Development of Approaches to Harmonization of a Comprehensive Internationalization Strategies in Higher Education, Research and Innovation at EU and Partner Countries

HARMONY

Development of approaches to harmonization of comprehensive internationalization strategies in higher education, research and innovation at EU and Partner Countries

Erasmus Mundus Joint Master Course: a case of Success

HARMONY Project meeting
Tomar
16 – 21 April 2018

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Erasmus Mundus Joint Master Course
Sustainable Transportation and Electrical Power Systems
http://www.emmcsteps.eu
120 ECTS
Associated Universities and Companies

**Company** | **Sector**                           | **Country**
---         | ---                                 | ---
ABB*       | Electrical systems                  | ES/DE
EDP        | Energy                               | PT/ES
E.ON       | Energy                               | DE/UK
Ford Motor Company | Automobile           | USA/DE
Gamesa Electric | Energy                        | ES/UK
HC Energia | Energy                               | ES
ISF (NGO)  | Engineering                          | ES
REN        | Electrical systems                  | PT
Schneider Electric** | Energy                        | ES/DE
Seat       | Automobile                           | ES
Siemens    | Electronics & electrical engineering | ES/DE
TRW Conekt | Engineering consultancy            | UK
WEG        | Electric Motors/Drives              | PT
Windtec    | Wind turbine engineering             | AT
Trainelec (CAF I+D) | Railway Industry | ES
General Electric Global Research | High-Power Electronics | DE
Alstom Transport | Railway Industry | FR
Joint Program

Students
- Joint student application selection and admission procedures
- Joint examination methods

Consortium agreement
- Partnership regulation, organization and decisions making
- Financial Issues
Erasmus Mundus Master Course in Sustainable Transportation and Electrical Power Systems

• Offers a highly specialized education in Electrical Engineering, focusing on two of the areas of the highest technological content and professional requirements in the energy sector.

• The main goal of the EMMC in “Sustainable Transportation and Electrical Power Systems” is the training of qualified staff in areas related to electrical energy management, emphasizing in power systems for renewable energies and electrical transportation.
The course is structured in two academic years, distributed in four 30 ECTS semesters for a total student workload of 120 ECTS.

The EMMC STEPS focuses on the three key areas of electrical energy engineering: Electrical Power Systems, Electrical and Hybrid Vehicles, Energy Efficiency and Renewable Energies but students can build their own curriculum based on their previous background and their professional interest.

The Master specifically offers two study tracks: Sustainable Transportation and Electrical Power Systems.
Several options for courses integration

All students spend a semester at each institution.

Different itineraries are offered → students can visit only three countries.

Two different specializations are proposed

Electrical Power Systems

Sustainable Transportation: Hybrid/Electric Vehicle

EMMC STEPS students will be studying in at least 3 EU countries.
Several options for courses integration

All students spend a semester at each institution.

Different itineraries are offered → students can visit only three countries.

Two different specializations are proposed

Electrical Power Systems

Sustainable Transportation: Hybrid/Electric Vehicle

The programme also offers the opportunity of carrying out the internship and the preparation of the Master Thesis in a fourth different country, eventually outside the EU (America/Asia).
• The Master Thesis may be supervised by a PhD Professor belonging to any of the partner Universities and jointly supervised by a professor or tutor from the associated organization (University or company) where the student is carrying out the internship.

• Graduates successfully completing the EMMC STEPS academic programme will be awarded with a Joint Master Degree in Sustainable Transportation and Electrical Power Systems (STEPS) by all the Consortium universities, fully recognized in the four partner countries.
During the first two weeks students will attend an *Introductory course* at the **University of Oviedo**. They will be introduced to the objectives, methodology and operational aspects of the programme. Students will also be introduced to the coordinators in each of the University and will have the opportunity to meet Master colleagues.
Courses integration

Semester 1 is conceived as a Levelling Course, in order to compensate knowledge for different educational background. Students wishing to focus on Sustainable Transportation strand will spend this first period in the University of Rome, while the focusing on Electrical Power Systems will attend lectures in the Polytechnic Institute of Coimbra - ISEC.
Semester 2 courses will be devoted to the study of advanced subjects on Sustainable Transportation and Electrical Power Systems at the University of Nottingham. Students will choose among ten different topics to focus the learning process either on Sustainable Transportation or Electrical Power Systems.
During **Semester 3** students will complete their specialization in either of the two proposed strands at the **University of Oviedo**. In Sustainable Transportation, topics are designed to cover both the electrical and mechanical considerations in the design of hybrid/electric vehicles and the integration of these new actors in the electrical network. Power Systems subjects include topics related to the management of electrical power systems, including development of renewable energy projects and sustainable development.
Courses integration

Electrical Power Systems

Kick-off course at Oviedo. Basic skills at Coimbra → Nottingham → Oviedo → Any institution, including other institutions.

Sustainable Transportation

Kick-off course at Oviedo. Basic skills at Rome → Nottingham → Oviedo → Any institution, including other institutions.

Finally, semester 4 will offer the opportunity of carrying out a professional internship in any one of the world leading companies associated to the Master or in a partner or associated University, and a guided research aimed at the preparation of the Master thesis.

The Master thesis will be related to one of the main lines identified as keystones in the Master: Electrical Power Systems, Electrical and Hybrid Vehicles, Energy Efficiency and Renewable Energies. The internship period will be closely linked to the thesis topic.
## Courses integration

### Electrical Power Systems

**Kick-off course at Oviedo. Basic skills at Coimbra**

- Power Electronics converters
- Control of Electromechanical systems
- Digital Control
- Power Systems
- Power Plants
- Distribution systems
- Electrical machines
- DSP and communications
- Microcontrollers

**Nottingham**

- FACTS and Distributed Generation (Renewable Generation Technologies)
- Renewable Generation Technologies and Control
- Power Quality and EMC Technologies for Wind Generation
- Advanced AC Drives

**Oviedo**

- Smartgrids and Microgrids
- Applied simulation to power systems
- Power Systems Laboratory
- Electrical Markets
- Project Management
- Economical and Financial Analysis

**Any institution, including other institutions.**

- Master's Thesis
- Internships
## Courses integration

### Kick-off course at Oviedo. Basic skills at Rome
- Mechanical background
- Dynamic analysis of AC machines
- Control of Electromechanical AC Drives
- Power Electronics
- Power Systems Basics
- Vehicle Cinematics & Dynamics
- Digital Control and microcontrollers
- Electrical machines
- Dynamic control of AC machines

### Nottingham
- Power Systems for Aerospace, Marine and Automotive Application
- Advanced power Conversion
- Advanced AC Drives + Project
- Advanced AC Machines
- Technologies for the Hydrogen Economy

### Oviedo
- Design of hybrid (HEV) and electric vehicles (EV) (includes Vehicle Cinematics & Dynamics)
- Energy storing and recovering in power systems and hybrid/electric vehicles
- EMC
- Power Systems for electrical transportation
- Applied simulation to electrical transportation
- Electrical Transportation Laboratory

### Any institution, including other institutions.

### Master's Thesis Internship
Erasmus Mundus Master Course in Sustainable Transportation and Electrical Power Systems

• The course allows the exchange of knowledge and professional experiences in a multicultural and multilingual context.

• Students will have the opportunity to attend local language and local culture courses so as to facilitate their integration in diverse backgrounds.

• Both specializations of the Master allow the student to work in two of the most promising sectors in terms of social return, job creation and relevance to the recovery of the global economy.
EMMC STEPS tuition fees:

- Tuition fees for Third-country graduate student (Category A students): €4,000 per semester, €16,000 for the full academic programme
- Tuition fees for European graduate students (Category B students): €2,000 per semester, €8,000 for the full academic programme

The number of scholarships for each category of individuals will be defined on a yearly basis by the Education, Audiovisual and Culture Executive Agency (EACEA):

- The amount of the full-study scholarship will be higher for third-country masters students (Category A scholarships) than for European masters students* (Category B scholarships). Category A scholarships are conceived as "full scholarships" covering all necessary costs of the student during his/her study period in Europe. Category B scholarships have to be considered as a "financial contribution" to the student's costs while following his/her EMMC studies.
Academic year 2012/2013

Nepal
Spain
Germany

Bangladesh
Ethiopia
China
Nigeria
India
Academic year 2012/2013
Academic year 2013/2014

Visa; monthly allowances
Title recognition
Technical colleges
Academic year 2014/2015
Academic year 2014/2015

Prof. Dhaker Abbes, Tunisia
(HEI, Lille France)
## Academic year 2012/2013

### 1st Graduates Internships

<table>
<thead>
<tr>
<th>Student</th>
<th>MsThesis</th>
<th>Internships</th>
<th>Internships Institution</th>
<th>Country</th>
<th>Ms Thesis Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chibuike Maduko</td>
<td>9</td>
<td>8</td>
<td>Vattenfall Vindkraft ABB</td>
<td>Sweden</td>
<td>University of Oviedo</td>
</tr>
<tr>
<td>Dereje Lemma Woldegiorgis</td>
<td>9</td>
<td>7.5</td>
<td>The University of Nottingham</td>
<td>UK</td>
<td>The University of Nottingham</td>
</tr>
<tr>
<td>Edgar Nuño</td>
<td>9</td>
<td>9.5</td>
<td>EDP Renováveis</td>
<td>Brazil</td>
<td>Instituto Politécnico de Coimbra (ISEC)</td>
</tr>
<tr>
<td>Enrique Rodríguez Díaz</td>
<td>10</td>
<td>10</td>
<td>University of Oviedo</td>
<td>Spain</td>
<td>University of Oviedo</td>
</tr>
<tr>
<td>Huthaifa M. Flieh</td>
<td>10</td>
<td>10</td>
<td>University of Wisconsin-Madison</td>
<td>USA</td>
<td>University of Wisconsin-Madison</td>
</tr>
<tr>
<td>Minoru Ithamar Tsuru Rodríguez</td>
<td>8.5</td>
<td>8.5</td>
<td>NCKU Taiwan</td>
<td>Taiwan</td>
<td>NCKU Taiwan</td>
</tr>
<tr>
<td>Octavian Mihai Rotaru</td>
<td>9</td>
<td>9</td>
<td>CT SEAT</td>
<td>Spain</td>
<td>University of Oviedo</td>
</tr>
<tr>
<td>Md. Rejwanur Rashid Mojumdar</td>
<td>10</td>
<td>7</td>
<td>EDP Renováveis, The UK</td>
<td>UK</td>
<td>University of Oviedo</td>
</tr>
<tr>
<td>Shan Huang</td>
<td>Pending</td>
<td>Pending</td>
<td>EDP Renováveis</td>
<td>Spain</td>
<td>University of Oviedo</td>
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<tr>
<td>Shreenidhi Sharma</td>
<td>8.9</td>
<td>8.88</td>
<td>The University of Nottingham</td>
<td>UK</td>
<td>The University of Nottingham</td>
</tr>
<tr>
<td>Therese Uzochukwuamaka Okeke</td>
<td>8.5</td>
<td>8.6</td>
<td>EDP Renováveis, The UK</td>
<td>UK</td>
<td>University of Oviedo</td>
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<tr>
<td>Konstantinos Valasiadis</td>
<td>Pending</td>
<td>Pending</td>
<td>Univ. Federal Santa Maria</td>
<td>Brazil</td>
<td>Univ. Federal Santa Maria</td>
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<tr>
<td>Chanditha Udalagama</td>
<td>10</td>
<td>10</td>
<td>Alstom Grid UK Limited</td>
<td>UK</td>
<td>The University of Nottingham</td>
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</tbody>
</table>
Graduates distribution for the first two editions (employment/PhD)

EMMC STEPS ALUMNI

**Cohort 2012-2014**

<table>
<thead>
<tr>
<th>Given Name</th>
<th>Family Name</th>
<th>Graduation date</th>
<th>Status</th>
<th>Time to first job</th>
<th>Actual occupation</th>
<th>PhD</th>
<th>Intern</th>
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<tbody>
<tr>
<td>Chundilha</td>
<td>Udalgama</td>
<td>September 2014</td>
<td>Working</td>
<td>Working at ABB just after finishing Master Thesis</td>
<td>Control Design Engineer at ABB Grid</td>
<td>No</td>
<td>The University of Nottingham</td>
</tr>
<tr>
<td>Chiibiko</td>
<td>Madiko</td>
<td>September 2014</td>
<td>Working</td>
<td>Working at ABB just after finishing Master Thesis</td>
<td>Power Engineer</td>
<td>No</td>
<td>Vaftaffe</td>
</tr>
<tr>
<td>Dentje</td>
<td>Lemma</td>
<td>September 2014</td>
<td>PhD</td>
<td>PhD in Nottingham just after finishing Master Thesis</td>
<td>Graduated Student Researcher. The University of Nottingham</td>
<td>Yes</td>
<td>The University of Nottingham</td>
</tr>
<tr>
<td>Edgar</td>
<td>Nito</td>
<td>September 2014</td>
<td>PhD</td>
<td>6 months to get admission at PhD programme</td>
<td>PhD student, DTU Wind Energy (Denmark)</td>
<td>Yes</td>
<td>EDP, Brasil</td>
</tr>
<tr>
<td>Enrique</td>
<td>Rodriguez</td>
<td>September 2014</td>
<td>PhD</td>
<td>6 months to get admission at PhD programme</td>
<td>PhD student, Aalborg University</td>
<td>Yes</td>
<td>University of Oviedo</td>
</tr>
<tr>
<td>Shan</td>
<td>Huang</td>
<td>September 2015</td>
<td>Working</td>
<td>She started working at State Grid in 2014, before finishing Master Thesis</td>
<td>She started working at State Grid in 2014, before finishing Master Thesis</td>
<td>No</td>
<td>EDP</td>
</tr>
<tr>
<td>Huthsisa</td>
<td>Filah</td>
<td>September 2014</td>
<td>PhD</td>
<td>PhD at the University of Wisconsin-Madison just after finishing Master Thesis</td>
<td>Phd student, The University of Wisconsin-Madison (WEMPEC)</td>
<td>Yes</td>
<td>University of Wisconsin-Madison</td>
</tr>
<tr>
<td>Konstantinos</td>
<td>Vlassiadis</td>
<td>September 2014</td>
<td>NOT KNOWN</td>
<td>NOT KNOWN</td>
<td>NOT KNOWN</td>
<td>No</td>
<td>University of Santa Maria (Brazil)</td>
</tr>
<tr>
<td>Md</td>
<td>Mallungdar</td>
<td>September 2014</td>
<td>Working</td>
<td>Working for 6 months</td>
<td>Senior Lecturer at Primeasia University (Bangladesh)</td>
<td>Yes</td>
<td>EDP UK, Scotland</td>
</tr>
<tr>
<td>Minoru</td>
<td>Tsiru</td>
<td>September 2014</td>
<td>Working</td>
<td>Working for 6 months</td>
<td>Tesla Motors (Netherlands)</td>
<td>Yes</td>
<td>NCUK-UoYm (Taiwan)</td>
</tr>
<tr>
<td>Octavian</td>
<td>Rofatlu</td>
<td>September 2014</td>
<td>Working</td>
<td>Working for 1 month</td>
<td>Electromechanical Engineer, Entropy Labs Ltd</td>
<td>Yes</td>
<td>SEAT</td>
</tr>
<tr>
<td>Sagar</td>
<td>Poshnch</td>
<td>September 2015</td>
<td>NOT KNOWN</td>
<td>NOT KNOWN</td>
<td>Deputy Manager Engineer Office in NTPC</td>
<td>No</td>
<td>University of Wisconsin-Madison</td>
</tr>
<tr>
<td>Shreeniha</td>
<td>Sharma</td>
<td>September 2014</td>
<td>Working</td>
<td>He started working in NTPC two months before finishing the master thesis</td>
<td>Phd student, Université de Sherbrooke, (Canada)</td>
<td>Yes</td>
<td>Polytechnic Institute Cambrpa</td>
</tr>
<tr>
<td>Therese</td>
<td>Okeke</td>
<td>September 2014</td>
<td>Working</td>
<td>She got the position at Siemens one month after she graduated</td>
<td>Graduated Engineer, Siemens Rail Automation UK</td>
<td>No</td>
<td>EDP UK, Scotland</td>
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**Cohort 2013-2015**

<table>
<thead>
<tr>
<th>Given Name</th>
<th>Family Name</th>
<th>Graduation date</th>
<th>Status</th>
<th>Time to first job</th>
<th>Actual occupation</th>
<th>PhD</th>
<th>Intern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Getnet</td>
<td>Tadesse</td>
<td>September 2015</td>
<td>Unemployed</td>
<td>Still not working</td>
<td>Applying to Lecturer and researcher positions in Ethiopia</td>
<td>Yes</td>
<td>The University of Nottingham</td>
</tr>
<tr>
<td>Patrick</td>
<td>Siungwa</td>
<td>September 2015</td>
<td>Working</td>
<td>Working Just after finishing master thesis</td>
<td>Principal Energy Officer Department of Energy Affairs (Malawi)</td>
<td>Yes</td>
<td>University of Northampton</td>
</tr>
<tr>
<td>Ahmed</td>
<td>Saleque</td>
<td>September 2015</td>
<td>Working</td>
<td>Working 1 week</td>
<td>American International University-Bangladesh (AIUB) as a Lecturer</td>
<td>Yes</td>
<td>University of Wisconsin-Madison</td>
</tr>
<tr>
<td>Milad</td>
<td>Berki</td>
<td>September 2015</td>
<td>PhD</td>
<td>3 months</td>
<td>Phd student, Université de Sherbrooke, (Canada)</td>
<td>Yes</td>
<td>Politecnico Institute Cambrpa</td>
</tr>
<tr>
<td>S. M.</td>
<td>Ferjed</td>
<td>September 2015</td>
<td>PhD</td>
<td>Just after finishing master thesis</td>
<td>Phd student, University of Oviedo</td>
<td>Yes</td>
<td>University of Oviedo</td>
</tr>
<tr>
<td>Djarr</td>
<td>Brackovic</td>
<td>September 2015</td>
<td>Unemployed</td>
<td>Still not working</td>
<td>Still not working</td>
<td>University of Rome</td>
<td></td>
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<tr>
<td>Omar</td>
<td>Mustlaq</td>
<td>September 2015</td>
<td>Working</td>
<td>Working 1 month</td>
<td>ISASTUR, (Spain)</td>
<td>No</td>
<td>University of Oviedo</td>
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<tr>
<td>Patroos</td>
<td>Tesagay</td>
<td>September 2015</td>
<td>NOT KNOWN</td>
<td>NOT KNOWN</td>
<td>ISASTUR, (Spain)</td>
<td>No</td>
<td>University of Oviedo</td>
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<tr>
<td>Mint</td>
<td>Karadneiz</td>
<td>September 2015</td>
<td>PhD</td>
<td>Just after finishing master thesis</td>
<td>Phd student, Politecnico di Torino</td>
<td>Yes</td>
<td>University of Rome</td>
</tr>
<tr>
<td>Rahul</td>
<td>Kohli</td>
<td>September 2015</td>
<td>Working</td>
<td>Working Just after finishing master thesis</td>
<td>Phd student, Politecnico di Torino</td>
<td>Yes</td>
<td>University of Rome</td>
</tr>
<tr>
<td>David</td>
<td>Nowak</td>
<td>September 2015</td>
<td>Working</td>
<td>Working Just after finishing master thesis</td>
<td>Phd student, Politecnico di Torino</td>
<td>Yes</td>
<td>University of Rome</td>
</tr>
<tr>
<td>Amir</td>
<td>Rubins</td>
<td>September 2015</td>
<td>Working</td>
<td>Working Just after finishing master thesis</td>
<td>Phd student, Politecnico di Torino</td>
<td>Yes</td>
<td>University of Rome</td>
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<tr>
<td>Magis</td>
<td>Praschova</td>
<td>September 2015</td>
<td>Unemployed</td>
<td>Still not working</td>
<td>Still not working</td>
<td>University of Rome</td>
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<tr>
<td>Alexander</td>
<td>Limas</td>
<td>September 2015</td>
<td>Unemployed</td>
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<td>Still not working</td>
<td>University of Rome</td>
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<tr>
<td>Phuipat</td>
<td>Chojesonmtpix</td>
<td>September 2015</td>
<td>NOT KNOWN</td>
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<td>Phd student, University of Oviedo</td>
<td>Yes</td>
<td>University of Oviedo</td>
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<tr>
<td>Devraj</td>
<td>Dutt</td>
<td>September 2015</td>
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<td>ISASTUR, (Spain)</td>
<td>Yes</td>
<td>University of Oviedo</td>
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<tr>
<td>Sobhi</td>
<td>Darg</td>
<td>September 2015</td>
<td>Working</td>
<td>Working 3 months</td>
<td>ISASTUR, (Spain)</td>
<td>No</td>
<td>University of Oviedo</td>
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</tbody>
</table>


• **Erasmus Mundus Joint Master Degree in Sustainable Transportation and Electrical Power Systems** it was certified for more 6 years.

• **In 10 of April of 2028, the Management Board decides to accredit the study programme, in accordance with the External Assessment Team recommendation and reasons**
• Thank you for your attention!!

Erasmus Mundus Joint Master Course
Sustainable Transportation and Electrical Power Systems
http://www.emmcsteps.eu