Last update: 12-07-2019

390205 - SCE - Energy Systems and Components

Coordinating unit: 390 - ESAB - Barcelona School of Agricultural Engineering

Teaching unit: 745 - EAB - Department of Agri-Food Engineering and Biotechnology

Academic year: 2019

Degree: BACHELOR'S DEGREE IN BIOSYSTEMS ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR ' S DEGREE IN AGRONOMIC SCIENCE ENGINEERING (Syllabus 2018). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN FOOD ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN AGRICULTURAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN AGRICULTURAL, ENVIRONMENTAL AND LANDSCAPE ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN FOOD ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)

ECTS credits: 6 Teaching languages: Catalan, Spanish, English

Teaching staff

Coordinator: JOAN MAJO ROCA

Others: Joan Majó Roca
Jordi Llop Casamada

Degree competences to which the subject contributes

Specific:

2. Rural engineering: engines and machinery, electrical engineering.

Teaching methodology

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Learning objectives of the subject

To track this course is that students achieve a basic vocabulary and an overview of energy systems. It aims to introduce students to the basics of electrical and thermal power systems, their applications, as well as saving technologies and energy efficiency, not to mention environmental issues.
Must be able to know the behavior of electrical systems, machines thermal criteria of energy efficiency and environmental protection. It aims to have the capacity to select and successfully apply these technologies in rural areas, as well as mastering the techniques of calculation introduced the subject.

Last update: 12-07-2019

390205 - SCE - Energy Systems and Components

Study load

Total learning time: 150h	Hours large group:	40h	26.67%
	Hours medium group:	0h	0.00%
	Hours small group:	20h	13.33%
	Self study:	90h	60.00%

Last update: 12-07-2019

390205 - SCE - Energy Systems and Components

Content

INTRODUCTION TO ENERGY SYSTEMS

Learning time: 5h

Theory classes: 2h
Self study : 3h

Description:
Introduction to the subject. Macro quantities of energy. Demand for primary energy-producing and energy end. Energy intensity. Environmental impact of energy consumption.

Related activities:
Activity 1: Class of theoretical explanation
Activity 2: Individual final assessment
Activity 5: Work: Update energy data

ELECTRICAL SYSTEMS single and three phase

Learning time: 45h

Theory classes: 10h
Laboratory classes: 8h
Self study : 27h

Description:
AC single phase. Representation Cartesian and complex. Serial and parallel connection. Instantaneous power, active, reactive and apparent. Theorem Boucherot. Energy efficiency in power transmission. Improved power factor.
Three-phase systems. Connecting generators and receivers in star and triangle. Relations-voltage intensity. Active power, reactive and apparent three-phase systems. Improved power factor receptors balanced.

Related activities:
Activity 1: Class of theoretical explanation
Activity 2: Individual final assessment
Activity 3: Solving exercises and problems
Activity 4: Practice Lab. Measure three phase power systems.
Activity 5: Work: Description of electrical installation

Last update: 12-07-2019

390205 - SCE - Energy Systems and Components

ELECTRICAL MACHINES	Learning time: 20h Theory classes: 6h Laboratory classes: 2h Self study : 12h

Description:
Basic principles of electrical machines. Classification. Qualitative study of generators and transformers. Three-phase electric motors: synchronous speed; slip; torque-speed curve; diagram powers; nameplate. Energy efficiency loads driven by electric motors. Speed regulation. Frequency inverters. Applications.

Related activities:
Activity 1: Class of theoretical explanation
Activity 2: Individual final assessment
Activity 3: Solving exercises and problems

DEFINITIONS AND FUNDAMENTAL CONCEPTS OF THERMAL MACHINES	Learning time: 30h Theory classes: 8h Laboratory classes: 4h Self study : 18h

Description:
Thermodynamic principles. Ideal thermodynamic cycles: cycles of steam production work (Rankine); power cycles gases (Otto, Diesel, Sabathe). Income heat. Charts and diagrams theoretical real.
Components of petroleum fuels. Technical specifications (calorific value, octane, density, additives, antiknock power, volatility, etc ...). Specifications for the use of bio fuels. Combustion: mass balance and energy balance.

Related activities:
Activity 1: Class of theoretical explanation
Activity 2: Individual final assessment
Activity 3: Solving exercises and problems

Last update: 12-07-2019

390205 - SCE - Energy Systems and Components

POWER AND EFFICIENCY OF MOTORS endothermic	Learning time: 30h Theory classes: 8h Laboratory classes: 4h Self study : 18h

Description:
Diagrams pressures. Powers: indicated effectively absorbed half. Yields. Specific consumption. Cost of operation. Characteristic curves (power, torque). Calculating powers. Brake torque (power measurement)

Related activities:
Activity 1: Class of theoretical explanation
Activity 2: Individual final assessment
Activity 3: Solving exercises and problems
Activity 4: Practice Lab.

PRODUCTION OF HEAT AND COLD AND MORE EFFICIENT TECHNOLOGIES	Learning time: 20h Theory classes: 6h Laboratory classes: 2h Self study : 12h

Description:
Steam production: boilers. Classification. Yields. Components of the facilities. More efficient technologies. Cooling systems. Diagram of compression refrigeration cycle. Components of a cooling system. Technologies efficient cooling systems.
CHP: concept, classification, characteristic parameters (REE ratio E / V, PES, etc ...) and application examples. Trigeneration.

Related activities:
Activity 1: Class of theoretical explanation
Activity 2: Individual final assessment
Activity 3: Solving exercises and problems

Last update: 12-07-2019

390205 - SCE - Energy Systems and Components

Planning of activities

ACTIVITY 1. THEORETICAL EXPLANATION	Hours: 88h Theory classes: 38h Self study: 50h
ACTIVITY 2. INDIVIDUAL ASSESSMENT TESTS	Hours: 2h Theory classes: 2h
ACTIVITY 3. RESOLUTION OF EXERCISES AND PROBLEMS	Hours: 40h Laboratory classes: 16h Self study: 24h
ACTIVITY 4. LABORATORY	Hours: 10h Laboratory classes: 4h Self study: 6h
ACTIVITY 5. DESCRIPTION AND ANALYSIS OF A DOMESTIC ELECTRICAL INSTALLATION	Hours: 10h Self study: 10h

Qualification system

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390205 - SCE - Energy Systems and Components

Bibliography

Basic:

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Llorens, M.; Miranda, A.L. Ingeniería térmica. Barcelona: CEAC, 1999. ISBN 843296560X.

Giacosa, D. Motori endotermici. 14a. Itàlia: Hoepli Editore, 1986. ISBN 8820314576.

Agüera Soriano, José. Termodinámica lógica y motores térmicos. 6ª ed. mejorada. Madrid: Ciencia 3, 1999. ISBN 8486204984.

Molina Martínez, José Miguel; Cánovas Rodríguez, Francisco Javier; Ruz Vila, Francisco Asís. Motores y máquinas eléctricas: fundamentos de electrotécnia para ingenieros. Barcelona: Marcombo, 2012. ISBN 9788426717948.

Complementary:

De Francisco, A.; Castillo, J.L.; Torres, J.L. La Energía eléctrica en la explotación agraria y forestal. Madrid: Mundi Prensa, 1993. ISBN 847114333X.

Cedrà, C. Les tracteurs agricoles. París: Tec & Doc, 1991. ISBN 2852068095.

Mitjà, Albert. La Cogeneració en els anys noranta : experiències a Catalunya. Barcelona: Generalitat de Catalunya. Departament d'Indústria i Energia, 1994. ISBN 8439329237.

Hoz Casas, Jordi de la; Blas del Hoyo, Alfredo de. Máquinas eléctricas [on line]. Barcelona: Edicions UPC, 2006 [Consultation: 20/03/2017]. Available on: <http://hdl.handle.net/2099.3/36709>. ISBN 9788483018705.

Others resources:

Hyperlink

Programes informàtics PROPAGUA i PROGASES

http://www.tecnun.es/asignaturas/termo/SOFTWARE/SoftTD.htm