

# 31<sup>st</sup> Stralsund Spring School

08<sup>th</sup> & 09<sup>th</sup> April 2024 online sessions  
16<sup>th</sup> – 26<sup>th</sup> April 2024 in Stralsund



**FUSES+**  
FUture Sustainable Energy Supply – based  
on renewable energy  
and hydrogen technology

faculty of  
electrical engineering  
+ computer science

University of Applied Sciences

Fakultät Elektrotechnik + Informatik

institute for renewable  
energy systems

Institut für Regenerative  
EnergieSysteme IRES

## Online Lectures: 08. - 09. April 2024

<b>E-Learning platform:</b>	You will find lecture materials at <a href="https://moodle.hochschule-stralsund.de">https://moodle.hochschule-stralsund.de</a> <b>Login-Data will be provided for each participant.</b>
<b>Online access for 29<sup>th</sup> and 30<sup>th</sup> March:</b>	<b>Online participation</b> via GoToMeeting: <a href="https://meet.goto.com/180920157">https://meet.goto.com/180920157</a>

Date	Time	Topic
<b>08.04.</b>	<b>Mo</b>	
(↔)	13:00 – 13:30	Welcome and Introduction to the Spring School / <b>Prof. Johannes Gulden &amp; Romy Sommer</b>
(↔)	13:30 - 14:30	Energy storage for Marine vessels / <b>Audrius Senulis</b>
	14:30 – 14:45	screen break
(↔)	14:45 - 15:45	Introduction to modelling and simulation of energy & storage systems / <b>Prof. Merja Mäkelä</b>
(↔)	15:45 - 17:00	Nordic electricity markets / <b>Prof. Merja Mäkelä</b>

Date	Time	Topic
<b>09.04.</b>	<b>Tue</b>	
(↔)	13:00 – 15:00	Power Transmission Lines, A General Overview / <b>Prof. Sergio Cabral</b>
	15:00 – 15:15	screen break
(↔)	15:15 - 16:15	Power quality in electrical grids / <b>Prof. Jako Kilter</b>
(↔)	16:15 – 17:15	Artificial intelligence applied in electrical power systems / <b>Dr. Stéfano Frizzo Stefanon</b>
(↔)	17:15 – 17:30	Q&A about the spring school to come



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**Attendance Programme in Stralsund: 16. – 26. April 2024**

<b>E-Learning platform:</b>	You will find lecture materials at <a href="https://moodle.hochschule-stralsund.de">https://moodle.hochschule-stralsund.de</a> <b>Login-Data will be provided for each participant.</b>
<b>Lecture rooms:</b>	<b>All lectures take place in house 4 / lecture hall 7</b>
<b>Laboratory locations:</b>	<b>KAE = Komplexlabor Alternative Energien (Alternative Energy Lab) house 7 / near wind turbine tower</b> <b>Laboratory FC-1 H-Box</b> in house 4 / room 217 and lecture hall 7 <b>Laboratory Simu 1</b> in house 4 / room 317 and 324 <b>Laboratory Flow 3D:</b> in house 4 / room 317a <b>Laboratory Heating&amp;Cooling:</b> house 7 / room 106

<b>15.04. Mo</b>	
<b>Day of arrival</b>	arrival / journey to Stralsund <i>Please send us your arrival times – you will get the keys from us for your accommodation in our guest house upon arrival.</i>

Date	Time	Topic	Location
<b>16.04. Tue</b>			
	09:00 - 09:30	Registration at <b>lecture hall 7 in house 4</b>	
	09:30 - 10:30	<b>Opening Session</b> incl. group photo - Welcome and Introduction to the University of Stralsund and its Institute of Renewable Energy Systems / <b>Rector Prof. Ralph Sonntag &amp; Prof. Johannes Gulden</b>	
	10:30 - 11:30	Carbon free energy supply demands in the future / <b>Prof. Jochen Lehmann</b>	
	11:45 - 13:00	Introduction in the hydrogen technology / <b>Johannes Gulden</b>	
	13:00 - 14:00	Lunch	
	14:00 - 14:45	The emergence of local energy communities - Democratizing the energy system / <b>Wim Timmerman</b>	
	15:00 - 16:30	Laboratory introduction + safety instruction / <b>Christian Sponholz / Prof. Thomas Luschtinetz</b> + visit of the ThaiGer-H2 Racing workshop / <b>Andreas Sklarow</b>	<b>house 7 / KAE</b>
	<b>16:30</b>	<b>Photo Rallye “the way downtown” – discovering useful locations such as shops, pubs etc., Hanseatic highlights and hidden places of Stralsund</b>	
		Meeting Point: House 7	



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17.04. Wed	
	08:00 – 09:45 Fuel cell technology I / <b>Prof. Hugh Middleton</b>
	10:00 - 11:00 Utilization of ground heat for heating and cooling / <b>Hannu Sarvelainen</b>
	11:00 - 12:00 Refitting of ships towards green shipping with alternative fuels and power sources / <b>Vasilij Djackov</b>
	12:00 - 13:00 Lunch
	13:00 - 17:00 <b>Laboratory 1 + 2</b>
	<b>18:00</b> Welcome to participants in front of house 7: Get-together-barbecue with guest students, lecturers and ThaiGer-H2-Racing team & hydrogen experiments by Cor Scholte

18.04. Thu	
	08:30 - 10:15 Fuel cell technology II / <b>Prof. Hugh Middleton</b>
	10:30 – 12:00 Utilization of ground heat for heating and cooling / <b>Hannu Sarvelainen</b>
	12:00 - 13:00 Lunch
	13:00 - 17:00 <b>Laboratory 3 + 4</b>
	<b>18:30</b> <b>Lecturers Dinner I</b> (Brasserie Grandcafe Stralsund, Neuer Markt 2)

19.04. Fri	
	08:30 - 09:30 Fuel cell technology III / <b>Prof. Hugh Middleton</b>
	09:45 - 11:00 Heat storage systems / <b>Hannu Sarvelainen</b>
	11:15 - 13:00 <b>Laboratory 5</b>
	13:00 - 14:00 Lunch
	14:00 - 16:00 <b>Laboratory 6</b>
	16:15 - 17:00 Wind-Water-Solar-Hydrogen systems and their points of attention / <b>Cor Scholte</b>



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20. – 21.04. Saturday & Sunday

free time – time for individual excursions to Stralsund and surroundings


22.04. Mo

	09:00 - 10:15	Operation of wind turbines / <b>Prof. Merja Mäkelä</b>
	10:30 - 12:00	The use of unconventional energy sources on water transport means / <b>Prof. Wojciech Zeńczak</b>
	12:00 - 13:00	Lunch
	13:00 - 15:00	<b>Laboratory 7</b>
	15:15 – 17:15	Development in solar energy technics / <b>Prof. Zbigniew Zapałowicz</b>
	18:00	<b>Intercultural Evening</b> with cold bring along buffet (Everybody can bring along specialties / snacks from their home-countries to be shared with each other) - organised by the students of the International Event Point >> <b>House 21 / rooms 202 and 216</b>

23.04. Tue

	09:00 - 10:00	Methods of energy storage in electric power system / <b>Prof. Michal Zeńczak</b>
	10:15 - 12:00	Selected aspects of green technologies safety / <b>Agata Krystosik-Gromadzińska</b>
	12:00 - 13:00	Lunch
	13:00 - 15:00	<b>Laboratory 8</b>
	15:15 - 16:45	Hybrid Energy Storage: Supercapacitor and Battery Technology Applied to Microgrid / <b>Thiago Soares</b>
	17:30	<b>Barbecue with ThaiGer Team and East Energy company</b>

24.04. Wed

	05:00 - 24:00	<b>Excursion to Hannover Fair</b>  Meeting point and departure at the <b>Golden Cube</b> (between house 19 and house 4): Please be there at <b>04:45 in the morning!</b> We will take a shuttle to the train station. There is enough time to sleep on the bus ;o)  <b>Take lunch packages with you. We will be back late at night.</b>  Please find further information here: <a href="http://www.hannovermesse.de/en/conference/">www.hannovermesse.de/en/conference/</a>
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


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25.04. Thu		
	09:00 - 10:30	The many faces of bioenergy and bioeconomy / <b>Henrik Kofød Nielsen</b>
	10:45 - 12:00	Seminar Prof. Gulden - Home universities and energy situation in the home countries of students - <b>short presentations of participants (10 minutes pitches per country)</b>
	12:00 - 13:00	Lunch
	13:00 - 14:00	Seminar Prof. Gulden - Home universities and energy situation in the home countries of students - <b>short presentations of participants (10 minutes pitches per country)</b>
	14:15 - 17:00	Krafla – Energy Transition Simulation Game: negotiating with the world / <b>Prof. Johannes Gulden &amp; Romy Sommer</b>
	<b>19:00</b>	<b>Lecturers Dinner II</b> (Restaurant Dolden Mädels Ratsherrn Braugasthaus, Am Fischmarkt 13a)

26.04. Fri		
	09:00 - 12:00	Presentations of lab results <u>by student teams</u> with discussion / <b>Christian Sponholz / Martin Hayduk</b>
	12:00 – 13:00	Lunch
	13:00 - 14:00	Process control systems in renewable energy production / <b>Prof. Merja Mäkelä</b>
	14:30 - 16:00	Online examination for all participants (attendees can take the exam in the <b>computer-room 317 in house 4</b> or use their own notebook at the <b>lecture hall 7 in house 4</b> )
	17:30 – 18:00	Handing-over of certificates / evaluation and farewell
	<b>18:00</b>	<b>Farewell barbecue / near house 7</b>

27.04. Sat		
Departure with shuttle service to the railway station or bus station. Please tell us your departure times.		

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**Laboratory work:** *In each of the 9 teams are members of different universities/countries.*  
 Preparation of a presentation (.ppt) and / or a short film sequence by each team:

Team 1	FC-5 Nexa	Team 4	FC-1 H-Box	Team 7	Ely-1 Electrolyzer
Team 2	Ely-1 Electrolyzer	Team 5	Flow3D	Team 8	Heating & Cooling
Team 3	FC-3 50 W	Team 6	HCC1 Buderus	Team 9	Simulink 1

**Division of the groups into laboratory work:**

	Wed		Thu		Fri		Mo	Tue	Room
	17.04.		18.04.		19.04.		22.04.	23.04.	
	13:00 - 15:00	15:00 - 17:00	13:00 - 15:00	15:00 - 17:00	11:15 - 13:00	14:00 - 16:00	13:00 - 15:00	13:00 - 15:00	
	Lab 1	Lab 2	Lab 3	Lab 4	Lab 5	Lab 6	Lab 7	Lab 8	
FC-1 H-Box			4	9					H4/217
					6	7	1+8	3+2	H4/lecture hall 7
Simulink 1			9						H4/317
					3+2	1	4+5	6+7+8	H4/324
Flow3D	3+4	5+6	7+8	2	1	9			H4/317a
FC-3 50 W	7	4		8	5	3	2	9	H7/KAE
FC-5 Nexa	1	3	5	6	7	8	9	4	H7/KAE
Ely-1 Electrolyzer	8	2		7	4	5	6+3	1	H7/KAE
HCC1 Buderus	2		6	1	9	4	7	5	H7/KAE
Heating & Cooling	9	1	3	5	8	2+6			H7/106
Offshore Energy Game	5+6	7+8+9	1+2	3+4					H4/lecture hall 7

**Locations of the labs & game:**

H7 / KAE = house 7 / Komplexlabor (Alternative Energy Lab) > near Windturbine  
 H7/106 = house 7 / lab room 106  
 H4 = house 4 / room 217, 317, 317a, 324 and lecture hall 7



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## Lab details:

<b>FC 1 – Heliocentris Box</b> H4 / 217 and H4/lecture hall 7	Micro Electrolyzer / PV and fuel cell	Johannes Gulden, Hugh Middleton
<b>Simu - Simulation of energy systems with Simulink</b> H4 / 324	Introduction to modelling energy storage systems with Matlab/Simulink	Merja Mäkelä, Romy Sommer
<b>FC 3 - 50W / H7/KAE</b>	Automation of a 50W-FC using a PLC	Thomas Luschtinetz
<b>FC 5 – Nexa / H7/KAE</b>	Nexa 1,2 kW UPS	Martin Hayduk
<b>ELY 1 – Electrolyser / H7/KAE</b>	Model electrolyser and windturbine-electrolyser-system (20kW type)	Jochen Lehmann, Cor Scholte, Edward Antwi
<b>HCC 1 - H2-combustion / H7/KAE</b>	Catalytic burner (Buderus)	Christian Sponholz
<b>Heating&amp;Cooling – Heat storage tank / heating &amp; cooling / H7/106</b>	Heat storage tank Comparison of the theoretical and real situation in heating and cooling	Hannu Sarvelainen, Maunu Kuosa
<b>Flow3D – calculation of hull forms</b> H4/317a	Refitting of ships / Hull form optimization: comparative research of 2 different hulls	Vasilij Djackov, Romy Sommer
<b>Offshore Energy Game</b> H4 / lecture hall 7	energy game on offshore energy, transportation, transformation and storage problems/solutions	Wim Timmermann, Romy Sommer

## Organisation:

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## Blended Intensive Programme



Funded by  
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