



# IMES

MASTER IN BIOENERGY AND ENVIRONMENT



UNIVERSITÀ  
DEGLI STUDI  
FIRENZE





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FIRENZE

**DIEF**

Dipartimento di  
Ingegneria Industriale





# The Master is Managed by the CREAR – Research Centre on Renewable Energies of the University of Florence

biofuels  
wind  
micrositing  
development  
CSP<sup>lab</sup>  
chain  
PV  
hydro  
bioenergy  
research  
solar  
geothterm  
biochemicals  
innovation  
anemometries  
development  
Education  
Training  
biomass  
renewables





**C.R.E.A.R.** CENTRO RICERCA  
ENERGIE ALTERNATIVE E RINNOVABILI



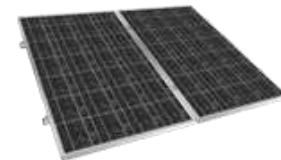
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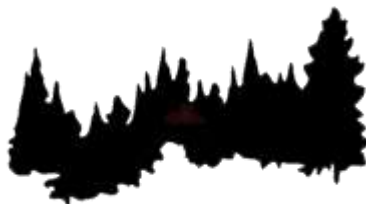
**DIEF**

Dipartimento di  
Ingegneria Industriale



**GESAAF**

Dipartimento di  
Gestione dei Sistemi Agrari,  
Alimentari e Forestali



**DISPAA**

Dipartimento di Scienze  
delle Produzioni Agroalimentari  
e dell'Ambiente



Dipartimento di  
Chimica "Ugo Schiff"



**DST**

Dipartimento di  
Scienze della Terra



CREAR (Centro di Ricerca sulle Energie  
Alternative e Rinnovabili)  
Established January 1<sup>st</sup> 2005

The Centre merges UNIFI competencies in the  
following areas:  
Energy Engineering, Electronics, Chemistry,  
Agro-forestry, Geology, Economics

# Biomass to energy: a strongly interdisciplinary chain



chemistry



law

economy



technology



agriculture

forestry



# The IMES Master aims to train the next generation of bioenergy project managers and technicians



## Bioenergy Project Manager & Developer

Main goal of IMES Master is to give the professional skills required for private or public entities undertaking in bioenergy field, from the production process to the management of energy projects. The knowledge of legislation in environmental and bioenergy fields plays a key role in the administration of National or European projects. The skills obtained with the Master are suitable for Industries, Companies and Public Administration, like Departments of Environment Politics, National or European Energy Agencies.



***Where do we come from?***



***Master set up through a  
Europe – USA Education & Training  
Cooperation started in year 2002***



**Established in 2002 thanks to the Support of the Joint Programme DG Education and Culture (EU) and FIPSE (USA)**

**Aim:**

- **to set up a Master Programme on Environmental and Bioenergy issues**
- **foster the cooperation on Education and Training in between EU and USA and within the EU Partners**



Education and Culture DG

### Three EU Universities involved:

- **Università di Firenze**
- **Aston University**
- **Universidade Nova de Lisboa**





## Cooperation and student mobility with USA Universities (FIPSE)

- Baylor University
- Arizona State University
- Embry Riddle Aeronautical University
  - this cooperation later transferred to the University of Maryland

# The Organising Committee



**Prof. Maurizio De Lucia**  
Director



**Prof. Emiliano Fratini, PhD**



**Dr. Enrico Palchetti, PhD**



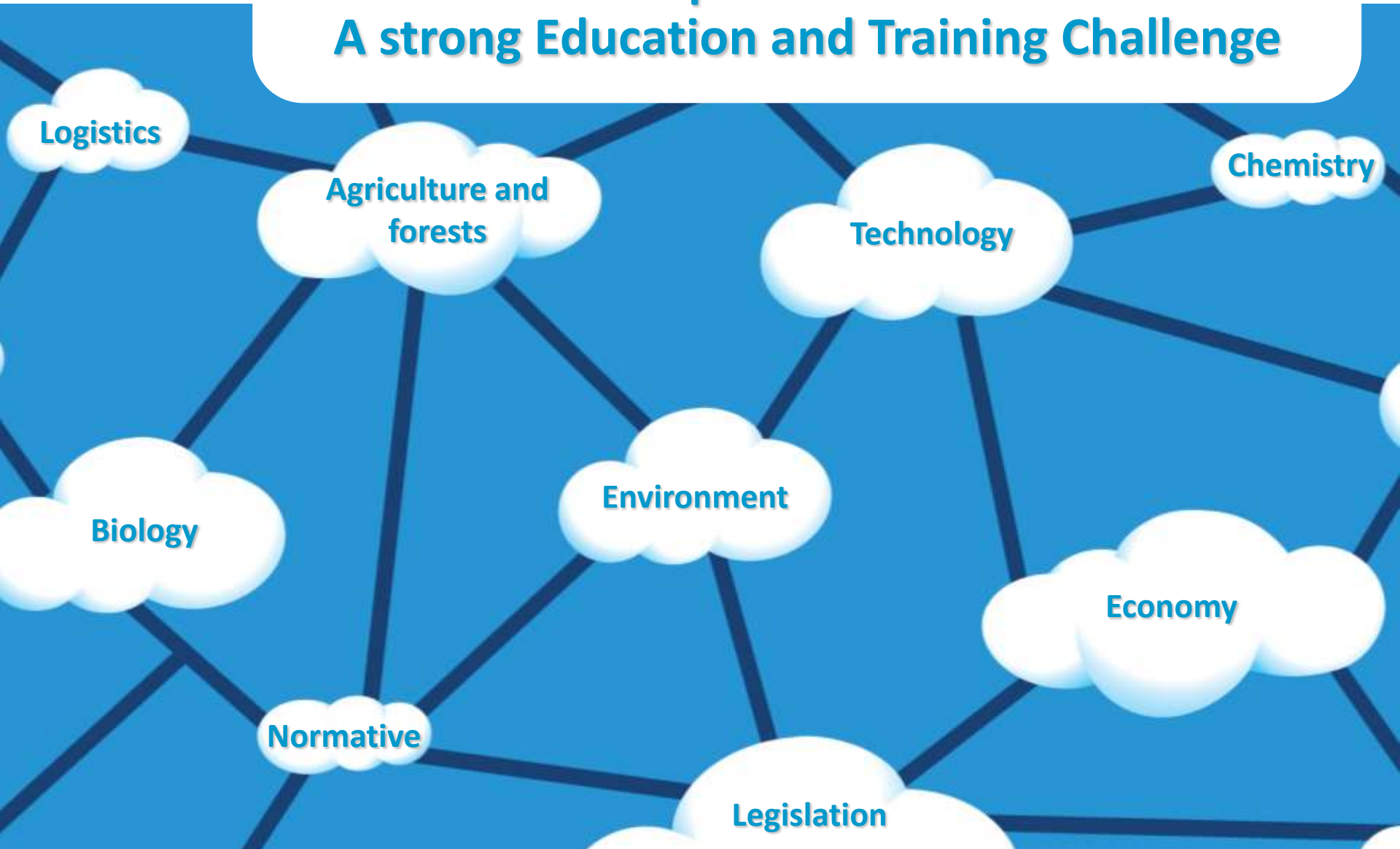
**Prof. David Chiaramonti, PhD**



**Eng. Leonardo Nibbi, M.Sc.**

- The Director and the Organising Committee are due to the management of the IMES Master Course in all his aspects.
- A staff of renowned scientific experts in all the fields of interest of the biomass to energy chain supervises the IMES Master activities.

**Biomass to energy chain is a Highly  
Interdisciplinary Topic, involving several  
independent issues  
A strong Education and Training Challenge**



# IMES: the Course Programme

The Programme consists of Five Main Topics:

- **Biomass Production**
  - Forest Biomass Production, Agricultural Energy crops and residues, Cultivation and harvesting techniques.
- **Power Generation And System Analysis**
  - Introduction to Energy Conversion Principles, Power plant technologies.
- **Renewable Energy & Bioenergy Generation**
  - Renewable Energy Technologies, Biomass Energy Conversion Technologies, Chemical and Physical Characteristic of Biofuels.
- **Environment**
  - General ecology, Environment and Air Pollution, Environmental Impact Assessment of Bioenergy System.
- **Business Management and Economy**
  - Energy Market & EMS, Principles of economic and financial analysis of projects, Environmental legislation.



**Quality of Teaching is our first concern.**

**A staff of University Professors and Researchers working together with Professionals from Industry and Research to give the Best quality in Education and Training.**

**People whose everyday work is to face the multiple challenges of Bioenergy, RES and Environmental issues.**



## Prof. Maurizio de Lucia – Director

- University Degree in Mechanical Engineering, magna cum laude, he received his PhD in Energy in 1989; his Present position is Full Professor of Energy Systems and Environment at the University of Florence.
- He is Expert & Reviewer for EU and ministries, chair and member of various National & International committees.
- He is Author of several publications in the field of Machinery and Energy Systems.
- His main areas of interest are energy systems, Renewable Energy, solar concentrators and energy efficiency.
- He coordinates groups with predominantly activities in Modelling, design, development and testing of Solar based Systems.



## Prof. Emeritus Francesco Martelli – Former Director

- Full Professor since 1980 at the Department of Industrial Engineering, University of Florence, Founder of the CREAR Centre.
- Retired, he is presently Professor Emeritus.
- He is Chairman of the European Turbomachinery Committee, organiser and chairman of several International and EU Conference.
- He has more than 30 years experience in the field of Energy, CFD modelling and Environmental Impact Modelling of Energy Production Plants.
- Author of more than 130 publications on International Journals and Conferences, he was the first **Director of the IMES Master since the beginning until 2017.**



## Prof. David Chiaramonti

- **David Chiaramonti** is Contract Professor of “Bioenergy” at the University of Florence and President of the RE-CORD research centre.
- Awarded Linneborn Prize in 2017, his main scientific interest is on the production and the use of biofuels, either liquid, gaseous or solid. His research works cover thermochemical biomass conversion processes as well as liquid biofuel production and use.
- He has published more than 120 scientific papers in these areas, chapters in books and studies, as well as articles in specialised magazines. He is also member of editorial boards of several scientific journals.
- **He has been one of the creators of the IMES Master**, member of the Organising Committee.



## Dr. Enrico Palchetti, PhD

- **Dr. Enrico Palchetti**, full researcher at the Department of Plant, Soil and Environmental Science of the University of Florence, holds a PhD in Agro-biotechnologies for tropical production.
- He has 12 years of experience in R&D mainly in the area of Renewable Energy in agriculture and in the tropical agricultural productions.
- He collaborates with private companies involved in the biofuel production in tropical and subtropical countries with a special focus on *Jatropha curcas*.
- He is author of more than 60 Scientific Papers.
- He is Member of the IMES Master Organising Committee



## Prof. Emiliano Fratini, PhD

- Dr. **Emiliano Fratini**, graduated in Chemistry, holds a PhD in Chemical Sciences at the University of Florence.
- He was Research Scholar at the Nuclear Engineering Department, MIT (USA) and he performed Research Activities in collaboration with several research Institutes, such as Laboratoire Léon Brillouin in Saclay, NIST Center for Neutron Research and Hahn-Meitner Institute in Berlin.
- Presently Assistant professor in Physical Chemistry, he is author of about 100 publications on peer review journals, and owns 3 national and international patents.
- He is Member of the IMES Master Organising Committee



## Prof. Giovanni Liberatore

- Prof. **Giovanni Liberatore**, graduated in Economics, holds a PhD In Economics.
- He is Full Professor of Economics since 1992 and Adjunct Professor of Principles of Financial Accounting at the New York University (Abroad Program) since 1998. He also collaborates with the Luiss Business School since 1995.
- He is author of Papers and Monographies on Accounting, Control and Economic Assessment of Enterprises.
- He operates also as consultant for Societies and Public Bodies for Accounting and Project Finance.



## Eng. Leonardo Nibbi M.Sc.

- Eng. **Leonardo Nibbi**, presently Fellow Researcher at the Department of Industrial Engineering, University of Florence.
- His experience in the renewable energy field since 1999 is mainly devoted to the logistic of the biomass to energy chain, with particular attention to the use of GIS tools for correct planning, sustainability of solid, gaseous and liquid biofuels, market and legislation for solid biofuel, microsinning and assessment of wind farms, Education and Training in the Renewable Energy Fields, with particular attention to Biomass to Energy and Wind Energy.
- **He tutors students and manages the IMES Master since 2005**, member of the organising Committee.



## Dr.Silvia Maltagliati, PhD

- Dr.**Silvia Maltagliati**, formerly senior technician at the **Environmental Protection Agency of Tuscany (ARPAT)**, is presently Seconded National Expert at the Unit F2, Bioproducts and Processing of the **DG RTD (Science, Research and Innovation) in Brussels**
- She has her focus expertise in the field of Environmental Modelling.
- After her Master degree in Physics, she achieved a PhD in “Energy and innovative industrial technologies”.
- Previously Contract Professor of Biofluid-Dynamics and of Biomechanics at the University of Florence, **she has been one of the creators of the IMES Master.**



## Dr. Giacomo Santini, PhD

- Dr. **Giacomo Santini**, graduated in Biological Sciences, holds a PhD in Animal Biology (Ethology).
- He is presently assistant professor for “Models & Methods in Conservation Biology” and for “Ethology and Animal Ecology”.
- His main scientific interests are about the behaviour and ecology of invertebrates, modelling in ecology and Community and Population Ecology.
- He is author of over 45 scientific papers on international ISI-indexed journals.



## Dr. Silvia Bargigli, PhD

- Dr. **Silvia Bargigli**, Graduated in Environmental Chemistry, she holds a PhD in Life Cycle Assessment and is presently **EHS Manager at Siemens AG** by the Energy Management Division.
- Her current activity focusses on Product-related Environmental Protection topics, among which: Life Cycle Assessment, Environmental Product Declarations, and Chemicals legislations (REACH, RohS,...)
- She previously worked as EHS Specialist and Waste Manager for Boehringer Ingelheim GmbH, as Environmental Technician in the Environmental Department of the Province of Florence, as Fellow Researcher for ENEA, as well as Contract Professor on LCA at the University of Siena.



## Eng. Marco Pacinotti M.Sc.

- Eng. **Marco Pacinotti**, MSc of Industrial engineering at the University of Florence and at University of Georgia (USA), is presently working in **ENI as project developer** responsible for acquisition and permitting of renewable projects.
- He previously worked for the CREAR, performing research in wind energy, concentrated solar power and cooling, where he developed two prototypes from design to commissioning.
- He also worked five years in ENEL as Project Developer and Project Engineer; during this period he developed around 600 MW of wind projects in Romania, plus several due diligences for wind projects in several countries and in Saudi Aramco as project developer.



## Sabrina Bruschi, M.Sc.

- **Sabrina Bruschi** M.Sc. in Sociology, has a 15 years experience in the Certification of Management Systems for Enterprises.
- She started working as a consultant for Enterprises on Management Systems for Quality, Environment, Safety, Ethics.
- Since 2008 she works for **TÜV Sud**, with the role of **Sales Regional Manager** for the Centre-Sud Area of Italy.



## Eng. Caterina Susini, M.Sc.

- Eng. **Caterina Susini**, is an Environmental Engineer whose main expertise is in the field of Waste Management and Waste Water Treatment, with a special focus on Anaerobic Digestion of the organic fraction of Municipal Solid Wastes.
- Since 2005, she is the **responsible of the MSW treatment plant of SEA Risorse**, the Municipal Waste management, Disposal and Collection enterprise of the Viareggio Area (Tuscany, Italy).
- She teaches “Anaerobic Digestion” for IMES.



## Dr. Antonio Borzì, PhD

- Dr. **Antonio Borzì** has a law degree from the University of Florence, with a thesis on constitutional law, holds a Ph. D. in constitutional law.
- He was a research associate in constitutional law and is an attorney at law. He was a member of the research group for the Observatory of Environmental Protection Legislation (O.Le.A.) of Ceradi – Luiss Guido Carli, coordinated by Professor Stefano Grassi. He was an official of the Regional Environmental Protection Agency for the Region of Calabria, and worked at the Ministry of the Environment.
- Presently, he is an **official at the AEEG, the Italian Regulatory Authority for Electricity Gas and Water.**



## Eng. Lucia Recchia, PhD

- M.Sc. in Environmental Engineering in 2002 and Ph.D. in Agricultural and Forestry Engineering in 2006 at the University of Florence, Italy.
- She is currently research fellow at the University of Florence. **She is accredited ISCC auditor.**
- Her research activity focuses on the evaluation of energy consumption of industrial and agro-industrial processes, the assessment of the impacts of phytosanitary products, the noise and vibration modelling for agricultural operations, the development and implementation of multicriteria analysis, LCA methodology, Carbon Footprint approach and the application of GIS tools.



## Dr. Paolo Sospiro, PhD

- Dr. **Paolo Sospiro**, PhD in Development Economic, graduated in Political Economy with a thesis on Poverty and Famine in Ethiopia.
- Erasmus Visiting Student at the ISCTE in Lisbon (Portugal), where he followed the African Mestrado, he specialised on International Aid at University of Ancona and then worked in different countries as Economist on International Aid projects.
- He is Contract Professor on Development Economics at **University of Macerata** since 2006.
- His main research interests are: Development, Education, Poverty and Inequality, Energy, Transport, Waste Management and Water Supply and consumers behavior.



## Eng. Alessandro Cappelletti, PhD

- Eng. **Alessandro Cappelletti**, PhD, is presently Fellow Researcher at the Department of Industrial Engineering, University of Florence.
- His main field of interest is the use of alternative fuels in gas turbine.
- He worked in many Italian and International projects on the design, numerical simulation and testing of new combustion system fueled with Hydrogen, Vegetal-oil and Pyrolysis oil.
- He collaborated with the main Italian energy companies such as ENEL, GE –Nuovo Pignone and Turbec (now Ansaldo Energia).
- He's also working on the development of innovative PV concentrated solar system, for the Combined Heat and Power production.



## Maurizio Cocchi, M.Sc.

- M.Sc. Agronomist and graduated at the IMES Master in Bioenergy and Environment, since 2007 Maurizio Cocchi is working in the field of bioenergy as consultant and project manager in national and international projects, carrying out feasibility studies, biomass resources assessments, market and policy assessments, training, capacity building and dissemination activities.
- Since 2012 he is also **editor of BE-Sustainable**, a quarterly magazine of bioenergy and the bioeconomy published by ETA-Florence.
- He has been Member of the IEA Bioenergy Task 40 “Sustainable International Bioenergy Trade: Securing Supply and Demand”



## Forest Biomass Production

- Fundamentals of Forestry
- Short Rotation Forestry (SRF) and forest residues

## Agricultural Energy crops and residues

- Energy Crops, Agricultural Residues and their Valorisation
- Crops for Biofuels Production

## Cultivation and harvesting techniques

- Evaluation of suitable and available areas
- Estimating the environmentally compatible bioenergy potential from agriculture
- Sustainability Criteria for Biofuels
- Cultivation and harvesting techniques



Dr. Barbara Mariotti, PhD  
*University of Florence*



Dr. Enrico Palchetti, PhD  
*University of Florence*



Eng. Lucia Recchia, PhD  
*University of Florence*

## Introduction to Energy Conversion Principles

- Basics and Thermodynamic Principles
- Fundamentals of Energy Engineering
- Thermodynamic Cycles

## Power plant technologies

- Introduction to Turbomachinery
- Turbines, Steam Plants, Internal and External Combustion Engines
- Organic Rankine Cycles
- CHP and Cogeneration
- System Analysis
- Small and Medium Size Heating Plants, District Heating
- Interfacing Production and Conversion



Prof. Francesco Martelli  
*University of Florence*



Eng. Leonardo Nibbi, M.Sc.  
*University of Florence*



Eng. Alessandro Cappelletti,  
PhD  
*University of Florence*

## Renewable Energy Technologies

- Wind, Solar H&C, Photovoltaics, CSP, Mini Hydro, Geothermal, Carbon Storage

## Biomass Energy Conversion Technologies

- Biomass Pre-treatment, Drying
- Thermochemical Conversion, Biomass Combustion, Gasification, Pyrolysis, Torrefaction
- Anaerobic Digestion, Microalgae

## Chemical and Physical Characteristic of Biofuels

- Chemistry of Biofuels
- 1<sup>st</sup> and 2<sup>nd</sup> Generation Biofuels
- Green Chemistry and by-products



Prof. David Chiaramonti  
*University of Florence*



Dr. Emiliano Fratini, PhD  
*University of Florence*



Eng. Caterina Susini, M.Sc.  
*SEA Risorse S.p.A.*



Eng. Marco Pacinotti, M.Sc.  
*ENI*

## General ecology

- Ecology of Organisms, Populations, Communities and Ecosystems
- Environmental Monitoring, Applied Ecology, Natural Resources Preservation

## Environment and Air Pollution

- Air quality and Air pollutants, Boundary Layer Physics
- Air Pollution Emissions: Monitoring and Dispersion Modelling

## Environmental Impact Assessment of Bioenergy System

- Fundamentals of Life Cycle Assessment
- Waste Management, GHS, CLP, REACH, MSDS



Dr. Giacomo Santini, PhD  
*University of Florence*



Dr. Silvia Maltagliati, PhD  
*European Commission – DG RTD*



Dr. Silvia Bargigli, PhD  
*Siemens AG*

## Energy Market & EMS

- System Management, EMAS, ISO 140001, ISO 50001
- Biomass Market, Energy Market

## Principles of economic and financial analysis of projects

- Fundamentals of Economy
- Economic aspects of energy
- How to submit a Proposal

## Environmental legislation

- Fundamentals of law
- National and International Environmental Legislation
- Waste Management, Land remediation



Prof. Giovanni Liberatore  
*University of Florence*



Sabrina Bruschi, M.Sc.  
*TÜV Süd - Italia*



Dr. Antonio Borzì, PhD  
*Authority of Electricity and Gas*



Dr. Paolo Sospiro, PhD  
*University of Macerata*



Maurizio Cocchi, M.Sc.  
*ETA Renewable Energies*



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**IMES**

Extra Curricular  
Seminars

In order to widen the Master contents, several renowned Researchers and Experts are regularly invited to hold Seminars on specific topics.

These Seminars are held both as front lessons or as video conference.

As a matter of example, in the latest editions, lecturers were invited from Deutsches Biomasseforschungszentrum (DBFZ), Arizona State University, Viessmann Academy, Italian National Research Centre IVALLSA and Efeso Consulting.



Dr. - Ing. Franziska Müller-Langer  
*DBFZ Deutsches  
Biomasseforschungszentrum*



Dr. - Ing. Marco Klemm  
*DBFZ Deutsches  
Biomasseforschungszentrum*



Dr. Raffaele Spinelli, PhD  
*CNR Ivalsa*



Prof. Larry Olson,  
*Arizona State University*



Mauro Braga  
*Viessmann Academy*



Filippo Garini, M.Sc.  
*Efeso Consulting*

**TRAINING FOR THE  
«REAL WORLD»:  
THREE MONTHS OF  
MANDATORY STAGE  
IN PUBLIC OR  
PRIVATE  
ENTITIES**

**INTERNSHIP**

**eta**florence  **renewable**energies  
Your partner in renewable energies

 **TERA**  
energy strategies

**Schmack** 

**VIESSMANN** Group

 **ROPATEC**  
Vertical energy

  
**CAVIRO**  
Wine Leader in Italy

 **centuriagenzia**  
INNOVAZIONE ROMAGNA

**CRPA** 

 **FEDI Implanti**  
Green Energy

 **AGRICONCONSULTING**

 **ifeu**  
Institut für Energie-  
und Umweltforschung  
Heidelberg GmbH

**D.R.E.A.M.**  
ITALIA



**LUND UNIVERSITY**

**ARPAT**  
Agenzia regionale  
per la protezione ambientale  
della Toscana



**SOME  
PREVIOUS  
INTERNSHIP HOSTS**

# INCOMING EDITION (11<sup>th</sup>)

## Academic Year 2018/19

- Front lessons in English if students from abroad are present
- Registration fee: 4000€



# IMES Master CONTACTS



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*Eng. Leonardo Nibbi, M.Sc.*  
[leonardo.nibbi@unifi.it](mailto:leonardo.nibbi@unifi.it)

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Dipartimento di Ingegneria Industriale  
Università degli Studi di Firenze

<http://crear.unifi.it/imes>