vehicle Batteries break Exercise 2 lunch dinner 22 Sep 2016 Fuel Cell Vehicles coffee break FCV System Analysis WTW, TCO, LCA break Drive Train Components (2)	Robert Steinberger-Wilckens (U Bham) Thomas von Unwerth (U Chemnitz) Ferdinand Panik (U Esslingen) Thomas von Unwerth (U Chemnitz)	Thermodynamical and Kinetics Modelling coffee break Multiphysics modelling break Student project 1 excursion Modelling Master Class Electromobility: System Modelling coffee break Exercise / Discussion break Student project 2	Murat Peksen (FZJ) Student Robert Steinberger-Wilskens (U Bham) Murat Peksen (FZJ) Student	Market Introduction Strategies coffee break Case Studies I: Ideation break Funding Sources Fuel Cell & Hydrogen Business Development coffee break Due Dilligence, Investment Decisions, Technology Deals break Case Studies II	Birgit Thoben (Bosch) Emma Vartolomei (AllStreet) Silash Ruparell Silash Ruparell
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20:30 open Gala dinner

Joint European Summer School for Fuel Cell, Electrolyser, and Battery Technologies

Solid Oxide Fuel Cells & Electrolysers	
Low Temperature Fuel Cells & Electrolysers	
Batteries	

Hotel Amarila 11 – 17 September 2016, Vouliagmeni (Athens), Greece

Deadline for registration: 31st August 2016

Title			
First name			
Last name			
Gender	Male	Female	
University/Institution/Company Name			
Street / P.O. Box			
Postal code			
Town/City			
Country			
Phone			
Fax			
E-mail :			
Athens arrival date and time			
Athens departure date and time			
Please note any special dietary re-			
quirements, disabilities etc. that we may			
need to know about			

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Joint European Summer School for Fuel Cell, Electrolyser, and Battery Technologies

Fuel Cell Vehicles	
Modelling Master Class	
(Fuel Cell) Business Development	

Hotel Amarila 18 – 14 September 2016, Vouliagmeni (Athens), Greece

Deadline for registration: 31st August 2016

Title			
First name			
Last name			
Gender	Male	Female	
University/Institution/Company Name			
Street / P.O. Box			
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quirements, disabilities etc. that we may			
need to know about			

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