PUBLIC REPORT DIDACTIC OFFER ON WIND ENERGY IN WESET PARTNER INSTITUTIONS

UNIROMA1
Sapienza University of Rome

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INTRODUCTION

WESET - Wind Engineering Skills in Egypt and Tunisia project (www.weset-project.eu) inscribes in the modernization, development and internationalization strategy of the HEIs involved, that share the common objectives of aligning Master degrees with the needs of Industry and the Society at large, and of creating links with foreign institutions.

The main goal is to transfer knowledge and technology on Wind Energy among experts in European, Egyptian and Tunisian institutions, strengthening the links between academic institutions and industry to produce engineers with the skills needed to support industrial growth in the wind energy sector.

The project aims also at promoting Bologna Process standards in the in South Mediterranean region.

The proposed project will contribute to the Engineering objective of the Capacity Building action in Tunisia and Egypt. Thus, it directly addresses the thematic national and geographic priorities set by the programme for South-Mediterranean countries (and Egypt and Tunisia in particular).

WESET project's specific objectives are

- fulfilling the lack of Engineers with multidisciplinary knowledge of Wind Technologies
- providing specific training materials and laboratories that support the training in Wind Engineering and the links HEIs-industry
- promoting the use of Wind as a reliable, cost-effective and pollution-free source of energy in SM countries, supporting their economic development and independence
- supporting the activities of WE companies in those countries and the creation of new companies by entrepreneurs, thanks to the technically qualified manpower of international standards.

WESET will achieve the purposed objectives through the following activities:

- By developing Master modules and laboratories suitable for capacity building in wind energy for on-campus learning in Egypt and Tunisia, linked with industry and official organizations in SM countries through the Wind Engineering Centers to be created as part of WESET;
- By elaborating training materials openly distributed to be used as part of Masters in Engineering

By training trainees from Egypt and Tunisia in Europe on real-life Wind Engineering aspects and by using those training materials for Master courses.

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SCOPING OF THE SURVEYS

The survey on the "Didactic offer on Wind Energy" is one of the task (1.1) of the WP1, which aims at creating the framework into which the WESET project activities are implemented. To introduce relevant courses and to make the didactic offer innovative, an analysis of the actual programs, modules and facilities on wind energy has been carried out.

The survey investigates the internal staff's competences at South Mediterranean High Education Institutes on Wind technologies, the courses delivered, the experimental equipment, the collaboration with local, national and international stakeholders and recent research and cooperation projects on the topic.

METHODOLOGY

Questionnaire on "Academic offer on Wind Engineering in South Mediterranean HEIs" aims at knowing and analyzing didactic and experimental opportunities offered by beneficiary Universities of WESET project in Egypt, Tunisia comparing the results with the European offers. The interviewees have been asked to complete the following sections:

1. SECTION 1 – THE ACADEMIC OFFER investigates the presence of programmes and courses/modules on Wind Engineering, the level, the number of students involved and the number of credits. Questions are related the training methodology, asking the percentage of course provided through lecture, tutorial and practical lessons. To understand the level of specialization, information are requested on Unit and Research Centre devoted to activities on Wind energy, the number of affiliated faculties and the example of the main output.
2. SECTION 2 – THE EXPERIMENTAL EQUIPMENT includes an in-depth list of equipment for wind technology, installed at the University. It is asked to indicate if the equipment is a demonstration station, a prototype unit, a monitoring system, a performance measurement or simulation software, and to provide when possible, a short description.
3. SECTION 3 - COLLABORATIONS WITH LOCAL, NATIONAL AND INTERNATIONAL STAKEHOLDERS aims at understand the level of collaboration of the university with local, National and International stakeholders, in term of outreach activities and research projects.
4. SECTION 4 - RESEARCH AND COOPERATION PROJECTS ON THE TOPIC investigates the ongoing research projects in the area of Wind Energy and Technology, asking to provide information concerning the source of funding, short description of main activities, partners and output in terms of publications, books or reports.

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PERSONAL DETAILS

List of Participants

n.	Current Position	Department/Centre	University/Research Centre	Country
1	Doctor	Cairo	Cairo University	Egypt (Égypte)
2	Head of Electrical and control engineering/ Professor and Dean	Electrical and control Engineering dep./Electrical Department	Arab Academy for Science and Technology	Egypt (Égypte)
3	Full Professor	Electrical Engineering	Laboratory of Sciences and Techniques of Automatic control & computer engineering Lab-STA (Sfax, Tunisia).	Tunisia (Tunisie)
4	Professor -Lab STA manager	Electrical department	Sfax Engineering School	Tunisia (Tunisie)
5	Tunisia	Informatique Industrielle	Lab-STA, ENIS, Universite de Sfax	Tunisia (Tunisie)
6	-	-	-	
7	Directeur	Génie électrique	système mécatroniques et signaux (SMS)	Tunisia (Tunisie)

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8	Assistant Lecturer	Mechanical Power	Ain-Shams	Egypt (Égypte)
9	Maître Assistant	Qualité et Norme	Laboratoire des Sciences et Techniques de l'Automatique et de l'informatique industrielle	Tunisia (Tunisie)
11	Associate Professor	Industrial Computing	National School of Electronics and Telecommunications ENETCOM	Tunisia (Tunisie)
12	Professor	Mechanical Department	The British University in Egypt	Egypt
14	Professor	Systems Engineering	University of Valladolid	Spain (Espagne)
15	Associate Professor	Department of Energy Technology	Aalborg University	Denmark
16	Researcher	Department of mechanical and aerospace engineering	Sapienza	Italy (Italie)
17	Electrical Engineering Student	Electrical Department	National Engineering School of Sfax	Tunisia (Tunisie)
20	Phd student	Physics Department	LAPER	Tunisia (Tunisie)
21	energetic engineering student	Energy Department	Monastir	Tunisia (Tunisie)

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22	material engineering student	material engineering departement	ENIS	Tunisia (Tunisie)
23	Associate Professor	ENICarthage, UR: SMS	U.R. SMS	Tunisia (Tunisie)

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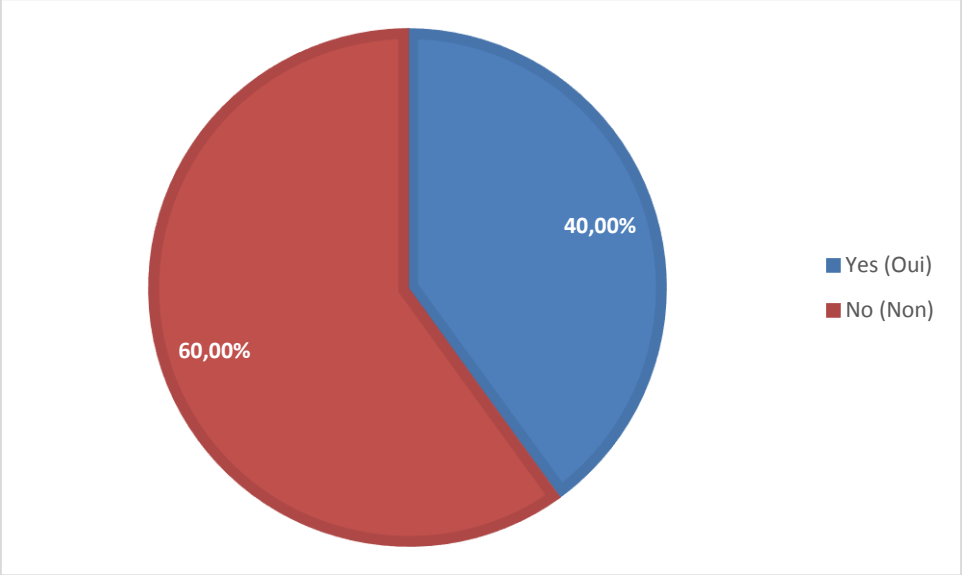
SECTION 1 - The Academic Offer (L'offre académique)

Does your Faculty/Department provide educational programme(s) on Wind Energy and Technology?
(Votre faculté/département offre-t-il un programme éducatif sur l'énergie éolienne et sa technologie?)

25 responses



n.	Partner		Programme Title	Faculty/Department	Level
2	Arab Academy for Science and Technology	1	Master of Science in Renewable Energy	Engineering	Master
		2	Master of engineering	Engineering	Master
5	Lab-STA, ENIS, Universite de Sfax	1	Systèmes à énergies renouvelables	Informatique Industrielle	3eme ingénieur
		2	Wind energy conversion process	Informatique Industrielle	Master
6	L'Ecole Nationale d'Ingénieurs de Sfax		Sustainable Mobility Actuators Research and Technology	Ecole Nationale d'ingénieurs de Sfax/ D Génie Electrique	Master
9	Laboratoire des Sciences et Techniques de l'Automatique et de l'informatique industrielle		Energie renouvelable	ISGIS qualité et norme	Master

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11	National School of Electronics and Telecommunications ENETCOM		Supervision of Energic Systems	ENETCOM	Specialization (Spécialisation)
13	-	1	Systèmes mécatroniques et conversion d'énergie	Faculté des Sciences et Techniques	Master course (Master)
		2	Développement durable et énergies renouvelablese	Faculté des sciences et techniques	Bachelor (Licence)
		3	Ingénierie des énergies renouvelables	Polytech Marseille	Bachelor (Licence)
15	Aalborg University		Wind power systems	Department of Energy Technology	Master course (Master)
16	Sapienza		NA	NA	NA
17	National Engineering School of Sfax		NA	NA	NA
20	LAPER		production d'energie	FST/departement de physique	sujet de memoire de master
23	U.R. SMS		Doctorat in Electrical Enginnering	Electrical Enginnering	Specialization (Spécialisation)
25	-	1	Energies marine éolienne et hydraulique	Ecole Centrale de MArseille	Bachelor (Licence)
		2	Energies renouvelables et développement	Département MT-Polytech Marseille c	Bachelor (Licence)

Does your Faculty/Department provide course(s)/module(s) on Wind Energy and Technology?
(Est-ce que votre faculté/département fournit un cours/module(s) en relation avec l'énergie éolienne et sa technologie?)

25 responses

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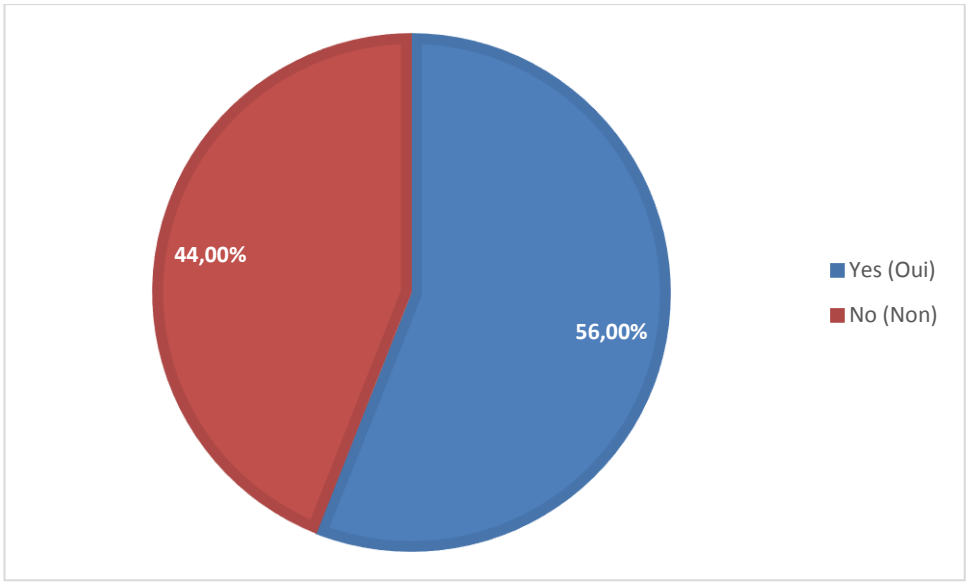

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Arab Academy for Science and Technology

n.	Title of Course/Module	Level	Type of Course(s)	Number of Students	Number of credits	Methodology	Topics delivered	Course's Instructor
1	Wind Energy	Master	Elective (Optionel)	1-20 students	3 credits	75% lecture 50 % tutorial 0% practical	Theoretical (Théorique), Technical (Technique), Social (awareness, impacts, acceptance, etc) (Social (sensibilisation, impacts, acceptation, etc.))	-
2	Meteorology for Wind Power	Master	Elective (Optionel)	1-20 students	3 credits	75% lecture 25 % tutorial 0% practical	Theoretical (Théorique), Technical (Technique)	-
3	Wind power Tech. and development	Master	Elective (Optionel)	1-20 students	3 credits	75% lecture 25 % tutorial 0% practical	Theoretical (Théorique), Numerical (Numérique), Technical (Technique), Economic (economic sustainability, costs, breakeven point, etc) (Économique (durabilité économique, coûts, seuil de rentabilité, etc.))	-

n.	Title of Course/Module	Short Description
1	Wind Energy	This course covers the three different fields contributing in wind power extraction (Mechanical, electrical and civil). The mechanical part presents wind power principals and technologies; modeling wind power machinery, the fabrication of different types of turbine and their mechanical industrial standards. The other part of the course explains the wind turbine generators types and converter; maximum power extraction of WT; control of wind turbine in different mode of operation off and on-grid connected; civil construction constraints and installation of wind farm; economics of wind energy.

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2	Meteorology for Wind Power	Wind energy resources in the present days. Historical retrospective and current status of the use of wind energy.Construction and operation of wind machines. Wind turbine types. Wind turbines of medium and high power. Wind farms . Electric generation using min-wind turbines.Wind power perspectives
3	Wind power Tech. and development	Introduction to wind energy. Wind energy concept. Wind turbine characteristics and resources. Aerodynamics of wind turbines. Wind turbine mechanics. Wind turbine dynamics. Electrical aspects. Wind turbine generators. Wind turbine batteries.Wind turbine cabling.Trends in control system design. Wind turbine calculations and blade element theory. Wind turbine design calculations. Environmental aspects.wind turbine economics

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Sfax Enginering School

n.	Title of Course/Module	Level	Type of Course(s)	Number of Students	Number of credits	Methodology	Topics delivered	Course's Instructor
1	Stockage et systèmes hybrides	Specialization (Spécialisation)	Mandatory (Obligatoire)	from 21 to 40 (De 21 à 40)	3	100% lecture 50 % tutorial 75% practical	Numerical (Numérique), Technical (Technique)	Krichen Lotfi
2	Modélisation et commande des machines synchrones	Specialization (Spécialisation)	Mandatory (Obligatoire)	from 21 to 40 (De 21 à 40)	n. 3	100% lecture 50 % tutorial 75% practical	Numerical (Numérique), Technical (Technique)	Koubaa Yassine

n.	Title of Course/Module	Short Description
1	Stockage et systèmes hybrides	
2	Modélisation et commande des machines synchrones	

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Lab-STA, ENIS, Universite de Sfax

n.	Title of Course/Module	Level	Type of Course(s)	Number of Students	Number of credits	Methodology	Topics delivered	Course's Instructor
1	Systèmes à énergies renouvelables	ingénieur	Mandatory (Obligatoire)	from 21 to 40 (De 21 à 40)	2	75% lecture 100 % tutorial 50% practical	Technical (Technique)	Helmi Aloui

n.	Title of Course/Module	Short Description
1	Systèmes à énergies renouvelables	

L'Ecole Nationale d'Ingénieurs de Sfax

n.	Title of Course/Module	Level	Type of Course(s)	Number of Students	Number of credits	Methodology	Topics delivered	Course's Instructor
1	Machines Electriques	Ingénieurs	Mandatory (Obligatoire)	from 41 to 75 (De 41 à 75)	3	75% lecture 50 % tutorial 100% practical	Theoretical (Théorique), Technical (Technique)	Krichen Lotfi
2	Convertisseurs statiques AC/DC, DC/DC	Master Course (Master)	Mandatory (Obligatoire)	from 41 to 75 (De 41 à 75)	3	75% lecture 50 % tutorial 100% practical	Technical (Technique)	Koubaa Yassine
3	Convertisseur statique DC/AC	Master Course (Master)	Mandatory (Obligatoire)	from 41 to 75 (De 41 à 75)	3	75% lecture 50 % tutorial 0% practical	Theoretical (Théorique), Technical (Technique)	-

n.	Title of Course/Module	Short Description
1	Machines Electriques	Exploitation des machines électriques, caractéristiques et dimensionnement
2	Convertisseurs statiques AC/DC, DC/DC	Redresseurs commandés, Hacheur survolteur, Hacheur dévolteur, structure et dimensionnement des hacheurs
3	Convertisseur statique DC/AC	Structure et modélisation des onduleurs, Commande MLI,

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Système mécatroniques et signaux (SMS)

n.	Title of Course/Module	Level	Type of Course(s)	Number of Students	Number of credits	Methodology	Topics delivered	Course's Instructor
1	Electronique de puissance, instrumentation, Automatique.	Master Course (Master)	Mandatory (Obligatoire)	more than 75 (Plus de 75)	6	100% lecture 0 % tutorial 50% practical	Technical (Technique)	Krichen Lotfi
2	Instrumentation	ingénieur	Mandatory (Obligatoire)	more than 75 (Plus de 75)	6	100% lecture 50 % tutorial 0% practical	Theoretical (Théorique)	Koubaa Yassine
3	Automatique	Master Course (Master)	Mandatory (Obligatoire)	more than 75 (Plus de 75)	9	100% lecture 50 % tutorial 100% practical	Theoretical (Théorique)	-
4	Traitement de signal	ingénieur	Mandatory (Obligatoire)	from 41 to 75 (De 41 à 75)	3	100% lecture 100 % tutorial 0% practical	Theoretical (Théorique)	-
5	Électrotechnique	Master Course (Master)	Mandatory (Obligatoire)	more than 75 (Plus de 75)	6	100% lecture 75 % tutorial 50% practical	Theoretical (Théorique), Technical (Technique)	-

n.	Title of Course/Module	Short Description
1	Electronique de puissance, instrumentation, Automatique.	
2	Instrumentation	
3	Automatique	
4	Traitement de signal	
5	Électrotechnique	

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Ain-Shams University

n.	Title of Course/Module	Level	Type of Course(s)	Number of Students	Number of credits	Methodology	Topics delivered	Course's Instructor
1	Renewable Energies	Bachelor (Licence)	Elective (Optionel)	from 1 to 20 (De 1 à 20)	3	75% lecture 50 % tutorial 0% practical	Theoretical (Théorique)	Krichen Lotfi

n.	Title of Course/Module	Short Description
1	Renewable Energies.	This is an elective course for the third year mechanical power students discussing the basics of renewable energy generation in the fields of wind engineering , solar energy and biomass

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Laboratoire des Sciences et Techniques de l'Automatique et de l'informatique industrielle

n.	Title of Course/Module	Level	Type of Course(s)	Number of Students	Number of credits	Methodology	Topics delivered	Course's Instructor
1	Systèmes de conversion d'énergie renouvelable	Master Course (Master)	Mandatory (Obligatoire)	from 21 to 40 (De 21 à 40)	6	50% lecture 75 % tutorial 100% practical	Theoretical (Théorique), Numerical (Numérique), Technical (Technique)	-
2	énergie éoliene	Master Course (Master)	Mandatory (Obligatoire)	from 21 to 40 (De 21 à 40)	6	75% lecture 50% tutorial 50% practical	Theoretical (Théorique), Numerical (Numérique), Technical (Technique)	-

n.	Title of Course/Module	Short Description
1	Systèmes de conversion d'énergie renouvelable	Ce module donne une étude générale des différents types des systèmes de conversion d'énergie renouvelable
2	énergie éoliene	ce module traite la technologie de l'énergie éoliene

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National School of Electronics and Telecommunications ENETCOM

n.	Title of Course/Module	Level	Type of Course(s)	Number of Students	Number of credits	Methodology	Topics delivered	Course's Instructor
1	Renewable Energy Systems	Specialization (Spécialisation)	Mandatory (Obligatoire)	from 21 to 40 (De 21 à 40)	3	75% lecture 0% tutorial 50% practical	Theoretical (Théorique), Numerical (Numérique), Technical (Technique), Economic (economic sustainability, costs, breakeven point, etc) (Économique (durabilité économique, coûts, seuil de rentabilité, etc.)), Social (awareness, impacts, acceptance, etc) (Social (sensibilisation, impacts, acceptation, etc.)), Regulations (National energy strategy, incentives, authorizations, etc) (Réglementaire (stratégie énergétique nationale, incitations, autorisations, etc.)), for the didactic methodology : 75% for Lecture and Tutorial and 25% for Practical	Prof Helmi Aloui

n.	Title of Course/Module	Short Description
1	Renewable Energy Systems	Principle, Tecnology, modelling and calculation around Wind Energy and PV Systems

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The British University in Egypt

n.	Title of Course/Module	Level	Type of Course(s)	Number of Students	Number of credits	Methodology	Topics delivered	Course's Instructor
1	Wind Energy Systems and Fundamentals	Master Course (Master)	Mandatory (Obligatoire)	from 1 to 20 (De 1 à 20)	3	75% lecture 25 % tutorial 0% practical	Theoretical (Théorique), Technical (Technique)	Amr Abdel Kader

n.	Title of Course/Module	Short Description
1	Wind Energy Systems and Fundamentals	Basic concepts and definitions. Availability of wind energy. Economics of wind energy. Estimation of wind energy. Site selection for wind energy. Wind energy equipment selection and specification. Design criteria. Design of wind energy plant components (rotor blades, gearbox, tower,..). Performance evaluation for wind energy power plants. Aerodynamics of wind turbines, speed control, and frequency modulation. Computer applications.

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Aalborg University

n.	Title of Course/Module	Level	Type of Course(s)	Number of Students	Number of credits	Methodology	Topics delivered	Course's Instructor
1	Dynamic Modelling of Electrical Machines and Control Systems	Master Course (Master)	Mandatory (Obligatoire)	from 21 to 40 (De 21 à 40)	5	75% lecture 0 % tutorial 50% practical	Theoretical (Théorique), Technical (Technique)	-
2	Advanced Course in Electrical Power Systems	Master Course (Master)	Mandatory (Obligatoire)	from 21 to 40 (De 21 à 40)	5	75% lecture 0 % tutorial 50% practical	Theoretical (Théorique), Technical (Technique)	-

n.	Title of Course/Module	Short Description
1	Dynamic Modelling of Electrical Machines and Control Systems	
2	Advanced Course in Electrical Power Systems	

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Sapienza University

n.	Title of Course/Module	Level	Type of Course(s)	Number of Students	Number of credits	Methodology	Topics delivered	Course's Instructor
1	Energy conversion systems	Bachelor (Licence)	Mandatory (Obligatoire)	more than 75 (Plus de 75)	n. 6	100% lecture 50 % tutorial 0% practical	Theoretical (Théorique), Technical (Technique)	Alessandro Corsini
2	Advanced energy conversion systems	Master Course (Master)	Elective (Optionel)	from 21 to 40 (De 21 à 40)	n. 9	75% lecture 50 % tutorial 0% practical	Theoretical (Théorique), Numerical (Numérique), Technical (Technique)	Franco Rispoli
3	Electrical energy conversion from renewable sources	Master Course (Master)	Elective (Optionel)	from 21 to 40 (De 21 à 40)	n. 6	75% lecture 50 % tutorial 0% practical	Theoretical (Théorique), Technical (Technique)	Giulio Capponi
4	Wind technologies: sizing, development and optimization	Bachelor (Licence)	Elective (Optionel)	from 21 to 40 (De 21 à 40)	n. 3	50% lecture 50 % tutorial 50% practical	Theoretical (Théorique), Numerical (Numérique), Technical (Technique), Regulations (National energy strategy, incentives, authorizations, etc) (Réglementaire (stratégie énergétique nationale, incitations, autorisations, etc.))	Katiuscia Cipri

n.	Title of Course/Module	Short Description
1	Energy conversion systems	
2	Advanced Course in Electrical Power Systems	
3	Electrical energy conversion from renewable sources	
4	Wind technologies: sizing, development and optimization	

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LAPER

n.	Title of Course/Module	Level	Type of Course(s)	Number of Students	Number of credits	Methodology	Topics delivered	Course's Instructor
1	production d'energie	Master Course (Master)	Mandatory (Obligatoire)	from 41 to 75 (De 41 à 75)	n. 3	75% lecture 50 % tutorial 0% practical	Theoretical (Théorique)	-

n.	Title of Course/Module	Short Description
1	production d'energie	

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Institution of Monastir

n.	Title of Course/Module	Level	Type of Course(s)	Number of Students	Number of credits	Methodology	Topics delivered	Course's Instructor
1	Renewable energy	Specialization (Spécialisation)	Mandatory (Obligatoire)	from 1 to 20 (De 1 à 20)	n. 3	75% lecture 50 % tutorial 0% practical	Theoretical (Théorique)	-

n.	Title of Course/Module	Short Description
1	Renewable energy	

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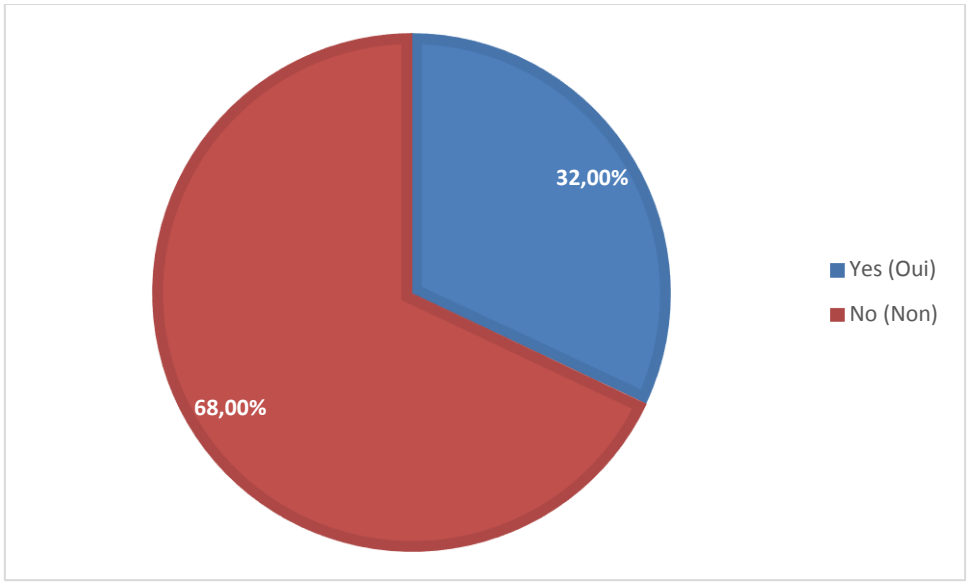
Is there a Unit/Centre at your Institution devoted to research/training on Wind Energy and Technology?

(Y a-t-il une unité ou un centre dans votre établissement consacré à la recherche/formation sur l'énergie éolienne et la technologie?)

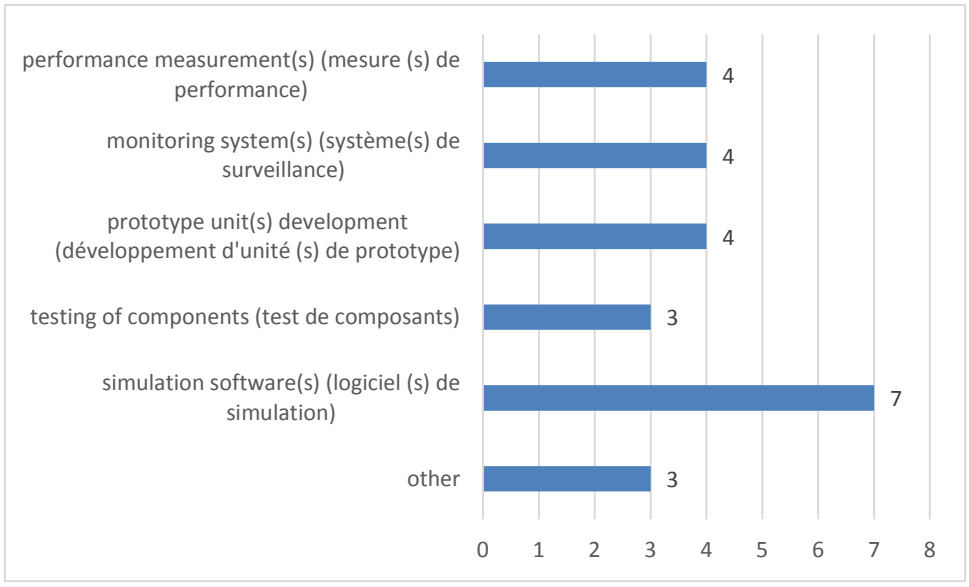
25 responses



Main research activities

(Principales activités de recherche)

9 responses



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n.	University	Name of the Unit/Centre (Nom du Unité/Centre)	Focus Area (Secteur d'intérêt)	Main research activities (Principales activités de recherche)	Example of output (Exemple de sortie)	List of affiliated departments/faculties (Nombre de départements/institutions affiliés)
1	Cairo University	NA	NA	NA	NA	NA
2	Arab Academy for Science and Technology	Energy Research unit	Renewable Energy	prototype unit(s) development (développement d'unité (s) de prototype), monitoring system(s) (système(s) de surveillance), performance measurement(s) (mesure (s) de performance)	built a setup and training	Electrical and Mechanical Engineering
3	Laboratory of Sciences and Techniques of Automatic control & computer engineering Lab-STA (Sfax, Tunisia).	Unit of Control of Industrial Process	Renewable Energy ; Control of Machines (Synchronous-ASynchronous) ; Control of Complex Systems	prototype unit(s) development (développement d'unité (s) de prototype), performance measurement(s) (mesure (s) de performance), simulation software(s) (logiciel (s) de simulation), Development of efficient control strategy even in the presence of faults		Electrical Engineering ; Mechanical Engineering
4	Sfax Engineering School	Lab-STA	Renewable energy, multidimensional systems	monitoring system(s) (système(s) de surveillance), performance measurement(s) (mesure (s) de performance)		Electrical Engineering and Mechanical Engineering
		Control of hybrid system (photovoltaic and wind) for producing energy	Renewable energy, analysis and control of wind system, synthesis of photovoltaic/Wind systems	prototype unit(s) development (développement d'unité (s) de prototype), monitoring system(s) (système(s) de surveillance)	Training of students in Master and PhD students	

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5	Lab-STA, ENIS, Universite de Sfax	NA	NA	NA	NA	NA
6	-	Laboratoire de recherche : Lab-STA	Développement d'algorithmes permettant à une chaine de conversion d'énergie d'extraire le maximum de puissance éolienne	simulation software(s) (logiciel (s) de simulation)		
9	Laboratoire des Sciences et Techniques de l'Automatique et de l'informatique industrielle	Laboratoire des Sciences et Techniques de l'Automatique et de l'informatique industrielle	développement des lois de commande robustes, basées sur la logique floue et la théorie des modes glissants, assurant le bon fonctionnement d'un système éolien	testing of components (test de composants), prototype unit(s) development (développement d'unité (s) de prototype), simulation software(s) (logiciel (s) de simulation)		
11	National School of Electronics and Telecommunications ENETCOM	Practical Laboratory	Renewable Energy	testing of components (test de composants), monitoring system(s) (système(s) de surveillance), simulation software(s) (logiciel (s) de simulation)	measurement, models, softs	Industrial computing department/ENETCOM
		Laboratory of Advanced Electronics systems and Sustainable Energy	Sustainable Development	testing of components (test de composants), prototype unit(s) development (développement d'unité (s) de prototype), monitoring system(s) (système(s) de surveillance), performance measurement(s) (mesure (s) de	Research activities (developement, publications, prototyping, ..)	ENETCOM

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				performance), simulation software(s) (logiciel (s) de simulation)		
12	The British University in Egypt	NA	NA	NA	NA	NA
14	University of Valladolid	Advanced Process Control Group	Control systems	Control systems at research level	Advanced Control of Multiple Renewable Energy Sources. (PhD thesis of Johanna Salazar, 2015) Offshore production of hydrogen using renewable energies: a predictive control approach. (PhD thesis of Alvaro Serna, 2018)	Systems Engineering
20	LAPER	LAPER	efficacité energetique et energie renouvelable	simulation software(s) (logiciel (s) de simulation)		
23	U.R. SMS	Research Unit Mechatronic Systems and Signals SMS	Mechatronic Systems and Signals	monitoring system(s) (système(s) de surveillance), performance measurement(s) (mesure (s) de performance), simulation software(s) (logiciel (s) de simulation), System modeling	System model of a Smart Grid	

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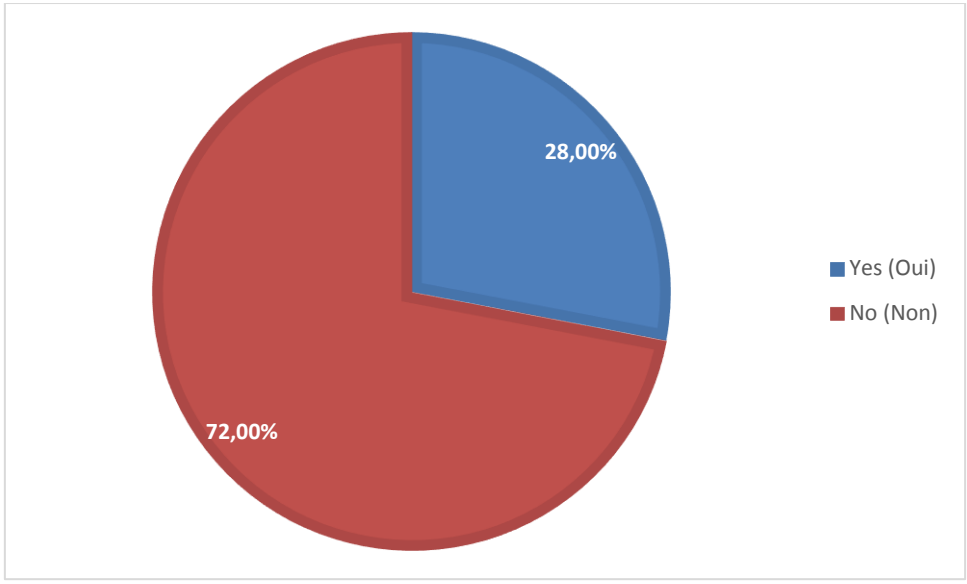
SECTION 2 - The Experimental Equipment (Équipement Expérimental)

Has your Department/Faculty got laboratories and/or equipment in Wind Energy? ***(Votre département/faculté a-t-il des laboratoires et/ou de l'équipement en énergie éolienne?)***

25 responses



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	University	Type1: Demonstration Station (Station de démonstration)	Type2: Prototype Unit(s) (Unité(s)de prototype)	Type3: Monitoring System(s) (Système (s) de surveillance)	Type4: Performance measurement(s) (Mesure(s) de performance)	Type5: Simulation software (logiciel(s) de simulation)	Type6: Other (Autre)
1	Cairo University	NA	NA	NA	NA	NA	NA
2	Arab Academy for Science and Technology	Energy Laboratory: 300 W wind energy grid connected setup	NA	energy laboratory: weather monitoring unit			
3	Laboratory of Sciences and Techniques of Automatic control & computer engineering Lab-STA (Sfax)	NA	NA	NA	NA	NA	NA
4	Sfax Engineering School	NA	NA	NA	NA	NA	NA
5	Lab-STA, ENIS, Universite de Sfax	NA	NA	NA	NA	NA	NA
7	système mécatroniques et signaux (SMS)	NA	NA	NA	NA	NA	NA
8	Ain-Shams	NA	NA	NA	NA	NA	NA
9	Laboratoire des Sciences et Techniques de l'Automatique et de l'informatique industrielle	NA	NA	NA	NA	NA	NA
11	National School of Electronics and Telecommunications ENETCOM	Practical Loboratory EEP2, Reasearch Laboratory ESSE: Wind energy	prototypes are developped in a collaboration frame between ESSE	Softs are developped in frame of projects by students: monitoring of a wind energy	wind speed, generated power: Wind energy principal, Energy storage, lexSolar 1046	Matlab: models are developped on Simulink	

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		principal, Energy storage, lexSolar 1046 and 1081	Laboratory and SATIE Laboratory (France): Wind Emulators	system	and 1081		
12	The British University in Egypt	Wind turbine test tunnel	NA	NA	NA	ANSYS fluid dynamics	NA
13	L'Ecole Nationale d'Ingénieurs de Sfax	Banc expérimental Ce banc comprend une éolienne à pales creuses, construite par une petite entreprise (Gallan solaire en collaboration avec l'équipe de recherche SASV du LSIS	NA	Ce banc contient un systèmes d'acquisition et de supervision	NA	Les logiciels Matlab/simulink et PSIM sont utilisés	NA
14	University of Valladolid	NA	NA	NA	NA	NA	NA
15	Aalborg University	NA	NA	NA	NA	NA	NA
16	Sapienza	Wind tunnel equipment	3D Printer	Anemometer	Wind tunnel equipment	FAST, Matlab, Ansys, OpenFoam	
17	National Engineering School of Sfax	NA	NA	NA	NA	NA	NA
20	LAPER	NA	NA	NA	NA	NA	NA
21	Institution of Monastir	NA	NA	NA	NA	NA	NA
22	ENIS	NA	NA	NA	NA	NA	NA
23	U.R. SMS	NA	NA	NA	NA	NA	NA

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25	U. Aix-Marseille	Laboratoire de l'Information et des Systèmes (LIS). Un banc de mesure comprenant une éolienne à pales creuses avec son système de capteurs et d'acquisition.	LIS. Un deuxième type d'éolienne classique avec son système MPTT et son système d'acquisition.	LIS Système de supervision avec l'outil controldesk de Matlab	NA	Simulink/Matlab - 20Sim_ AMESIM	NA

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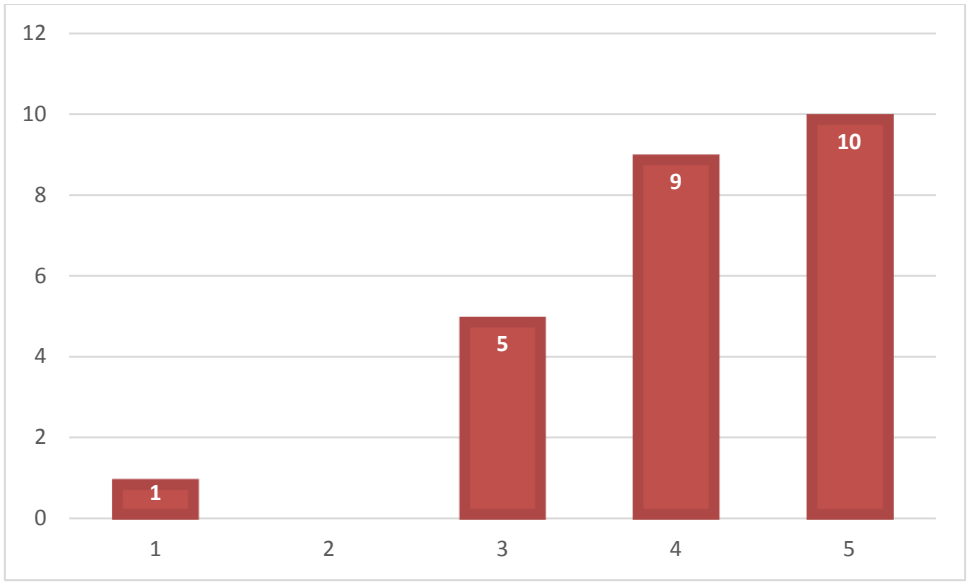
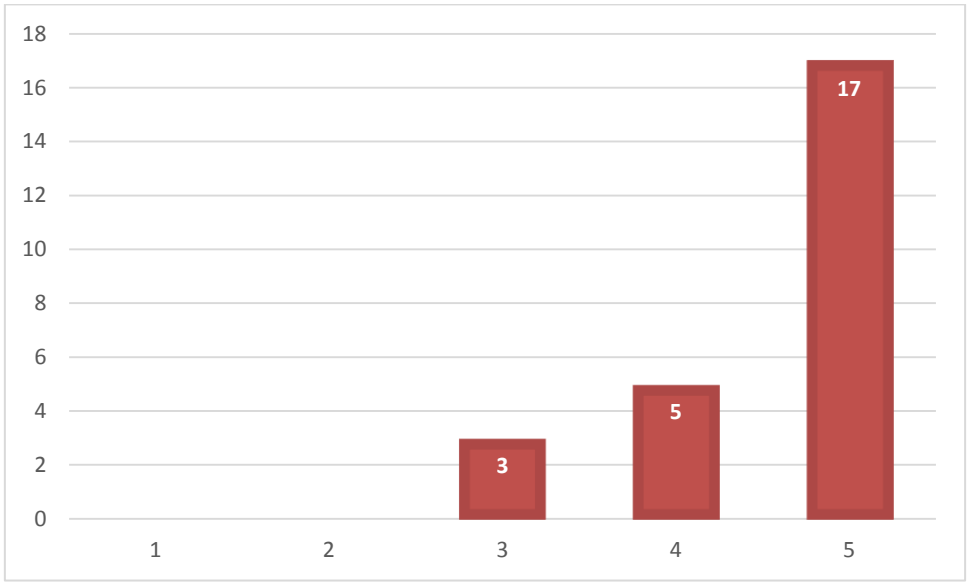
How do you estimate the interest of internal staff to spend long period (from 1 to 3 months) in foreign laboratories for training and scientific collaborations?
(Comment estimez-vous l'intérêt du enseignants à passer de longues périodes (de 1 à 3 mois) dans des laboratoires étrangers pour des formations et des collaborations scientifiques?)

25 responses



How do you estimate the interest of PhD students to spend long period (from 1 to 3 months) in foreign laboratories for training and scientific collaborations?
(Comment estimez-vous l'intérêt des doctorants à passer de longues périodes (de 1 à 3 mois) dans des laboratoires étrangers pour des formations et des collaborations scientifiques?)

25 responses



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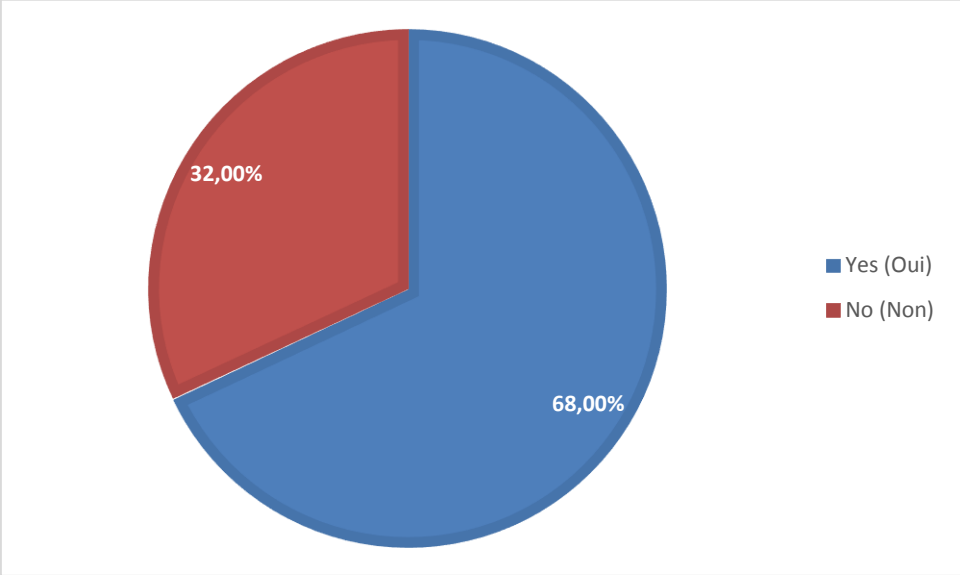
SECTION 3 - Collaboration with Local, National and International Stakeholders (Collaboration avec les Parties Prenantes Locales, Nationales Et Internationales)

Does your Institution engage in any collaboration activities with stakeholders operating in Wind Energy and Technology field?

(Votre institution participe-t-elle à des activités de collaboration avec des intervenants œuvrant dans le domaine de l'énergie éolienne et de sa technologie?)

25 responses



The stakeholders your institution is collaborating with operate at:

(Les parties prenantes avec lesquelles votre institution collabore opèrent à)

17 responses

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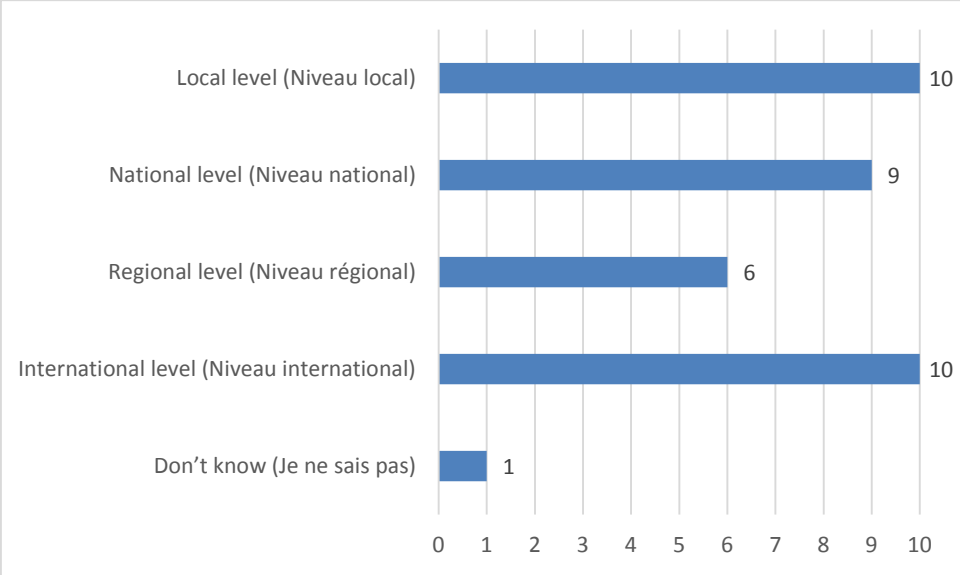
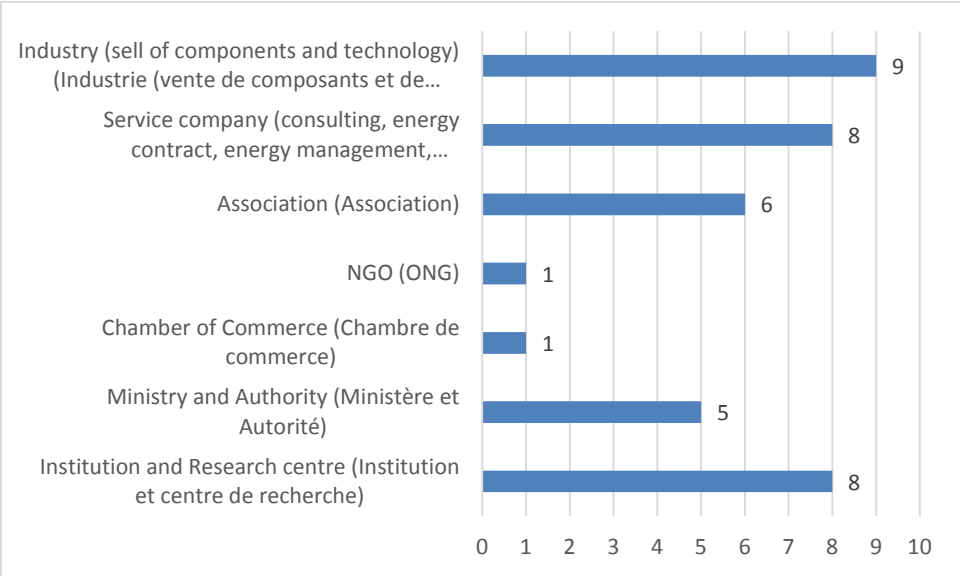


Please explain the nature of stakeholders:

(Veuillez expliquer la nature des parties prenantes:)

17 responses



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n.	University	Stakeholder(s) involved (Intervenant(s) impliqué)	Target Audience (Public cible)	Output (Résultat)
1	Cairo University	NA	NA	NA
2	Arab Academy for Science and Technology	Ministry of electricity and energy	Engineer and student	20 expert in energy audit
		service company	Engineer	study report
3	Laboratory of Sciences and Techniques of Automatic control & computer engineering Lab-STA (Sfax, Tunisia).	Expert in the field of renewable energies	Searcher	Training of students on Master and PHD
4	Sfax Engineering School	Academic Professor and experts on hybrid systems and renewable energy	Phd students	Training of Master students and PhD students
		Kamoun Omar	étudiants et doctorant	projet de fin d'étude et Thèses de doctorant
5	Lab-STA, ENIS, University of Sfax	Teacher	Engineering student	engineer
7	Système mécatroniques et signaux (SMS)	Solar Energy system		collaboration
		société international de l'énergie et des sciences		achat de matériel
		Association tunisienne de l'énergie éolienne (ONG)		collaboration, formation
		Agence nationale de la métrologie		centre d'excellence
		Shams Energy Access		achat de matériel
9	Laboratoire des Sciences et Techniques de l'Automatique et de	membres des laboratoires	doctorants	essais pratiques sur les bancs d'essais

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	l'informatique industrielle			
10	-	LIAS-ENSIP, École nationale supérieure d'ingénieurs de Poitiers enseignants et doctorants	Doctorant	Satisfaisantes
11	National School of Electronics and Telecommunications ENETCOM	Engineers, Teachers and students Doctorants, teachers, industrials	students and company customers Doctorants, teachers, industrials	trainings, soft development models, publications, prototypes
12	The British University in Egypt	Academy of Scientific Research and Technology	Wind energy community	Local design and manufacturing of wind turbine components
13	-	Gallan solaire Universités Mohamed Premier d'Oujda (Maroc) et université de Catania (Italie)	Industriel et étudiants Doctorants	La création et la conception d'une éolienne commercailisée PhD s
14	University of Valladolid	Aws truepower slu virtualpie ltd dexawave institut fuer seeverkehr swirtschaft und logistik treelogic d'appolonia spa cranfield university sustainable technologies floating power plant	Design of multiuse wind+wave+aquaculture+hydrogen platforms: www.h2ocean-project.eu	Aws truepower slu virtualpie ltd dexawave institut fuer seeverkehr swirtschaft und logistik treelogic d'appolonia spa cranfield university sustainable technologies floating power plant

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15	Aalborg University	Danfoss, Ørsted, Engerginet, Siemens, AET, Vestas	Educating postgraduate students, Content and quality of the educational programmes, Communication/marketing, Internationalisation	Danfoss, Ørsted, Engerginet, Siemens, AET, Vestas
16	Sapienza	confidential		new wind turbine blade design
		confidential		Report on wind energy repowering capability in Italy
17	National Engineering School of Sfax	NA	NA	NA
20	LAPER	chercheur	doctorate	scientifique
23	U.R. SMS	engineer	doctorate student	management of wind energy in Tunisia
		engineer	doctorate student	platform for training , monitoring and management of the wind energy
25	U. Aix-Marseille	Gallan Solaire	Grand Public	La commercialisation d'une éolienne à pales creuses

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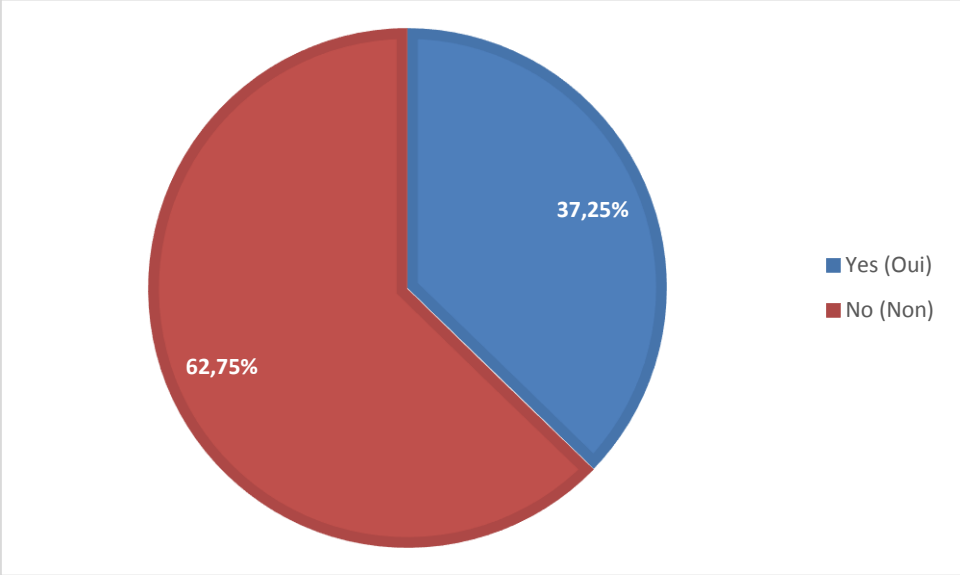
SECTION 4 - Research project (after 2013) (Projets de recherche (depuis 2013))

Has the University recently completed research project(s) or is involved in ongoing research project(s)?
(L'Université a-t-elle récemment terminé un ou plusieurs projets de recherche ou participe-t-elle à un (des) projet (s) de recherche en cours?)

25 responses



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Research project
(Projets de recherche)

n.	University	Project title (Titre du projet)	Description (Description)	Source of funding (Source de financement)	Partners (Les partenaires)	Main Outputs (Principaux résultats)
2	Arab Academy for Science and Technology	Jamilla	Renewable energy in Egypt	International (International)		
3	Laboratory of Sciences and Techniques of Automatic control & computer engineering Lab-STA (Sfax, Tunisia).	Project Scientific and Technical Research CMCU (France)	Rational Application of solar energy to automatic control of agricultural and industrial systems	International (International)	University of Poitiers France; University ofPicardie Jule Vernes France	training of PHD Studiens
		Inter-University Cooperation Project and scientific research between Tunisia and the type of PCI Spain.	Advanced control of industrial processes, agricultural, electrical; Rational Application of solar energy for advanced control of agricultural systems ; Renewable Energy Technologies in Agriculture control systems for Learning & research	International (International)	University of Valladolid, Spain	training studiens of Master and PHD
		Mobilty ERASMUS	Training in several areas of research	International (International)	University of Valladolid Spain.	training of Master and PHD studiens
4	Sfax Engineering School	Project of cooperation between Tunisain and Marrocain research CMPTM	Technology of renewable energy for irrigation and control of industrial process	International (International)		Project of cooperation between Tunisain and Marrocain research CMPTM
		Mobility ICM ERASMUS+ KA107	All research fields	European (Européen)	University of Valladolid	Training of Phd students in several

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						area of research
5	Lab-STA, ENIS, Universite de Sfax					
7	Système mécatroniques et signaux (SMS)	CMCU KAIS	Projet Erasmus	European (Européen)		
		CMCU SAFYA	Projet de mobilité international	International (International)		CMCU SAFYA
		CMPIM Hichem TRABELSI	projet de coopération technique	European (Européen)		
		Project Erasmus Key 1	Programme de mobilité des staff académique	European (Européen)		
12	The British University in Egypt	Development and implementation of an innovative design in sandwich structures used in wind turbine blades	The objective of this project is to design 100 kW wind turbine blade; it included both the aerodynamic and structural designs, a modified sandwich design that improved blade's resistance to impact loads.	RDI-EU funded	NA	A blade prototype produced for the first time in Egypt through vacuum infusion process.
		The design, fabrication and testing a small Vertical Axis Wind Turbine (VAWT) for off-grid applications	The objective of this project is to design, construct and test a 5 kW VAWT for off grid application.	RDI-EU funded	NA	
		National knowledge and Technology Alliance in Renewable Energy for Egypt's Sustainable Development	The objective of this project is to include all parties involved in wind energy research in Egypt in order to plan local support for wind turbine manufacturing.	ARST	NA	A full scale turbine

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		Enhancement of Photovoltaic and Wind Turbine Performance for High Temperature and Low Wind Speed Environment	The wind energy part is concerned with the development of low wind speed wind turbine.	Newton – Musharafa Fund	NA	The outcome will include detailed design of many components and set up of manufacturing plans.
13	-	PFC Rangers	La conception des convertisseurs à base de SiC	National (Nationale)	Air bus , Nexya, FDD	la commercialisation d'un convertisseur 3KW
14	University of Valladolid	DEVELOPMENT OF A WIND-WAVE POWER OPEN-SEA PLATFORM EQUIPPED FOR HYDROGEN GENERATION WITH SUPPORT FOR MULTIPLE USERS OF ENERGY (H2ocean)	H2OCEAN started its activities on the 1st of January, 2012 and was successfully completed the 31st of December, 2014. It recieved a financial contribution of 4,5 million EUR (FP7-OCEAN.2011-1 “Multi-use offshore platforms”). UVa was one of the two developers of the proposal, and headed one WP.	European (Européen)	AWS TRUEPOWER SLU, Spain VIRTUALPIE LTD, UK DEXAWAVE, Denmark INSTITUT FUER SEEVERKEHR SWIRTSCHAFT UND LOGISTIK, Germany TREELOGIC, Spain D’APPOLONIA SPA, Italy CRANFIELD UNIVERSITY, UK SUSTAINABLE TECHNOLOGIES, Spain and Italy FLOATING POWER PLANT, Denmark	Design of a multiuse offshore platform integrating wind, wave energy, hydrogen storage and aquaculture.

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15	Aalborg University	RePlan – Facilitating resilient power system with ancillary services from Renewable Power Plants	The overall objective of this project is to contribute to the integration of large share of renewable energy in the Danish power system and thus to enable a resilient power system in the future by developing technical solutions for the provision of ancillary services by renewable power plants. RePlan focuses on WP and PV plants since they are expected to jointly produce the lion's share of renewable energy generation capacity needed to reach the Danish government 2050 targets. RePlan develops con-trollers for the delivery of ancillary services, incorporating communication properties in the con-trol loops of the ReGen plant model and using state-of-the-art methods for simulation of renewa-ble generation patterns and wind power forecast methods. Based on both simulation models and verification in laboratory	National (Nationale)

			facilities, this project intends to address this challenge: What is the impact of communication and power availability forecast error in providing coordination and ancillary services from ReGen plants?			
23	U.R. SMS	Academic Staff mobility from University of Valladolid (Spain)	Academic Staff mobility from University of Valladolid (Spain)	European (Européen)	University of Valladolid (Spain)	management of energy in a SG
25	U. Aix-Marseille	PFC Rangers	Il s'agit de réaliser une alimentation 3KW destinée à équiper les hélicoptères avec un rapport poids puissance <1	National (Nationale)	AirBus, Nexya, FDD, AMU	La commercialisation de l'alimentation
		DualPlas	La conception d'un module hybride photovoltaique-Thermique (PVT)	National (Nationale)	DualPlas, CEA,AMU, Clipsol	La commercialisation du module PVT à faible coût.

CONCLUSION

This survey was developed to identify and know the framework into which the WESET project activities are implemented. The main goal was to make all participants aware about the didactic offers and the teaching services provided by the Beneficiary Universities, identifying what could be improved or completed with additional programs, modules and facilities on wind energy.

The level of the didactic offer in wind energy varies among the interviewed HEI, also in consideration of the National interest and application of the technology for the energy production.

Another important distinction is in “programme” and “courses”.

Only the 40% of the up to 25 faculties/universities interviewed offer an entire programme on Wind Energy and Technologies, also if, looking at the titles of the programmes, courses on Wind Source and Technologies are included in wider programme in Renewable Energies and Energetic systems. Only Aalborg University provides an entire programme on Wind power systems at Master level.

56% of interviewed universities provide courses concerning the topic of Wind Energy and Technology. If courses are related to generic components or competences like electronic system, inverters, automatism, electric machines, courses are mandatory, while specific courses on wind sources, turbines and components can be selected by the students (elective courses). Specific courses are attended meanly by up to 20 students, while generic courses covering transversal competences see the participation of up to 40 students.

The number of credits, according to local HEIs system, as well as the methodology in teaching change from universities to universities.

Only 32% of participants (8 universities in total) declare to have laboratories or training centre(s) on Wind Technologies. The main activities (researches) carried on are 1) simulation (7 on 8), then measurement, monitoring of systems and development of prototypes (4 on 8).

28% of universities has laboratories of equipment in Wind Energy (7 on 25). The equipment are composed by small wind turbines (up to 300 W), weather monitoring units, Wind energy storage unit, wind turbine test tunnel, software for simulation and monitoring.

The Lab and demonstration units are mostly connected with the presence of research projects related to wind energy, representing almost the 30% of the HEI participating the survey. The same cannot be stated for who has collaboration contracts and projects with industries.

In general interviewed show interest in the opportunities for internal staff to spend a period (from 1 to 3 months) abroad for training and research at foreign laboratories. For 22

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universities on 25, international experience for training and research remains a very good opportunity for the students. Long period of training abroad is always well seen for PhD students

The 68% of universities has engaged collaboration with stakeholders operating in Wind Energy. In general, collaboration are at local, National and International level, with industries (9 on 17), Service companies and Research centres (8 on 17). The majority of collaboration are for training, thesis and reports. 9 universities on 25 is involved or has been involved in research project on wind technologies. Part of them aimed at studying the use of renewable systems for specific needs and in specific fields like agriculture and industry, to design new control systems or prototypes.

RECOMMENDATIONS

WESET project foresees the elaboration of 4 new modules on Wind Technologies and Energy. According with the results of the survey, didactic material on the fundamentals of wind energy engineering should be elaborated for HEI, which do not have any module in their didactic offers.

The modules proposed in the WP2 cover almost all the main issues required from the industry, included a practical approach base on the design of wind farms that is provided in the module 4. Stand-alone installation and mini-micro applications are still ¼ of the market and it should be taken into account in WP2 and WP3. In fact, during the last years, countries have invested in big plants composed by > 500 kW wind turbines. The next trend, due to the limitation in the wind source characterized by high wind speed, it is to invest in mini and micro technologies, trying to obtain for them comparable performances.

Moreover, particular attention should be put in both WP2 and WP3 on:

- Power plant development. Students complain the lack of practical approach in the provided courses, as the analysis of real contexts, National and local regulations, sizing and economical sustainability of the project, evaluation of environment impacts.
- Operation and maintenance. Considering the average age of the installed wind farms, companies are looking for experts in maintenance of wind turbine and planning of periodical and extraordinary interventions in order to avoid permanent damages to the technologies and to the people.
- Resource assessment. The analysis of the wind source is on the base of a correct wind farm's design. Experts in wind technologies should be able to perform a in depth campaigns for the source evaluation or appropriate simulations of context to foresee the energy production.

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Research and development is always kept into strong consideration for future planning and labour market trend: one of the main topic concerns the installation of offshore wind turbine in depth seabed, using for example floating platforms.

For further information or comments on this document, contact Fernando.Tadeo@uva.es

and weset.erasmusplus@uva.es

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