

Hinweise zum Doppelmaster mit Cartagena (Spanien)

Im Masterstudiengang Energietechnik wählst du generell **zwei Spezialisierungsfächer** mit je 18 ECTS.

Es gibt **keine starre Regelung** seitens der Prüfungsordnung, die bestimmte Spezialisierungsfächer für den Spanien-Doppelmaster vorschreibt. Da das Programm in Cartagena jedoch den Schwerpunkt „Renewable Energy“ hat, sind nur Fächer perfekt kompatibel, die thematisch an die spanischen Module anknüpfen oder diese sinnvoll ergänzen. Diese sind Windenergie, Solarthermie, Photovoltaik, Wasserkraft, Wasserstofftechnologie, Biomasse und Leistungselektronik.

Die höchste inhaltliche Kompatibilität bieten die folgenden Fächer aus Gruppe 1:

- **Windenergie** (starke Überschneidung mit dem dortigen Modul *Engineering of Wind Energy Systems*)
- **Erneuerbare thermische Energiesysteme** (perfekt passend zu den Modulen *Thermal Solar Energy* und *Biomass and Biofuels*)
- **Strömungsmechanik und Wasserkraft** (deckt sich mit *Hydraulic and Tidal Energy*)

Und folgenden Fächer aus Gruppe 2:

- **Elektrische Maschinen und Antriebe** (ideale Grundlage für die Module *Power Electronics for Renewable Energies* sowie *Electric Energy Generation and Storage Systems*)
- **Energiewirtschaft und Systemanalyse** bzw. **Energiesysteme und Energiewirtschaft** (ergänzt das technische Wissen in Spanien um die ökonomische und systemische Perspektive)
- **Regelungstechnik / Systemdynamik** (universell wichtig für die Steuerung großer Wind- und Solarparks)

In Spanien erbringst du insgesamt Pflicht- und Wahlpflichtmodule im Umfang von **60 ECTS** im 3. und 4. Semester. Du kannst vor deinem Auslandsaufenthalt die Spezialisierungsfächer komplett in Deutschland abschließen und in Spanien nur Vertiefungsfächer (Wahlpflichtfächer) und Schlüsselqualifikationen belegen. Ebenso kannst du deine Spezialisierungsfächer zwischen Spanien und Deutschland aufteilen.

Beachte außerdem den unterschiedlichen Arbeitsaufwand für die Masterarbeit: In Deutschland brauchst du für die Anerkennung der Masterarbeit 30 LP, also 900 Arbeitsstunden. In Spanien erwartet man nur 540 Stunden, weshalb du dort für die Masterarbeit nur 18 LPs bekommst. Die Lücke von 12 LP füllst in Cartagena durch Projektarbeit, Laborpraktika oder weitere Lehrveranstaltungen.

Damit alle in Spanien belegten Fächer später in Deutschland angerechnet werden können, wird **vor dem Auslandsaufenthalt ein Learning Agreement** mit dem Stuttgarter Studiengangsmanagement vereinbart.

Bitte beachte, dass in Cartagena die meisten Lehrveranstaltungen auf Spanisch unterrichtet werden. Du solltest also mindestens über das Niveau B2 verfügen. Außerdem sind die Semesterzeiten gegenüber Deutschland verschoben. Das Wintersemester beginnt bereits Anfang September, während das Sommersemester schon Anfang Februar beginnt.

Vorschlag für ein Doppelmasterprogramm, wenn die SFs komplett in Deutschland erbracht werden sollen:

1. Semester (Stuttgart)		2. Semester (Stuttgart)		3. Semester (Ausland)		4. Semester (Ausland)	
KF (SF 1)	6	EF (SF 1)	3	WPF 2	3	MA	30/18*
EF (SF 1)	6	EF (SF 2)	3	WPF 3	6	(WPF 4 /Projekt/Prak	12**)
Prak (SF 1)	3	WPF 1	6	Weitere WPF oder Industrieprak	15		
KF (SF 2)	6	WPF 2	3	SQ 1	3		
EF (SF 2)	6	FA	15	SQ 2	3		
Prak (SF 2)	3						
Summe LP	30	Summe LP	30	Summe LP	30	Summe LP	30

In Deutschland zu erbringen (60 LP):

SP 1: KF + EF 1 + EF 2 + Prak = 18 LP

SP 2: KF + EF 1 + EF 2 + Prak = 18 LP

Vertiefungsfächer: WPF 1 + WPF 2 = 9 LP

Forschungsarbeit: 15 LP

Im Ausland zu erbringen (60 LP):

Vertiefungsfächer: WPF 2 + WPF 3 = 9 LP

Weitere Vertiefungsfächer oder Industriepraktikum: 15 LP

SQs: SQ 1 + SQ 2 = 6 LP

Masterarbeit: 30 / 18* LP (*In Cartagena nur 18 LP für die MA, so dass zusätzliche Module mit 12** LP benötigt werden)

KF = Kernfach, EF = Ergänzungsfach, Prak = Praktikum, WPF = Wahlpflichtfach, FA = Forschungsarbeit, SQ = Schlüsselqualifikation, MA = Masterarbeit

Vorschlag für ein Doppelmasterprogramm, wenn die SFs auch im Ausland belegt werden sollen:

1. Semester (Stuttgart)		2. Semester (Stuttgart)		3. Semester (Spanien)		4. Semester (Spanien)	
KF (SF 1)	6	Weitere WPF oder Industrieprak	15	EF (SF 1)	6	MA	30/18*
KF (SF 2)	6	FA	15	EF (SF 2)	6	(WPF 4 /Projekt/Prak	12**)
Prak (SF 1)	3			EF (SF 1)	3		
Prak (SF 2)	3			EF (SF 2)	3		
WPF 1	6			SQ 1	3		
WPF 2	6			SQ 2	3		
Summe LP	30	Summe LP	30	Summe LP	30	Summe LP	30

In Deutschland zu erbringen (60 LP):

SP 1: KF + Prak = 12 LP

SP 2: KF + Prak = 12 LP

Vertiefungsfächer: WPF 1 + WPF 2 = 12 LP

Weitere Vertiefungsfächer oder Industriepraktikum: 15 LP

Forschungsarbeit: 15 LP

Im Ausland zu erbringen (60 LP):

SP 1: EF 1 + EF 2 = 18 LP

SP 2: EF 1 + EF 2 = 18 LP

Vertiefungsfächer: WPF 2 + WPF 3 = 9 LP

SQs: SQ 1 + SQ 2 = 6 LP

Masterarbeit: 30 / 18* LP (*In Cartagena nur 18 LP für die MA, so dass zusätzliche Module mit 12** LP benötigt werden)

KF = Kernfach, EF = Ergänzungsfach, Prak = Praktikum, WPF = Wahlpflichtfach, FA = Forschungsarbeit, SQ = Schlüsselqualifikation, MA = Masterarbeit



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Double Master Degrees

STUTTGART UNIVERSITY & ETSII-UPCT

Francisco Vera García
Industrial Engineering Faculty
Vice-Dean of International Relations
October 2015



Escuela Técnica Superior de Ingeniería Industrial
UNIVERSIDAD POLITÉCNICA DE CARTAGENA
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1 Introduction





Spain: Universities

Regions: 17

Universities: 74

Public Universities: 47

4 Technical Universities

(Madrid, Catalunya, Valencia and Cartagena)

R&D: 1.4% GDP

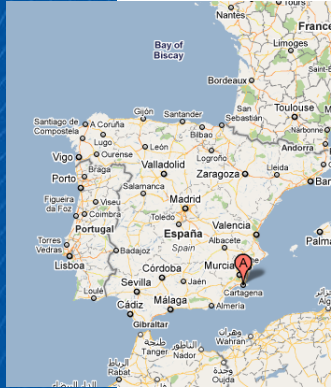




Located at Cartagena, Southeast Spain

Introduction

MURCIA Region



Spain



Cartagena





Public Universities

Murcia Region

Introduction



● University of Murcia

● Technical University of Cartagena, (UPCT)

Distance < 50 km

Both Universities are joining by





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2 Universidad Politécnica de Cartagena Technical University of Cartagena





- **First engineering studies: 1883 (Mining Engineering)**
- **Established as an independent University in 1998**
- **Students: 7000 aprox. (ETSII 2500 aprox.)**
- **Teaching staff: > 500**
- **Administrative and auxiliary staff >300**
- **Schools: 7 + 2 affiliated**
- **Departments: 25**
- **17 degree level studies.**
- **12 master level studies.**
- **10 doctoral programs.**
- **77 R+D groups**
- **Position in Spanish R+D rankings:**
 - The 3rd best in obtaining R+D research project funds
 - Global position in research output: 14/55





Academic centres

Universidad Politécnica de Cartagena

- School of Agricultural Engineering
- School of Architecture and Building Eng.
- School of Civil and Mining Engineering
- **School of Industrial Engineering**
- School of Naval Engineering
- School of Telecommunications Eng.
- Faculty of Business
- Defense University Centre (affiliated centre)



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etsii

Universidad Politécnica de Cartagena (Spain)

títulos de grado
adaptados al EEES

Bachelors



Grado en Ingeniería Eléctrica.

Electric Eng. Degree

240 ECTS



Grado en Ingeniería Electrónica Industrial y Automática.

Industrial Electronics & Automatics Eng. Degree

240 ECTS



Grado en Ingeniería Mecánica.

Mechanics Eng. Degree

240 ECTS



Grado en Ingeniería Química Industrial.

Industrial Chemical Eng. Degree

240 ECTS



Grado en Ingeniería en Tecnologías Industriales.

Industrial Technologies Eng. Degree

240 ECTS



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Máster en Ingeniería Industrial

Master's Degree in Industrial Engineering

Máster en Energías Renovables

Master's Degree in Renewable Energies

Máster en Ingeniería Ambiental y de
Procesos Químicos y Biotecnológicos

Máster Interuniversitario en Electroquímica,
Ciencia y Tecnología





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Master's Degree in Industrial Engineering





This Master Degree provides the professional capabilities corresponding to Industrial Engineering and it is supporting by the “*Colegio Oficial de Ingenieros Industriales*” (Spanish Professional Association of Industrial Engineering).

➤ OBJECTIVES

- The students can apply their knowledge and understanding in a manner that indicates a professional approach to their work or vocation,
- have competences typically demonstrated through devising and sustaining arguments
- and solving problems within **mechanical, electrical, chemical and electronic** fields.
- To train newly graduates who want to introduce themselves with dedication to research by doing a **Doctoral Thesis** in Industrial Technologies



WORDS THAT DEFINE THE CONTENT

- Electronic & Automatics,
- Electrical Engineering,
- Bioengineering,
- Industrial Chemistry & Environmental Sciences,
- Energy,
- Construction,
- Machines,
- Industrial Organization and
- Manufacturing



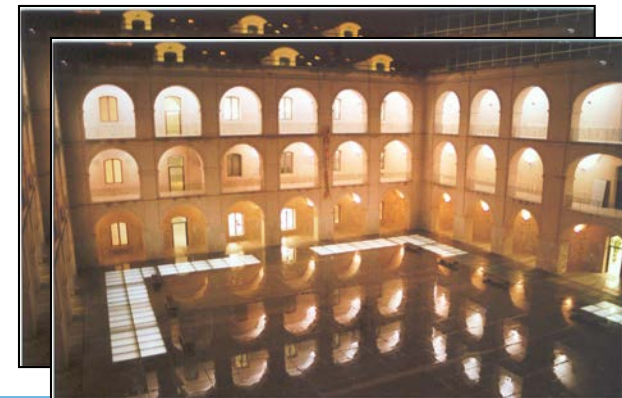


ACADEMIC STRUCTURE of MASTER'S DEGREE IN INDUSTRIAL ENGINEERING

- Four semester with 900 hours/semester and 30 ECTS/semester.
- **Three Compulsory Specific Modules (78 ECTS)**
- Optional Module (30 ECTS)
- Final Master Thesis 12 ECTS (360 hours). **Compulsory.**
- Practices in Enterprise 15 ECTS (until 450 hours). Optional.
- Research training 15 ECTS (until 450 hours). Optional. Training in Research Centres.

➤ MODULES

- **INDUSTRIAL TECHNOLOGY MODULE (39 ECTS)**
- **MANAGEMENT MODULE (15 ECTS)**
- **UTILITIES MODULE: INDUSTRIAL PLANTS AND AUXILIARY CONSTRUCTIONS (24 ECTS)**
- **OPTIONAL MODULE (30 ECTS)**
 - **I: Projects and Industrial Installations**
 - **II: Structures and Industrial Installations**
 - **III: Electrical Powered Vehicles (EPV)**
 - **IV: Electrical Power Systems (EPS)**
 - **V: Mechanical and Manufacturing**
 - **VI: Chemical Industry**



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Master's Degree in Renewable Energies





M. Sc. Renewable Energies

➤ OBJECTIVES

- To train newly graduates who wish to join in the renewable energy sector.
- To qualify professionals of this sector who are willing to increase their expertise and to find out about the latest advances in different technologies of renewable energy.
- To train newly graduates who want to introduce themselves with dedication to research in this area by doing a Doctoral Thesis.



➤ MODULES

- Wind energy modules
- Photovoltaic (PV) modules
- Thermal Energy modules
- Electronics Technologies modules

WORDS THAT DEFINE THE CONTENT

- Renewable Energy.
- Solar, Thermal and Photovoltaic.
- Eolic (Wind).
- Biomass and Bio-fuels.
- Hydroelectric and Sea motion energy.
- Technology of Hydrogen.





ACADEMIC STRUCTURE of RENEWABLE ENERGY MASTER

- Two semesters with 900 hours/semester and 30 ECTS/semester.
- Final Master Thesis 18 ECTS.
- Practices in Enterprises or in Research Centres (optional) 12 ECTS

➤ MODULE I.- INTRODUCTION

- Energy and Sustainable development (**compulsory**), 3 ECTS Annual subject

➤ MODULE II.- BASICS

- Engineering of Wind Energy System (opt 1ST Semester), 6 ECTS
- Hydraulic and Tidal Energy (opt 1ST Semester), 6 ECTS
- Biomass and biofuels energy (opt 1ST Semester), 6 ECTS
- Electric Energy Generation and Storage Systems (opt 1ST Semester), 6 ECTS
- Power Electronics for Renewable Energies (opt 1ST Semester), 6 ECTS
- Thermal Solar Energy (opt 2nd Semester), 6 ECTS
- Engineering of Photovoltaic Systems (opt 2nd Semester), 6 ECTS
- Hydrogen and Fuel Cells (opt 2nd Semester), 6 ECTS
- Electronic Control Systems Applied to Renewable Energies (opt 2nd Semester), 6 ECTS

All the students must select a minimum of **five subjects** of Module II.

➤ MODULE II.- SPECIALIZATION

- Engineering Projects for Renewable Energy (opt 1ST Semester), 3 ECTS
- Planning and Decision-Making on Renewable Energy (opt 1ST Semester), 3 ECTS
- Simulation Tools for Wind Generators (opt 2nd Semester), 3 ECTS
- Advance Design of Refrigeration and Air Conditioning Systems: Solar Appliances (opt 2nd), 3 ECTS
- Thermal Systems: Heat and Electricity Generation from Biomass and Biofuels (opt 2nd), 3 ECTS
- Advanced Control System for Power Inverter in Renewable Energy systems (opt 2nd), 3 ECTS
- Distributed Network Power Generation (opt 2nd Semester), 3 ECTS
- New subjects waiting to be approved by ANECA

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Ph. D. Programs & Research Groups





Ph. D. Programs



- ❑ **Environmental Eng. and Chemical and Biotechnological Processes**
- ❑ **Renewable Energy** (from M.Sc. Program)
- ❑ Information and Communication Technologies
- ❑ Water and Soil Engineering
- ❑ Business Administration
- ❑ **Electro-Chemistry. Science and Technology**
- ❑ **Industrial Technologies** (from M.Sc. Program)
- ❑ Environmental and Sustainable Mining
- ❑ Architecture and Building Technology
- ❑ Advanced Techniques in Agricultural and Food R+D

Research Groups.

Research Groups

- **Energy, Environment and Water Resources**
- **Engineering, Design and Industrial Production**
- **Chemistry, Materials, Physics and Mathematics**
- **Microelectronics Design and Components**
- **Electrical Engineering and Renewable Energies**
- **Fluid Mechanics and Thermal Engineering**
- **Chemical Engineering and Process**
- **Thermal and Energy Modeling**
- **Electronic Engineering and System Division**
- **Water Management and Optimization**
- **Foods Sciences and Agronomy**
- **Business Sciences**
- **Information Technology and Communications**
- **Others**



http://gruposinvestigacion.upct.es/grupos_ID/grupos_ID.php



General Description. Field of Interests

Microelectronics Design and Components

Organic PV modules and cells

Characterization of Dielectric Materials focused on Microelectronics

Electrical Engineering and Renewable Energies

Wind turbine modeling

PV plant modeling

Energy Efficiency





General Description. Field of Interests (II)

Fluid Mechanics and Thermal Engineering

Heat Transmission and Efficiency

Biomass, Biofuels & Hydrogen

Heat Exchangers

Thermal and Energy Modeling

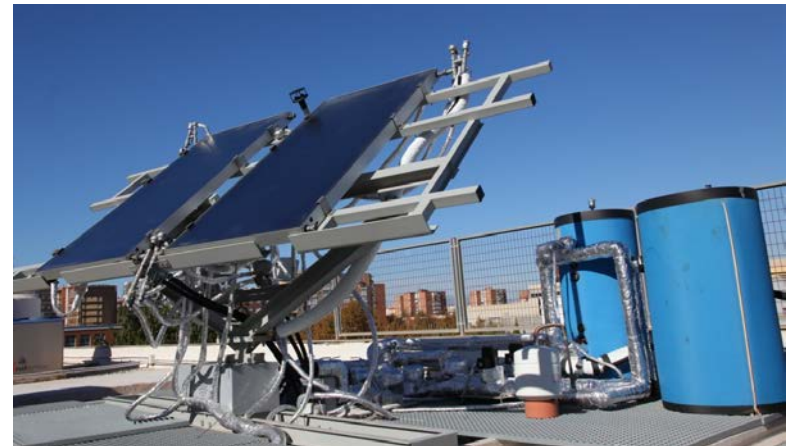
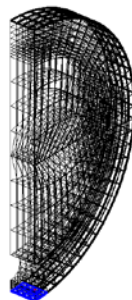
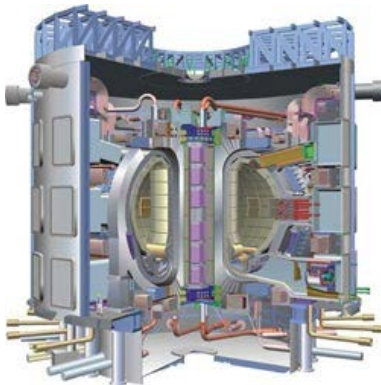
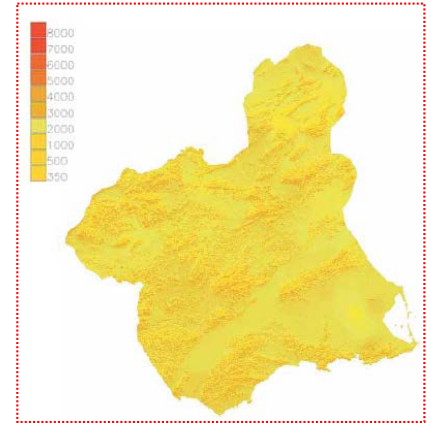
Refrigeration & Air Conditions system

Energy Efficiency

Computational dynamics applied to fluid problems

Thermal Efficiency of engines

Solar Energy





General Description. Field of Interests (III)

Chemical Engineering and Process

Fuel cells and Ionic Liquids

Plastic raw materials

Electronic Engineering and System Division

Energy Efficiency

Wireless Sensor Networks

Water Management and Optimization

Biofuels

Water efficiency and management

Grounds management



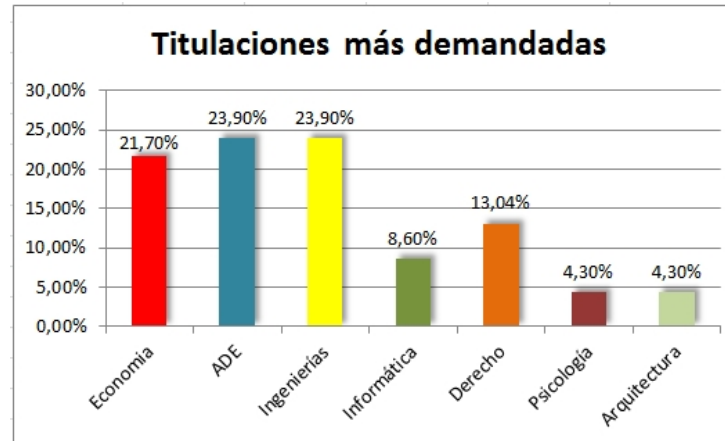


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6 ETSII – UPCT & Relations with Enterprises



- Engineering is a of the first demanded Degree in Spain



http://www.fuem.um.es/foroempleo_resumen/2014/cifras.html

- **COIE-UPCT (Center for Job Orientation and Information)**
 - ✓ 1045 External Practical for Students (data from 2013-14)
 - 780 for ETSII's Degrees (74.6% of total)
 - 90.1% increases in comparison with 2012-13
- **Specific Training Programs for Students**
 - ✓ Banco Santander Grants for PYMES (*Little & Medium Enterprise*)
 - ✓ International Training Programs in 2013-14 (IAESTE (12), ERASMUS+Training (5), Vulcanus (1), Leonardo Da Vinci (no data),...)

- CATEDRAS' NETWORK <http://red-catedras.upct.es/index.php/catedras>



Telefónica, Odilo, MTorres, Indra, G's Spain, Banco Santander, Hidrogea, Sabic, Fundación REPSOL, Fuentes Fertilizers and other are already developing their projects in the UPCT.

The Network of Chairs sponsored by Technology Companies of the Universidad Politécnica de Cartagena (UPCT) is a space for the collaboration between this university and technology companies whose purpose is to conduct training, research and development or the transfer of knowledge in areas of common interest.

«This network is a pioneering concept in Spain»



7

Living in Cartagena (Spain)





The student life: University services

Living in Cartagena

Documentation and Library Service

Language Service (7 languages taught)

International Relations Service

Free Wifi for all the University

Student club

Residence Halls

“Godfather” program





The student life: Sport activities

Living in Cartagena



Aikido
Badminton
Dancing
Belly dancing
Flamenco
Climbing
Fitness

Bodybuilding
Skating
Pilates
Taichi-Chuan
Tennis
Ping-pong
Judo

Diving
Golf
Kayak
Sailing
Wind surfing
Swimming
Rugby





The student life: surroundings





The student life: Living Costs in Cartagena

Living in Cartagena (Spain)

Current cost per month

400 – 600 €/month

Sharing a Flat

125 – 200 €/month

Student Lunch Menu – University Campus

4.70 €

Full Breakfast

1.50 €

Swimming Pool & Sport Centre

1 €/day Indoor football 10 €/hour





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Technical University of Cartagena(Spain)

Thank you for your attention!!!

Francisco Vera García
Industrial Engineering Faculty
Vice-Dean of International Relations
October 2015



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