

UNIVERSIDAD AUTÓNOMA DE BAJA CALIFORNIA
COORDINACIÓN DE FORMACIÓN BÁSICA
COORDINACIÓN DE FORMACIÓN PROFESIONAL Y VINCULACIÓN UNIVERSITARIA
PROGRAMA DE UNIDAD DE APRENDIZAJE

I. IDENTIFICATION DATA

- 1. Unidad Académica:** Facultad de Ciencias Marinas
- 2. Programa Educativo:** Licenciatura en Ciencias Ambientales
- 3. Plan de Estudios:**
- 4. Nombre de la Unidad de Aprendizaje:** Energías Alternas
- 5. Clave:**
- 6. HC: 01 HL: 03 HT: 01 HPC: 01 HCL: 00 HE: 01 CR: 07**
- 7. Etapa de Formación a la que Pertenece:** Terminal
- 8. Carácter de la Unidad de Aprendizaje:** Optativa
- 9. Requisitos para Cursar la Unidad de Aprendizaje:** Ninguno

Equipo de diseño de PUA
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II. PURPOSE

Alternative Energies is an optional subject taught in the in the terminal stage of Environmental Sciences Program. Its purpose is to acquire the basic engineering knowledge for capture and transfer energy from renewable sources. Using a scientific and technological methodology, to understand the processes that govern the coupling of the power generation cycles of the nature with the electromechanical devices that capture and allow taking advantage of this energy and providing knowledge and skills to support the professional performance of the Environmental Sciences, for the benefit of society and the environment.

III. COMPETENCY

Explain the environmental context of the processes of capturing and transforming energy from renewable sources, by evaluating the operation bases of renewable power stations, in order to reduce greenhouse gas emissions and promote the sustainable use of energy, with solidarity, attachment to the truth, professional ethics and respect for nature.

IV. EVICENCE (S) OF PERFORMANCE

Prototypes equipment design for capture and production energy, which contains identification of environmental conditions and data collection in order to generate basic designs of system for energy generation from renewable sources.

V. UNITS

UNIT I. Energy Context, Environment and Society

Competencia:

Evaluate the historical context of employment and generation of energy in the world, the consumption of energy and the development of renewable and non-renewable sources and the current state of technology. Through the analysis of historical background, concepts such as the environment, the environmental aspect, and sustainable development. To understand in context that the use of renewable energy is a legacy to future generations.

Contenido:**Duration: 2 hours**

- 1.1. Historical review of energy use
- 1.2. No renewable energy
- 1.3. Renewable energy

UNIT II. Energía Solar

Competencia:

Analyze the basic principles of solar energy use by means the engineering processes applied to the collection and transformation of energy from the sun, in order to generate a numerical design and resolution methodology for practical problems, with creativity.

Contenido:

- 2.1. Photovoltaic Solar Energy
 - 2.1.1. Solar Energy Technology
 - 2.1.2. Autonomous photovoltaic systems
 - 2.1.3. Photovoltaic systems connected to the grid
- 2.3. Thermal solar energy
 - 2.3.1. Solar Thermal Technology
 - 2.3.2. System elements
 - 2.3.3. Conventional support system
 - 2.3.4. Medium and high temperature solar thermal energy

Duration: 2 hours

UNIT III. Wind Energy

Competency:

Analyze capture, production, and transfer balance sheets of wind power through the assessment of their generation processes, their application in production processes and their socioeconomic and environmental impacts, to promote their efficient use, with a critical attitude and responsibility with the environment.

Contents:

- 3.1. Technology
- 3.2. Autonomus wind systemss
- 3.3. Wind systems connected to the grid

Duration: 2 horas

UNIDAD IV. Biomass energy

Competency:

Analyze the liberation, transformation and storage processes of the energy, from the Biochemical and Physicochemical reactions of the Biomass. Through mathematical equations of kinetics and reactions of energy release, in order to take advantage of the waste organic solids of production processes, with a critical attitude and responsibility with the environment.

Contents:

Duration: 2 hours

4.1. Technology

4.1.1. Direct combustion

4.1.2. Thermo-chemical combustion

4.1.3. Physical-chemical combustion

4.1.4. Biochemical combustion

UNIDAD V. Hydraulic energy

Competency:

Assessment of future hydraulic energy scenarios in Mexico, by compact hydroelectric plants designs applications, the country's water resources assessment, and the rational use of natural sources, and the small hydroelectric power plants designs for small riverbeds streams residual waters, with the purpose of proposing schemes of sustainable development, with a critical attitude and responsibility with in the environment

Contents:

- 5.1. Hydraulic technology
- 5.2. System elements

Duration: 4 hours

UNIDAD VI. Geothermic energy

Competency:

Processes analysis of subsurface magma heat in energy transformation into electric energy, by the geothermal regional and country deposits assessments, in order to evaluate their potential and new applications, with a critical attitude and responsibility in the environment.

Contents:

- 6.2. Geothermic energy technology
- 6.3. System elements

Duration: 2 hours

VI. LABORATORY PRACTICE

Workshop No.	Competencia	Development	Materials	Duration
1	Identify different device types used to capture photovoltaic solar energy, by design of energy capture and transfer prototypes, in order to apply them, in electric motors.	Design a device for capturing photovoltaic energy, assemble the prototype and test its performance, with support from the workshop guide	Electric motors, solar cells, connectors, inverter and battery charger, multimeter, soldering iron,, workshop guide	6 hours
2	Describe the properties of heat capture and transfer devices and the fluids and their static and dynamic behavior, their temperature increases, in order to apply their knowledge in prototypes design of, with responsibility.	Diseña un dispositivo de captación de energía solar térmica, ensambla un prototipo y mide su eficiencia, con apoyo de la guía del taller.	Tubos de cobre, bastidores de madera, conectores, soplete y soldadura de estaño, material reflejante, pintura negra, guía del taller.	8 hours
3	Identificar los dispositivos mecánicos y electromecánicos de captación de energía eólica y su conversión a energía, mecánica y eléctrica. Para aprender sus parámetros de funcionamiento, con compromiso por el bien común y respeto por la naturaleza.	Assess wind generators performance under different operating conditions, with the support of the workshop guide	Wind generator, Windmill water pumping, multimeter, anemometer, thermometer, workshop guide.	9 hours
4	Identificar los diferentes tipos de digestores que se emplean para tratamiento de biomasa mediante el monitoreo de las reacciones de hidrólisis y catálisis para determinar su aprovechamiento como energía térmica y/o química, Con un trabajo solidario y de respeto a los compañeros y el medio ambiente.	Diseña un digestor de biomasa y producción de compuestos químicos de alta energía. Ensamblar el prototipo y probar su desempeño con respecto a los demás grupos de la sesión, con apoyo de la guía del taller.	Temperature sensors, mechanical agitators, blender, digesters, densitometer, workshop guide.	8 hours
5	Identify different types of digesters used for biomass treatment by monitoring hydrolysis reactions and catalysis, in order to determine their	Hydraulic turbines assessment for electrical energy generation assembles a prototype and measures its	PVC pipes, connectors, glue, convection stove, multimeter torque meter, water tank, workshop guide.	9 hours

	use as thermal and / or chemical energy, with a work of solidarity and respect for colleagues and the environment.	efficiency, with the support of the workshop guide.		
6	Components identification of a geothermal energy system, by components review and State electricity energy standards, in order to characterize a geothermal energy generating plant with a sense of social responsibility	Identify a geothermal power plant parts, with the support of the workshop guide	Thermometers, computer, workshop guide.	8 hours

VI. WORLSHOP PRACTICE

Workshop No.	Competencia	Development	Materials	Duration
1	Prototypes design for energy capture and production, containing environmental conditions and data collection, in order to generate renewable energy generation and system designs.	Draw and design renewable energy prototypes, with the support of the workshop guide.	Workshop guide, prototype material	16 hours

VI. FIELD TRIP PRACTICE

Workshop No.	Competency	Development	Materials	Duration
1	Mechanisms identification of a geothermal energy system, by means of a field trip of the geothermal fields in Cerro Prieto, in order to characterize a geothermal energy generating plant and social solidarity	Geothermal fields prospection in Ensenada region field trip, with the support of the workshop guide.	UABC vehicle, field notebooks, Gps,	16 hours

VII. METHODOLOGY

Framework:

The first day of class the teacher establishes the form of work, the evaluation criteria, the quality and characteristics that the academic work must have, and the rights and obligations of both the teacher and the student.

Estrategia de enseñanza (docente)

El curso comprenderá diferentes dinámicas de grupo para asegurar el cumplimiento de las competencias.

En las clases de teoría y taller se hará uso del pizarrón o de otros materiales audiovisuales para explicar al alumno los conceptos teóricos de la asignatura de manera clara y breve, ilustrando dichos conocimientos mediante un acervo de problemas y ejercicios en donde se demostrará al estudiante como aplicar los conocimientos teóricos a modelos sencillos de dispositivos de captación de energía, contando con la disponibilidad de material didáctico y apuntes en página web del curso.

En la enseñanza interactiva, el profesor estará encargado de exponer algunos de los temas, para ello realizará la demostración de las actividades a realizar en los talleres, durante las exposiciones el docente ocupará medios audiovisuales y hará diferentes preguntas para fomentar el debate de ideas. En el taller el docente promueve el orden y respeto

Promover tanto el aprendizaje y la argumentación individual como el trabajo en equipo y la discusión basada en consensos.

Facilitar el aprendizaje de la solución de problemas mediante la realización de los ejercicios de investigación utilizando como contraste las hipótesis de trabajo planteadas por los alumnos como base del método científico.

Motivar a los alumnos a leer sobre problemáticas ambientales contemporáneas, así como para exponer y discutir en equipos sobre sus causas y alternativas de solución.

Teaching strategy (teacher)

The course will include different group dynamics to ensure compliance with the competences.

In theory and workshop classes, the blackboard or other audiovisual materials to explain to the student the theoretical concepts of the subject in a clear and brief manner.

Illustration the knowledge through a collection of problems and exercises where the student, how apply the theoretical knowledge to simple models of energy capture devices, counting on the availability of teaching material and notes on the course website.

Learning strategy (student)

Collaborative learning will be use; the students organized by teams to work during the course and in the workshop practices from which they will deliver a final research in writing.

The students will carry out bibliographical research and discussion groups; will deliver reading reports that include a personal interpretation of the student.

The written report of the workshop and field work, should include: Introduction, and objectives, materials, methodology, results (graphs, tables, and images), discussions, conclusions and bibliography

VIII. EVALUATION CRITERIA

Accreditation criteria

- 80% attendance to be entitled to ordinary examination and 40% attendance to be entitled to extraordinary examination according to the School Statute articles 70 and 71.
- Scaled from 0 to 100, with a minimum approval of 60.

Evaluation criteria

- Requirements to accredit the subject:
- 80% attendance in workshops given.
- Carry out the different activities developed in the course, which will be evaluated by the following qualification criteria:

3 partial exams:	30 %
Workshop reports, must contain prototype design, environmental conditions, data gathering, of a generation system of renewable energy	
Tasks (exercises of each unit):	50 %
Final project base on a complete study case of energy application.....	20 %
Total	100 %

IX. REFERENCES

Básicas	Complementarias
<p>Carta González et al. 2009. Centrales de Energías Renovables, Pearson Educación, Madrid. ISBN. 978-84-8322-600-1.</p> <p>Bo Hanus.2012. Energías Alternativas en nuestro Hogar. Tikal ediciones, Madrid, 9788499281582</p> <p>Nirmalakhandan.N. (2002) Modeling tools for environmental engineers and scientist. Ed. CRC Press.</p> <p>Griskey R. G. (2002). Transport Phenomena and Unit Operations a Combined Approach. Ed John Wiley & Sons, Inc.</p> <p>Perales Benito, Tomás (2009) Guía del instalador de energías renovables: energía fotovoltaica, energía térmica, energía eólica, climatización Editor: Creaciones Copyright, Páginas:254 p: ISBN:9788496300569</p>	<p>Scenna N. (1999) Modelado, Simulación y optimización de procesos químicos. ISBN: 950-42-0022-2</p> <p>Nigro N. & Storti M. (2005). Métodos Numéricos en Fenómenos de Transporte. Ed. CIME.</p> <p>Reynolds. J, Jeris J. & Theodore (2002) Handbook of chemical and environmental calculations. Ed. Wiley-interscience. ISBN: 0-471-40228-1.</p> <p>Dolores M.E. (1998) Solución de problemas de ingeniería con Matlab. Ed. Prentice Hall, ISBN: 0-13-397688-2.</p> <p>Sorensen B. (2004) Renewable Energy. Ed. Elsevier Science, ISBN: 0-12-656150-8.</p> <p>Luque A & Hegedus S. (2003) Handbook of Photovoltaic Science and Engineering. Ed. Wiley & Sons. ISBN: 0-471-49196-9.</p> <p>Talayero Navales, Ana Patricia (2008) Energías renovables: energía eólica..Editor: Universidad de Zaragoza, Páginas:302 p. :ISBN: 9778492521210</p>

X. TEACHING PROFILE

The teacher of this subject must have a Bachelor's degree in Environmental Engineering, Bachelor of Environmental Sciences, related area and preferably postgraduate in natural sciences, or proven experience in the area.