UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Ingegneria
ACADEMIC YEAR	2017/2018
MASTER'S DEGREE (MSC)	ENGINEERING AND INNOVATIVE TECHNOLOGIES FOR THE ENVIRONMENT
SUBJECT	MANAGEMENT OF TERRITORIAL ENERGY RESOURCES
TYPE OF EDUCATIONAL ACTIVITY	C
AMBIT	20937-Attività formative affini o integrative
CODE	09000
SCIENTIFIC SECTOR(S)	ING-IND/11
HEAD PROFESSOR(S)	RIZZO GIANFRANCO Professore Ordinario Univ. di PALERMO
OTHER PROFESSOR(S)	
CREDITS	6
INDIVIDUAL STUDY (Hrs)	96
COURSE ACTIVITY (Hrs)	54
PROPAEDEUTICAL SUBJECTS	
MUTUALIZATION	
YEAR	2
TERM (SEMESTER)	1° semester
ATTENDANCE	Not mandatory
EVALUATION	Out of 30
TEACHER OFFICE HOURS	**RIZZO GIANFRANCO** Tuesday 09:00 11:00 Deaim - Stanza T218

DOCENTE: Prof. GIANFRANCO RIZZO

PREREQUISITES	The student must hold basic knowledge of calculus, physics and applied physics that would allow him to face without problems issues related to the energy management at land scale, in order of suitably assessing urban and district energy balances.
LEARNING OUTCOMES	RISULTATI DI APPRENDIMENTO ATTESI Si riferiscono all'insegnamento e non ai singoli moduli che lo compongono. Vanno espressi utilizzando i descrittori di Dublino Conoscenza e capacita' di comprensione Lo studente, al termine del corso, avra' acquisito conoscenze e metodologie per affrontare le tematiche connesse con l'utilizzo delle risorse energetiche sia a livello locale che territoriale, nel contesto della salvaguardia della sostenibilita' ambientale. Lo schema concettuale di azione e' costituito dai principi della termodinamica e dai documenti dell'Unione Europea in materia di sicurezza energetica degli Stati Membri. Capacita' di applicare conoscenza e comprensione Lo studente sara' in grado di individuare le metodologie di analisi piu' appropriate alla natura ed alla entita' dei problemi di gestione energetica nel territorio. Sara' inoltre in grado di valutare l'effetto sulle politiche energetiche e sulle pressioni esercitate in ambiente di differenti scenari di intervento. Autonomia di giudizio La conoscenza di metodi integrati di analisi consentira' allo studente di intervenire in maniera autonoma per affrontare problematiche energetiche diverse e per formulare ipotesi di sviluppo territoriale basate sul corretto utilizzo delle fonti energetiche. Abilita' comunicative Le modalita' di conduzione del corso e quelle della verifica finale sono fortemente finalizzate ad esaltare la capacita' di comunicazione da parte dello studente verso un'utenza esterna, sia istituzionale che privata. Capacita' d'apprendimento Lo studente sara' inoltre in condizione di apprendere nuove metodiche di approccio alle problematiche energetiche ed ambientali e di affrontare tematiche nuove sullo sfondo della sostenibilita' ambientale.
ASSESSMENT METHODS	Oral examination and discussion on the project work. The interview is aimed at determining the student's ability to process the knowledge gained by using them to solve problems and the ability to express the teaching content using a technically correct language. Special attention will be paid to the ability of the students to sketch out an energy balance at regional and/or urban scale, taking into account the different forms of energy involved. The vote is expressed in thirtieths with possible praise, according to the scheme reported in the "CdS" website at: http://www.unipa.it/dipartimenti/dicam/cds/ingegneriadeisistemiedilizi2027/.content/documenti/En-Valutazione-esame-orale_LM24-Ingegneria-dei-Sistemi-Edilizi.pdf
EDUCATIONAL OBJECTIVES	The course is aimed at providing the basic concepts that will make the student capable to solve energy and environmental problems caused by anthropogenic activities, both at urban and territorial level. The consequences of the use of renewable and non-renewable sources are analysed and qualitative and quantitative models for their assessment are proposed. The presented assessment methods refer to the in force national and European standards. Also, an overview of the energy technologies used both in the civil and industrial context, is presented. These technologies use renewable energy sources. Finally, the mainly responsible phenomena of the impact of anthropogenic activities on the natural environment are briefly described with a specific focus on the use of fossil and fissile fuels.
TEACHING METHODS	The class is composed by frontal lessons, exercises and a project work. Moreover, some visit to energy sites in the university campus is foreseen. Exercises are proposed by the teacher and developed by students, while the project is autonomously made by the students with the tutoring of teachers.
SUGGESTED BIBLIOGRAPHY	• Dispense didattiche inserite in rete ed a disposizione degli studenti. • Chiesa G. e Dall'O' G., "Gestione delle Risorse Energetiche nel Territorio". C.E.A. - Casa Editrice Ambrosiana. • Filippi M., Rizzo G., "La certificazione energetica e la verifica ambientale degli edifici", Dario Flaccovio Editore, Palermo, 2007. • Filippi M., Rizzo G., Scaccianoce G., "La certificazione energetica per l'edilizia sostenibile", Dario Flaccovio Editore, Palermo, 2014. • Scheer H., "Autonomia Energetica. Una nuova politica per le energie rinnovabili". Edizioni Ambiente. • Normativa di settore.

SYLLABUS

Hrs	Frontal teaching
2	Course introduction. General remarks on energy problems in the territory. The different forms of energy. The energy conservation law. Energy quality and its degradation. Energy and net useful work. Irreversibility types in transformations. The exergy concept. Comparison among energy sources.
6	The energy demand of the humankind. Historical data on energy consumption. Energy balances of human societies in various historical époques. Energy balances at territorial scale. Different forms of primary energy. Classification of the primary energy sources. The non-renewable energy sources: coal, natural gas, petrol. The non-breeder nuclear fission. The almost inexhaustible energy sources. The endogenous heat. The nuclear power. Origin of nuclear fuels. Introduction to the renewable energy sources (RES). Environmental and economic benefits deriving from the use of RES. Limits to the use of RES. RES availability.
6	The Sun. Physical characteristics. The spectrum of the extra-terrestrial solar radiation. Solar paths. Brief description on the extra-terrestrial and terrestrial solar radiation. Shadows. Climatic data at territorial scale.
10	Energy distribution within the territory. Energy vectors and users. Plants for the energy transformation. Low temperature solar thermal system. The flat-plate solar collector. General characteristics of the flat-plate solar collectors. Technological characteristics of a solar thermal plant. Typologies of solar collectors: integrated-storage, vacuum and uncovered. Designing of a solar thermal plant. Economically optimal sizing of a solar panels' system. Environmental analysis of flat solar systems. Photovoltaic solar system. The photovoltaic effect. Systems and components for the photovoltaic conversion: the photovoltaic cell. The wind power. The biomass. Hydrogen fuel cells for the electric power generation. Brief description of the cogeneration for the combined production of electric and thermal energy. The geothermal energy.
10	Building Energetics. Energy demand of buildings. The indoor requirements. Green roofs.
8	Tools for the environmental sustainability assessment. Environmental consequences of the energy production from primary and secondary sources. Primary and secondary pollutants. Natural and anthropogenic pollution sources. Effects on humans and the environment. Transport-related atmospheric pollution. The environmental impact at global and local level. The Environmental Impact Assessment (EIA). The Strategic Environmental Assessment (SEA). The Ecological Footprint.

Hrs	Practice
39	Support and tutoring in class for the project.