Ecole Centrale Nantes, Nantes (France)
Aug. 24 – Sept. 4, 2015

2nd AAU and ECN ewtec affiliated PhD course on:

'Numerical and experimental modelling and control of Wave Energy Converters'

Aim of the course:

The main objective of this course is to train each participant to the numerical and experimental modelling and control of Wave Energy Converters (WECs).

The following topics will be taught:

- The State of the Art of wave energy conversion techniques
- The State of the Art of numerical modelling of WECs, the limitations and the alternative numerical approaches
- The State of the Art of experimental modelling of WECs, the limitations
- The State of the Art of control of WECs

By the end of the course, the participants will have carried out the following tasks:

- Wave measurement and generation in wave tank
- Numerical investigation of the performance of a WEC
- Experimental investigation of the performance of a WEC with and without control

Venue and date:

The course will take place at the Ecole Centrale Nantes, city of Nantes, France. Nantes can easily be reached from Paris by train (2hrs), or directly by flying to Nantes Atlantique Airport (Air France/KLM service from/to Amsterdam and Paris).

The course will be held on two weeks from Monday, August 24 to Friday, September 4, 2015.

Pre-requisites

- Degree in Engineering
- Basic knowledge of Matlab or any other programming language

Registration:

For registration, contact aurelien.babarit@ec-nantes.fr, +33 240 371 631.

Type	Master and PhD students	Others
Registration fee	800€	2 400€

Financial support from :

Tentative program (week 1/2)

Course program: Numerical and experimental modelling and control of Wave Energy Converters **Week 1/2**

	Monday 24 **Introduction to wave energy utilization**	Tuesday 25 **Ocean waves**	Wednesday 26 **Wave structure interaction**	Thursday 27 **Wave to wire modelling**	Friday 28 **Wave to wire modelling**
8:30 - 9:00		Ocean Waves 1: time and frequency domain time series analysis JPK	Follow-up AB	Follow-up AB	Follow-up AB
9:00 - 9:30	General introduction to the course AB & JPK		Ocean Waves 2: Linear waves GD	PTO modeling, from floating body to WEC AB	Ocean Waves 3: advanced wave analysis and modelling GD
9:30 - 10:00	Introduction to wave energy utilization JPK				
10:00 - 10:30					
10:30 - 11:00					
11:00 - 11:30		Visit of ECN facilities + introduction of exercise JPK & MK & SB & FB	Linear floating body response - open source BEM code Nemoh AB	CFD modeling - RANSE + SWENSE LG	CFD modeling - SPH DLT
11:30 - 12:00					
12:00 - 12:30					
12:30 - 13:00					
13:00 - 13:30					
13:30 - 14:00	Introduction to wave energy utilization JPK	Wave measurement and generation in ECN's wave tank (cont.) JPK & MK & SB & FB	Linear floating body response - open source BEM code Nemoh (cont.) AB	W2W modeling - frequency domain AB	W2W modeling - frequency domain AB
14:00 - 14:30					
14:30 - 15:00					
15:00 - 15:30			Numerical investigation of response of floating structures in waves AB		
15:30 - 16:00	Experimental performance investigation of WECs JPK				
16:00 - 16:30					
16:30 - 17:00					
17:00 - 17:30					

AB: Aurélien Babarit - JPK: Jens Peter Kofoed - MK: Morten Kramer - SB: Sylvain Bourdier - FB : Félicien Bonnefoy - GD: Guillaume Ducrozet - LG : Lionel Gentaz - DLT: David Le Touzé - FA: Fabrice Ardhuin

Lecture
Exercise
Visit
Guest lecture

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Tentative program (week 2/2)

	Monday 31 **Wave to wire modelling**	Tuesday 1 **Control of WECs**	Wednesday 2 **Control of WECs**	Thursday 3 **WEC simulation tools**	Friday 4 **SEMREV visit**
8:30 - 9:00	Follow-up AB	Follow-up AB	Follow-up AB	Follow-up	Drive to Le Croisic AB
9:00 - 9:30	Time domain modeling / viscous effects / uncertainties AB	Control of wave energy converters MK	Control of wave energy converters MK	Wave propagation modelling FA	
9:30 - 10:00					
10:00 - 10:30					SEMREV visit & presentation, DanWEC presentation CB
10:30 - 11:00				Wave interaction in arrays of wave energy converters MF	
11:00 - 11:30	InWave: a multibody dynamic solver for WEC simulation AC	Practical experience with control of WECs MK	Practical experience with control of WECs AB		
11:30 - 12:00					
12:00 - 12:30					Lunch at Le Croisic
12:30 - 13:00					
13:00 - 13:30					
13:30 - 14:00	W2W modeling - time domain AB	Experimental performance investigation of WEC's with and without control MK & SB & FB	Experimental performance investigation of WEC's with and without control MK & SB & FB	Experimental performance investigation of WEC's with and without control MK & SB & FB	Reporting / evaluation of the course AB
14:00 - 14:30					
14:30 - 15:00					Outdoor activities AB
15:00 - 15:30					
15:30 - 16:00					
16:00 - 16:30					
16:30 - 17:00					
17:00 - 17:30					Drive back to Nantes AB

AB: Aurélien Babarit - MF: Matt Folley - MK: Morten Kramer - SB: Sylvain Bourdier - FB : Félicien Bonnefoy - CB: Christian Berhault - AC: Adrien Combourieu - FA: Fabrice Ardhuin

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