



2nd Joint European Summer School on Fuel Cell and Hydrogen Technology



17th – 28th September 2012
Heraklion, Crete

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INTRODUCTION

The Second Joint European Summer School on Fuel Cell and Hydrogen Technology shall be held in Heraklion, (in Crete, Greece) from 17 to 28 September 2012.

Following the successful pattern of summer schools carried out by the HySafe Consortium, the EU Integrated Projects Real-SOFC and LargeSOFC and the European Summer School on Hydrogen Safety, the European Commission has decided to continue its support to this work. Co-funding is now provided under the TrainHy-Project via the Fuel Cell and Hydrogen Joint Undertaking (FCH JU) which is a joint agency of the European Commission and European Industry and Research Groups in this respective field. Thereupon the *University of Ulster* (United Kingdom), *Technical University of Denmark*(Denmark), the *University of Birmingham* (United Kingdom) and the *Forschungszentrum Jülich* (Germany) teamed up with *Heliocentris Energy Solutions* (Germany) to form the TrainHy Consortium.

The TrainHy Consortium organises the *Joint European Summer School on Fuel Cell and Hydrogen Technology*. This Summer School is offered annually. The *First Joint European Summer School on Fuel Cell and Hydrogen Technology*(www.hysafe.org/SummerSchoolFCH) was held from 22 August to 02 September 2011 in Viterbo, Italy.

Using the experience gained from the *First Joint European Summer School on Fuel Cell and Hydrogen Technology*, the *Second Joint European Summer School on Fuel Cell and Hydrogen Technology*(www.hysafe.org/SummerSchoolFCH2012) now offers nine specialised courses:

- Solid Oxide Fuel Cells, 17 - 21 September 2012
- The Safety of Hydrogen Technologies, 17 - 21 September 2012
- Proton Exchange and Alkaline Fuel Cells, 17 - 21 September 2012
- Electrochemistry for Fuel Cells and Electrolysers, 17 - 21 September 2012
- Fuel Cell Modelling, 17 - 21 September 2012
- Hydrogen Technology, 24 - 28 September 2012
- Electrolysis, 24 - 28 September 2012
- Solid Oxide Fuel Cell Systems & Balance Of Plant Components, 24 - 28 September 2012
- System Modelling, 24 - 28 September 2012

An optional exam will be available for students who are required to obtain ECTS points relevant to their MSc and PhD studies.

These courses are designed for MSc-students, PhD-students, and Post-Doctorate researchers. More experienced researchers wishing to review the technologies addressed and expand their knowledge, to possibly suit a newly acquired position, will 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 hydrogen applications. Practically-orientated sessions consisting of table-top experiments supervised by Heliocentris Energy Solutions give students ample opportunity to apply the theoretical knowledge acquired from the taught lectures.

Within each week of the school students may choose to study a single course, or any of the following combinations of two courses:

Week 1 (17 September - 21 September 2012)

- Solid Oxide Fuel Cells & The Safety of Hydrogen Technologies
- Proton Exchange and Alkaline Fuel Cells & The Safety of Hydrogen Technologies
- Solid Oxide Fuel Cells & Electrochemistry for Fuel Cells and Electrolysers
- Proton Exchange and Alkaline Fuel Cells & Electrochemistry for Fuel Cells and Electrolysers
- Solid Oxide Fuel Cells & Fuel Cell Modelling
- Proton Exchange and Alkaline Fuel Cells & Fuel Cell Modelling

Week 2 (24 September - 28 September 2012)

- Hydrogen Technology & Electrolysis
- Solid Oxide Fuel Cell Systems / Balance Of Plant Components & Electrolysis
- Hydrogen Technology & System Modelling
- Solid Oxide Fuel Cell Systems / Balance Of Plant Components & System Modelling

The school draws on the knowledge and expertise of a group of teachers currently working at the leading edge of fuel cell and hydrogen research and development in Europe from universities, national research centres and industry. These teachers have bundled their expertise and resources in the **TrainHy Teaching Team** to deliver lectures at the Joint European Summer School on Fuel Cell and Hydrogen Technology. The 2012 Summer School's selection of lecturers is given in the programme below.

Informal networking is a key element of science and scientific work in general. The Joint European Summer School on Fuel Cell and Hydrogen Technology 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 work they are doing (or expect to be doing).

Please refer to the programme below for detailed information about the Summer School content.

CERTIFICATE OF ATTENDANCE

A Certificate of Attendance shall be issued to all students of the Joint European Summer School on Fuel Cell and Hydrogen Technology. This Certificate of Attendance can be used for acquiring CPD-Points.

UNIVERSITY APPROVED CREDIT POINTS UNDER THE EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

Students who would like to receive PhD-level or MSc-level ECTS-points are expected to undertake an assessment. ECTS-points for each of these courses can be obtained as follows.

Week 1 (17 September - 21 September 2012):

Solid Oxide Fuel Cells, Proton Exchange and Alkaline Fuel Cells, Electrochemistry for Fuel Cells and Electrolysers, and, Fuel Cell Modelling

1. On Friday, 21st September 2012, students are expected to do an exam.
2. The exam-results shall be communicated to students on Friday, Friday, 21st September 2012, between 17:45pm - 18:15pm.
3. A credit bearing certificate shall be issued to students who completed the exam successfully. The credit value is equal to 1.25 ECTS for each course.

The Safety of Hydrogen Technologies

Students who would like to receive ECTS-points for the Safety of Hydrogen Technologies are invited to attend the PgCert/PgDip/MSc in Hydrogen Safety Engineering (<http://www.hysafe.org/MSchSE>).

Week 2 (24 September - 28 September 2012):

Hydrogen Technology, Electrolysis, Solid Oxide Fuel Cell Systems & Balance Of Plant Components, and, System Modelling

1. On Friday, 28th September 2012, students are expected to do an exam.
2. The exam-results shall be communicated to students on Friday, Friday, 28th September 2012, between 17:45pm - 18:15pm.
3. A credit bearing certificate shall be issued to students who completed the exam successfully. The credit value is equal to 1.25 ECTS for each course.

Please refer to the summer school website at www.hysafe.org/SummerSchoolFCH2012 for more information.

LOCATION & VENUE

Heraklion is the capital of Crete and one of the Mediterranean region's most fascinating and vibrant cities. It is full of places to discover. With the current efforts to open up the wonderful mediaeval city centre, it speaks to us of a past full of history and great events that reflect its location at the crossroads of three continents. The city is also the commercial and technological centre of the island. It has a strategic geopolitical position in the south-eastern Mediterranean sea connecting three continents and many different cultures. Heraklion is celebrating its rich history and moving onwards to a future full of potential. It offers a wealth of museums, historical sightseeing and events throughout the year. For more details, see <http://www.heraklion.gr/en>

The hotel hosting the school is located on a long sandy beach in the Kokkini Hani area, 12 km from Heraklion City Centre and 8 km from the airport. It has a big swimming pool with seawater and many further outdoor activities. Rooms are of a good standard and offer all the facilities you would expect including air-conditioning and free WiFi internet access. More details at <http://www.aquisresorts.com/aquisresorts/aquis-arina-sand-overview.aspx>.

HOW TO REACH THE HOTEL BY PUBLIC COACH SERVICE

When you exit the arrival hall of the airport, you have to cross the main road. On your left hand side, you will see a bus station. You can use all coaches driving to the directions: Hersonissos, Malia, Agios Nikolaos. Busses run approx every 30 minutes. The driving distance to the hotel is approx 15-20 minutes. Tickets (to Kokkini Hani - 3,00 € per person) must be bought at the small kiosk near the bus station.

In September, we can expect temperatures in the mid to high 20°C range. 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, E: manuela@panhellas.gr, T: 0030 2810 300847, F: 0030 2810 300848*.

As we meet around the end of the main European holiday season, there will very probably be suitable low cost charter flights to Heraklion airport (<http://heraklionairport.net/>) available from a wide range of major and regional European airports.

ORGANISING COMMITTEE

Prof Robert Steinberger-Wilckens (University of Birmingham, United Kingdom)
Mrs Chantal Hake (Forschungszentrum Jülich, Germany)
Dipl Ing Josef Mertens (Forschungszentrum Jülich, Germany)
Prof Søren Linderøth (Technical University of Denmark, Denmark)
Dipl Ing Svea Reiners (HeliocentrisEnergy Solutions, Germany)
Dr Arief Dahoe (University of Ulster, United Kingdom)

CORRESPONDENCE

Student registration and financial matters - Mrs Chantal Hake, Email: ch.hake@fz-Jülich.de, Phone +49 2461 61-2244, Fax +49 2461 61-4155.

Lecturers/other information - Mr Josef Mertens, Email: jo.mertens@fz-Jülich.de, Phone +49 2461 61-6706.

STUDENT FEE AND REGISTRATION

The registration cost per student is 890 € per week. This amount covers *all inclusive* accommodation in a double room (6 nights - Sunday to Saturday), tuition fees for **one single course** or **any combination of two courses taught in the same week**, school banquet and the half-day excursion. All registrations should be made by the **31st of August 2012** (week 1) and the **7th of September 2012** (week 2) at the very latest. The registration forms for each week of the school are given at the end of this document.

CANCELLATION POLICY

To cancel your registration, send an email stating your intent to ch.hake@fz-juelich.de. Refunds will be subject to a cancellation fee. If your request arrives by 27th August 2012, the registration fee will be refunded after the school applying a cancellation fee of 150,00 € of the processed registration fee. After 27th August 2012, your request will not be processed.

PROGRAMME

| FIRST WEEK | | | | | |
|------------------------------|--|--|--|--|----------------------------|
| Sunday, 16th September 2012 | | | | | |
| 19:00 | Welcome and Early Registration | | | | |
| Monday, 17th September 2012 | | | | | |
| | SOLID OXIDE FUEL CELLS | THE SAFETY OF HYDROGEN TECHNOLOGIES | PROTON EXCHANGE AND ALKALINE FUEL CELLS | ELECTROCHEMISTRY FOR FUEL CELLS AND ELECTROLYSERS | FUEL CELL MODELLING |
| 08:30 - 10:00 | Introduction to Fuel Cell Applications R. Steinberger-Wilckens, University of Birmingham (United Kingdom) | | | | |
| 10:00 - 10:30 | Introduction to Hydrogen Safety V.V. Molkov, University of Ulster (United Kingdom) | | | | |
| 10:30 - 11:00 | Coffee Break | | | | |
| 11:00 - 13:00 | Status of Fuel Cell Technology and Introduction to Thermodynamics R. Steinberger-Wilckens, University of Birmingham (United Kingdom) | | | | |
| 13:00 - 14:00 | Lunch | | | | |
| 16:00 - 17:45 | General Introduction to Electrochemistry C. Lamy, Institut Européen des Membranes (France) | | | | |
| 17:45 - 18:15 | Coffee Break | | | | |
| 18:15 - 20:00 | Introduction to High Temperature Fuel Cells N. Sammes, Pohang University of Science and Technology (Korea) | | | | |
| 20:00 - 21:30 | Dinner | | | | |
| 21:30 - 23:00 | Poster Session, Participant Session | | | | |
| Tuesday, 18th September 2012 | | | | | |
| | SOLID OXIDE FUEL CELLS | THE SAFETY OF HYDROGEN TECHNOLOGIES | PROTON EXCHANGE AND ALKALINE FUEL CELLS | ELECTROCHEMISTRY FOR FUEL CELLS AND ELECTROLYSERS | FUEL CELL MODELLING |
| 08:30 - 10:15 | Cell Components: Anode and Electrolyte A. Atkinson, Imperial College London (United Kingdom) | | Principles of Proton Exchange Fuel Cells Ö. Aras, Heliocentris Energy Solutions (Germany) | | |
| 10:15 - 10:45 | Coffee Break | | | | |
| 10:45 - 12:30 | Cell Components: Cathode A. Atkinson, Imperial College London (United Kingdom) | | Materials for Proton Exchange Fuel Cells C. Lamy, Institut Européen des Membranes (France) | | |
| 13:00 - 14:00 | Lunch Lecture Energy Policy and Climate Change J.-Fr. Hake, Forschungszentrum Jülich (Germany) | | | | |
| 14:00 - 16:00 | Proton Exchange Fuel Cells: Tabletop Experiments J. Gilmer, Ö. Aras, Heliocentris Energy Solutions (Germany) | | | | |

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|---------------------------------------|--|--|--|---|---|
| 16:00 - 17:45 | | Overview of Hydrogen Technologies and their Safety Aspects T. Jordan, Karlsruhe Institute of Technology (Germany) | | Electrochemistry of Low Temperature Fuel Cells and Electrolysers I B. Pollet, University of West Cape (South Africa) | Modelling Basics I A. Kulikovsky Forschungszentrum Jülich (Germany) & Moscow State University (Russia) |
| 17:45 - 18:15 | <i>Coffee Break</i> | | | | |
| 18:15 - 20:00 | | Hydrogen Storage Technologies: Compatibility of Metallic Materials with Hydrogen H. Barthelemy, Air Liquide (France) | | Electrochemistry of Low Temperature Fuel Cells and Electrolysers II B. Pollet, University of West Cape (South Africa) | Modelling Basics II A. Kulikovsky Forschungszentrum Jülich (Germany) & Moscow State University (Russia) |
| 20:00 - 21:30 | <i>Dinner</i> | | | | |
| 21:30 - 22:00 | Introduction to Students' Project | | Introduction to Students' Project | Introduction to Students' Project | Introduction to Students' Project |
| Wednesday, 19th September 2012 | | | | | |
| | SOLID OXIDE FUEL CELLS | THE SAFETY OF HYDROGEN TECHNOLOGIES | PROTON EXCHANGE AND ALKALINE FUEL CELLS | ELECTROCHEMISTRY FOR FUEL CELLS AND ELECTROLYSERS | FUEL CELL MODELLING |
| 08:30 - 10:00 | Fuels for Solid Oxide Fuel Cells J. B. Hansen, Topsoe Fuel Cells (Denmark) | | Proton Exchange Fuel Cells: Stacks and Systems Ö. Aras, Heliocentris Energy Solutions (Germany) | | |
| 10:00 - 10:30 | <i>Coffee Break</i> | | | | |
| 10:30 - 12:00 | Manufacturing Methods N. Sammes, Pohang University of Science and Technology (Korea) | | High Temperature Proton Exchange Fuel Cells: Materials, Stacks and Systems J. Oluf Jensen, Technical University of Denmark (Denmark) | | |
| 12:00 - 13:00 | <i>Lunch</i> | | | | |
| 13:00 - 14:30 | | Hydrogen Storage Technologies: Compatibility of Non-Metallic Materials with Hydrogen H. Barthelemy, Air Liquide (France) | | Electrochemistry of High Temperature Fuel Cells and Electrolysers I N. Sammes, Pohang University of Science and Technology (Korea) | Multi-Physics Modelling M. Peksens, Forschungszentrum Jülich (Germany) |
| 14:30 - 15:00 | <i>Coffee Break</i> | | | | |
| 15:00 - 16:30 | | Hazards Related to Hydrogen Properties and Comparison with Other Fuels V.V. Molokov, University of Ulster (United Kingdom) | | Electrochemistry of High Temperature Fuel Cells and Electrolysers II N. Sammes, Pohang University of Science and Technology (Korea) | Macroscopic Modelling of Fuel Cell Degradation A. Kulikovsky Forschungszentrum Jülich (Germany) & Moscow State University (Russia) |
| 16:30 - 21:30 | EXCURSION | | | | |

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|--------------------------------------|--|---|---|--|---|
| 21:30 - 23:00 | <i>Dinner</i> | | | | |
| Thursday, 20th September 2012 | | | | | |
| | SOLID OXIDE FUEL CELLS | THE SAFETY OF HYDROGEN TECHNOLOGIES | PROTON EXCHANGE AND ALKALINE FUEL CELLS | CHARACTERISATION METHODS | FUEL CELL MODELLING |
| 08:30 - 10:15 | Cell and Stack Design I. Vinke, Forschungszentrum Jülich (Germany) | | Alkaline Fuel Cells: Materials, Stacks and Systems J. Oluf Jensen, Technical University of Denmark (Denmark) | | Cell and Stack Design I. Vinke Forschungszentrum Jülich (Germany) |
| 10:15 - 10:45 | <i>Coffee Break</i> | | | | |
| 10:45 - 12:30 | Degradation Mechanisms R. Steinberger-Wilckens, University of Birmingham (United Kingdom) | | Phosphoric Acid Fuel Cells: Materials, Stacks and Systems J. Oluf Jensen, Technical University of Denmark (Denmark) | | |
| 12:30 - 14:30 | <i>Lunch Lecture</i> Design Materials S. Istomin, Moscow State University (Russia) | | | | |
| 14:30 - 16:00 | Proton Exchange Fuel Cells: Tabletop Experiments J. Gilmer, Ö. Aras, Heliocentris Energy Solutions (Germany) | | | | |
| 16:00 - 17:45 | | Hydrogen Deflagrations G. Ciccarelli, Queen's University (Canada) | | I-V Characteristics/Stack and System Evaluation I. Vinke, Forschungszentrum Jülich (Germany) | Computational Multiphase Modelling of 3D Transport Phenomena in Proton Exchange Fuel Cells T. Berning Aalborg University (Denmark) |
| 17:45 - 18:15 | <i>Coffee Break</i> | | | | |
| 18:15 - 20:00 | | Hydrogen Deflagrations G. Ciccarelli, Queen's University (Canada) Mitigation of Hydrogen Deflagrations A.E. Dahoe, University of Ulster (United Kingdom) | | Materials Characterisation V.A. Sadykov Boreskov Institute of Catalysis (Russia) | Water Management Issues in Proton Exchange Fuel Cells T. Berning Aalborg University (Denmark) |
| 20:00 - 21:30 | <i>Dinner</i> | | | | |
| 21:30 - 23:00 | Poster Session, Participant Session | | | | |
| Friday, 21st September 2012 | | | | | |
| | SOLID OXIDE FUEL CELLS | THE SAFETY OF HYDROGEN TECHNOLOGIES | PROTON EXCHANGE AND ALKALINE FUEL CELLS | CHARACTERISATION METHODS | FUEL CELL MODELLING |
| 08:30 - 09:30 | EXAM | | | | |
| 09:30 - 11:15 | System Concepts and balance of Plant Components O. Posdziech, Staxera (Germany) | | Vehicle Applications F. Panik, University of Esslingen (Germany) | | |
| 11:15 - 11:30 | <i>Coffee Break</i> | | | | |

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|---|---|---|--|--|---|
| 11:30 - 13:15 | Current R&D Issues R. Muecke Forschungszentrum Jülich (Germany) | | Markets, Market Development and Technology Introduction F. Panik, University of Esslingen (Germany) | | |
| 13:15 - 14:15 | <i>Lunch</i> | | | | |
| 14:15 - 16:00 | Practical Demonstration: A Robust and Simple to Use SOFC Module U. Bossel, Almus AG (Switzerland) Proton Exchange Fuel Cells: Tabletop Experiments J. Gilmer, Ö. Aras, Heliocentris Energy Solutions (Germany) | | | | |
| 16:00 - 17:45 | | Hydrogen Detonations G. Ciccarelli, Queen's University (Canada) | | Impedance Spectroscopy J.C. Njodzefon, Karlsruhe Institute of Technology (Germany) | Thermo-mechanical Modelling M. Peksen Forschungszentrum Jülich (Germany) |
| 17:45 - 18:15 | <i>Coffee Break</i> | | | | |
| 18:15 - 20:00 | | Hydrogen Releases and Fires V.V. Molokov, S.L. Brennan, University of Ulster (United Kingdom) | | In-situ Methods R. Muecke Forschungszentrum Jülich (Germany) | System Modelling T. Woudstra Delft University of Technology (The Netherlands) |
| 20:30 - 21:00 | Strategies for the Transition to a Sustainable Energy Future U. Bossel, Almus AG (Switzerland) | | | | |
| 21:00 - 23:00 | <i>Gala Dinner</i> | | | | |
| Saturday, 22nd September <i>Departure</i> | | | | | |

| SECOND WEEK | | | | |
|-------------------------------------|---|---------------------|--|-------------------------|
| Sunday, 23rd September 2012 | | | | |
| 19:00 | <i>Welcome and Early Registration</i> | | | |
| Monday, 24th September 2012 | | | | |
| | HYDROGEN TECHNOLOGY | ELECTROLYSIS | SOLID OXIDE FUEL CELL SYSTEMS & BALANCE OF PLANT COMPONENTS | SYSTEM MODELLING |
| 08:30 - 10:00 | Introduction to Fuel Cell Applications R. Steinberger-Wilckens, University of Birmingham (United Kingdom) | | | |
| 10:00 - 10:30 | Introduction to Hydrogen Safety V.V. Molkov, University of Ulster (United Kingdom) | | | |
| 10:30 - 11:00 | <i>Coffee Break</i> | | | |
| 11:00 - 13:00 | Status of Fuel Cell Technology and Introduction to Thermodynamics R. Steinberger-Wilckens, University of Birmingham (United Kingdom) | | | |
| 13:00 - 14:00 | <i>Lunch</i> | | | |
| 14:00 - 16:00 | Proton Exchange Fuel Cells: Tabletop Experiments J. Gilmer, Ö. Aras, Heliocentris Energy Solutions (Germany) | | | |
| 16:00 - 17:45 | General Introduction to Electrochemistry F. Barbir, University of Split (Croatia) | | | |
| 17:45 - 18:15 | <i>Coffee Break</i> | | | |
| 18:15 - 20:00 | Introduction to High Temperature Electrochemistry I. Vinke, Forschungszentrum Jülich (Germany) | | | |
| 20:00 - 21:00 | The Birth of the Fuel Cell U. Bossel, Almus AG (Switzerland) | | | |
| 21:00 - 22:30 | <i>Dinner</i> | | | |
| Tuesday, 25th September 2012 | | | | |
| | HYDROGEN TECHNOLOGY | ELECTROLYSIS | SOLID OXIDE FUEL CELL SYSTEMS & BALANCE OF PLANT COMPONENTS | SYSTEM MODELLING |
| 08:30 - 10:30 | Introduction to Hydrogen - Relevance to Economy and Society T. Jordan, Karlsruhe Institute of Technology (Germany) | | Systems and System Components J. B. Hansen, Topsoe Fuel Cells (Denmark) | |
| 10:30 - 11:00 | <i>Coffee Break</i> | | | |
| 11:00 - 13:00 | Physical Properties of Hydrogen T. Jordan, Karlsruhe Institute of Technology (Germany) | | Balance of Plant: Fuel Processing R. Steinberger-Wilckens, University of Birmingham (United Kingdom) | |
| 13:00 - 14:00 | <i>Lunch</i> | | | |
| 14:00 - 16:00 | Practical Demonstration: A Robust and Simple to Use SOFC Module U. Bossel, Almus AG (Switzerland) Proton Exchange Fuel Cells: Tabletop Experiments J. Gilmer, Ö. Aras, Heliocentris Energy Solutions (Germany) | | | |

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|---------------------------------------|--|---|---|--|
| 16:00 - 17:45 | | History and Thermodynamics of Electrolysis M. Mogensen, Technical University of Denmark (Denmark) | | Cell and Stack Design F. Barbir, University of Split (Croatia) |
| 17:45 - 18:15 | <i>Coffee Break</i> | | | |
| 18:15 - 20:00 | | Alkaline Fuel Cells: Materials, Properties and Challenges M. Mogensen, Technical University of Denmark (Denmark) | | Systems and System Components F. Barbir, University of Split (Croatia) |
| 20:00 - 21:30 | <i>Dinner</i> | | | |
| 21:30 - 22:00 | Introduction to Students' Project | Introduction to Students' Project | Introduction to Students' Project | Introduction to Students' Project |
| Wednesday, 26th September 2012 | | | | |
| | HYDROGEN TECHNOLOGY | ELECTROLYSIS | SOLID OXIDE FUEL CELL SYSTEMS & BALANCE OF PLANT COMPONENTS | SYSTEM MODELLING |
| 08:30 - 10:00 | Applications of hydrogen T. Jensen, University of Aalborg (Denmark) | | Balance of Plant: Heat Exchangers and Air Supply O. Posdziech, Staxera (Germany) | |
| 10:00 - 10:30 | <i>Coffee Break</i> | | | |
| 10:30 - 12:00 | Hydrogen Production A. Dhir, University of Birmingham (United Kingdom) | | Balance of Plant: Electrical Conversion & Connection V. Väisänen, Lappeenranta University of Technology (Finland) | |
| 12:00 - 13:00 | <i>Lunch</i> | | | |
| 13:00 - 14:30 | | Polymer Electrolyte Membrane - Electrolysers: Materials, Properties and Challenges M. Carmo, Forschungszentrum Jülich (Germany) | | Modelling Basics A. Kulikovskiy Forschungszentrum Jülich (Germany) & Moscow State University (Russia) |
| 14:30 - 15:00 | <i>Coffee Break</i> | | | |
| 15:00 - 16:30 | | Solid Oxide Electrolysis Cells: Materials, Properties and Challenges I A. Hauch, Technical University of Denmark (Denmark) | | 2D and 3D Modelling A. Gubner, Hochschule München (Germany) |
| 16:30 - 21:30 | EXCURSION | | | |
| 21:30 - 23:00 | <i>Dinner</i> | | | |
| Thursday, 27th September 2012 | | | | |
| | HYDROGEN TECHNOLOGY | ELECTROLYSIS | SOLID OXIDE FUEL CELL SYSTEMS & BALANCE OF PLANT COMPONENTS | SYSTEM MODELLING |

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| 08:30 - 10:30 | Hydrogen Storage T. Jensen, University of Aalborg (Denmark) | | Fuels for Solid Oxide Fuel Cell Systems: Biogas and Bio-syngas S. McPhail, National Agency for New Technologies, Energy and the Environment (Italy) | |
| 10:30 - 11:00 | <i>Coffee Break</i> | | | |
| 11:00 - 13:00 | Open R & D Issues A. Dhir, University of Birmingham (United Kingdom) | | Fuels for Solid Oxide Fuel Cell Systems: Ethanol, Ammonia, etc. S. McPhail, National Agency for New Technologies, Energy and the Environment (Italy) | |
| 13:00 - 14:00 | <i>Lunch</i> | | | |
| 16:00 - 17:45 | | Solid Oxide Electrolysis Cells: Materials, Properties and Challenges II A. Hauch, Technical University of Denmark (Denmark) | | Computational Fluid Dynamics Simulation A. Gubner, Hochschule München (Germany) |
| 17:45 - 18:15 | <i>Coffee Break</i> | | | |
| 18:15 - 20:00 | | PEM-Electrolysers: Materials, Properties and Challenges M. Carmo, Forschungszentrum Jülich (Germany) | | Component Modelling: Fuel Processing R. Steinberger-Wilckens, University of Birmingham (United Kingdom) |
| 20:00 - 21:30 | <i>Dinner</i> | | | |
| 21:30 - 23:00 | Poster Session, Participant Session | | | |
| Friday, 28th September 2012 | | | | |
| | HYDROGEN TECHNOLOGY | ELECTROLYSIS | SOLID OXIDE FUEL CELL SYSTEMS & BALANCE OF PLANT COMPONENTS | SYSTEM MODELLING |
| 08:30 - 09:30 | EXAM | | | |
| 09:30 - 11:15 | Hydrogen Safety: Focus on Standards and Codes V.V. Molokov, University of Ulster (United Kingdom) | | System Modelling R. Steinberger-Wilckens, University of Birmingham (United Kingdom) | |
| 11:15 - 11:30 | <i>Coffee Break</i> | | | |
| 11:30 - 13:15 | Markets and Infrastructure A. Dhir, University of Birmingham (United Kingdom) | | Gird Connection of Distributed Generation V. Väisänen, Lappeenranta University of Technology (Finland) | |
| 13:15 - 14:15 | <i>Lunch</i> | | | |
| 16:00 - 17:45 | | Integration in Energy Systems R. Steinberger-Wilckens, University of Birmingham (United Kingdom) | | Component Modelling: Heat Exchangers A. Gubner, Hochschule München (Germany) |
| 17:45 - 18:15 | <i>Coffee Break</i> | | | |

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| 18:15 - 20:00 | | Technological Status and Future M. Carmo, ForschungszentrumJülich (Germany) | | Component Modelling: Other Components R. Steinberger-Wilckens, University of Birmingham (United Kingdom) |
| 20:00 - 21:30 | <i>Gala Dinner</i> | | | |
| Saturday, 29th September 2012 | | | | |
| <i>Departure</i> | | | | |

2nd Joint European Summer School for Fuel Cell and Hydrogen Technology

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|---|--------------------------|
| Solid Oxide Fuel Cells | <input type="checkbox"/> |
| The Safety of Hydrogen Technologies | <input type="checkbox"/> |
| Proton Exchange and Alkaline Fuel Cells | <input type="checkbox"/> |
| The Safety of Hydrogen Technologies | <input type="checkbox"/> |
| Solid Oxide Fuel Cells | <input type="checkbox"/> |
| Electrochemistry for Fuel Cells and Electrolysers | <input type="checkbox"/> |
| Proton Exchange and Alkaline Fuel Cells | <input type="checkbox"/> |
| Electrochemistry for Fuel Cells and Electrolysers | <input type="checkbox"/> |
| Solid Oxide Fuel Cells | <input type="checkbox"/> |
| Fuel Cell Modelling | <input type="checkbox"/> |
| Proton Exchange and Alkaline Fuel Cells | <input type="checkbox"/> |
| Fuel Cell Modelling | <input type="checkbox"/> |

Aquis Hotel Arina Sand,
17th – 21st September 2012, Heraklion, Crete

Deadline for registration: **31st August 2012**

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| Title | |
| Family Name | |
| First name | |
| Gender | Male <input type="checkbox"/> Female <input type="checkbox"/> |
| University/Institution/Company Name | |
| Street / P.O. Box | |
| Postal Code | |
| Town/City | |
| Country | |
| Phone | |
| Fax | |
| E-mail : | |
| Heraklionarrival date and time | |
| Herakliondeparture date and time | |
| Please note any special dietary requirements, disabilities etc. that we may need to know about | |

PLEASE RETURN BY E-MAIL OR FAX TO

Mrs Chantal Hake at ch.hake@fz-juelich.de or Fax +49 2461 61 9550

You will then receive a confirmation and an invoice for the meeting fee

2nd Joint European Summer School for Fuel Cell and Hydrogen Technology

- | | |
|--|--------------------------|
| Hydrogen Technology | <input type="checkbox"/> |
| Electrolysis | <input type="checkbox"/> |
| | |
| SOFC Systems & Balance of Plant Components | <input type="checkbox"/> |
| Electrolysis | <input type="checkbox"/> |
| | |
| Hydrogen Technology | <input type="checkbox"/> |
| System Modelling | <input type="checkbox"/> |
| | |
| SOFC Systems & Balance of Plant Components | <input type="checkbox"/> |
| System Modelling | <input type="checkbox"/> |

Aquis Hotel Arina Sand,
24th – 28th September 2012, Heraklion, Crete

Deadline for registration: **7th September 2012**

| | |
|--|---|
| Title : | |
| Family Name | |
| First name | |
| Gender | Male <input type="checkbox"/> Female <input type="checkbox"/> |
| University/Institution/Company Name | |
| Street / P.O. Box | |
| Postal Code | |
| Town/City | |
| Country | |
| Phone | |
| Fax | |
| E-mail | |
| Heraklion arrival date and time | |
| Heraklion departure date and time | |
| Please note any special dietary requirements, disabilities etc. that we may need to know about | |

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Registration Form for **additional overnights** of participants of the

**Second Joint European Summer School on
Fuel Cell and Hydrogen Technology
17-28.09.2012
Crete – Greece**

Return the completed form to
PANHELLAS TOURISM & CONGRESS
Pediados 3, 71306 Heraklion, Crete, Greece
Fax +30 2810 300848 E-mail: manuela@panhellas.gr

Note: The accommodation for the summer school is included in the registration at the summer school from 16.09-22.09.2012 (max 6 nights) and for 23.09-29.09.2012 (max 6 nights)

**Additional overnights can be booked before, after or in between the
aforementioned dates.**

PLEASE FILL IN ALL DETAILS AS REQUESTED BELOW

Name _____ First Name _____
Address City Country _____
Tel _____ Fax _____
Email _____

Please book _____ additional overnight/s for the period
from _____ to _____ at Hotel _____

| Aquis Hotel Arina Sand | PRICES per room per day | |
|---|-------------------------|-----------------|
| | Double room | Single room |
| Including All inclusive treatment Breakfast, Lunch, Dinner, Drinks during Meals, Drinks, Ice Cream, Cake and small snacks during the whole meal) | € 134.00 | € 105.00 |

If you prefer to stay at Heraklion area for additional overnights, we would like to suggest the following hotels:

| | PRICES per room per day | |
|---|-------------------------|----------------|
| | Double room | Single room |
| Hotel Marin Dream 3*** (www.marinhotel.gr) Including overnight and breakfast | € 75.00 | € 62.00 |
| Hotel Olympic 3*** (www.hotelolympic.com) Including overnight and breakfast | € 78.00 | € 65.00 |

Total Rate for the additional accommodation: Euro _____

Private Transfers can be arranged:

- a. from Heraklion airport to Arina Sand Hotel
- b. from Arina Sand Hotel to Heraklion airport

for the rate of 25,00 €per taxi per way (max. 4 persons)

Private Transfer Yes No

Date: _____ FlightNumber: _____ Arrival Time: _____

Date: _____ FlightNumber: _____ Departure Time: _____

Special Notes: _____

If you wish to rent a car, please find below our special car rental rates:

| Category | Car Type | 3 Days | 4 Days | 5 Days | 6-7 Days | Extra Day |
|----------|--|--------|--------|--------|----------|-----------|
| B | Hyundai Atos or similar A/C | 117,70 | 161,70 | 182,60 | 219,00 | 31,00 |
| C | Fiat Punto/Peugeot 206 A/C | 129,80 | 168,30 | 195,80 | 228,00 | 32,00 |
| E.H | Hyundai Accent | 136,40 | 174,90 | 210,10 | 267,30 | 35,65 |
| E.J | Suzuki Jeep Jimmy - open - 4 seats | | | | | |
| E.A | Hyundai Accent 1,4 Auto | 209,00 | 246,40 | 285,00 | 343,20 | 48,50 |
| E.P | Peugeot 307/Opel Astra 1,4 | | | | | |
| F.S | Opel Astra Sedan/Toyota Corolla Terra | | | | | |
| F.M | Hyundai Matrix 1,6 | 246,40 | 285,00 | 343,20 | 419,50 | 59,00 |
| F.M.Au | Hyundai Matrix 1,6 Aut | | | | | |
| G.M. | Mini Bus Multipla /Caddy A/C - 6 seats | 285,00 | 340,00 | 440,00 | 525,00 | 74,00 |
| G | Mini Bus Scudo A/C - 9 seats Hyundai H1 A/C - 9seats or similar | 328,00 | 412,50 | 485,00 | 566,50 | 80,00 |
| X | Nissan X-Trail 2.0 Luxury | 341,00 | 421,50 | 467,50 | 600,00 | 83,00 |

Minimum for the car rental is 3 days.

All above rates includes C.D.W., T.P.I., unlimited kilometres, taxes (23%) and free delivery/collection at the airport Heraklion or at Hotel Arina Sand during the working hours daily from 08:00 - 21:00.

Pick-up or drop-off from 21:00-08:00 will be charged with a supplement of **Euro 25,00**.

Change of city between delivery and collection will be charged **Euro 50,00**

IMPORTANT NOTE: As the payment has to be arranged prior to arrival, clients don't have to show any credit card or leave any caution when they pick up the car!

Yes, I wish to book a car category _____ for the dates

from _____ until _____ = Total days _____

Pick up should be arranged at (place) _____ (time) _____

TOTAL AMOUNT FOR ALL SERVICES: EURO _____

Payment will be arranged by:

A. Bank Deposit
COMMERCIAL BANK (022)
6, Othonos Str. – Athens
Account nr. 022/ 83769173 (Panhellas S.A.)
Swift Address: EMPOGR AA
IBAN: GR 680120 022 00 000 00083769173

Account name – Panhellas S.A
Please mention: Summer School Crete 2012

B. Credit Card:

I authorize Panhellas S.A. to collect the amount of Euro _____ from my credit card

VISA MASTER

Card no : _____ Exp. Date _____

Last three digits of the number at the backside of the card _____

Cardholder's signature _____ Date _____

Cardholder's address: _____

| |
|---------------------|
| Cancellation |
|---------------------|

In case of cancellation, a 3% bank charge will be granted and the rest of the amount will be reimbursed to your credit card.

All written cancellations should be addressed to Panhellas Congress & Tourism Crete.

Please, note that there will be not any refund for cancellation after 10.09.2012.