FACULTAD DE CIENCIAS E INGENIERÍA

SUSTAINABLE ENERGY
2024-2

I. INFORMACIÓN GENERAL

CURSO	SUSTAINABLE ENERGY
CLAVE	ING310
CRÉDITOS	3
HORAS DE DICTADO	CLASE: 3 Semanal
HORARIO	TODOS
PROFESORES	ROLF GRIESELER RAMZY FRANCIS KAHHAT ABEDRABBO

II. PLANES CURRICULARES DONDE SE DICTA EL CURSO

ESPECIALIDAD	ETAPA	NIVEL	CARÁCTER	REQUISITOS
INGENIERÍA CIVIL	PREGRADO EN FACULTAD	0	ELECTIVO	Cred.en Especialidad : 140.00
INGENIERÍA MECATRÓNICA	PREGRADO EN FACULTAD	0	ELECTIVO	Cred.en Especialidad : 140.00
INGENIERÍA DE MINAS	PREGRADO EN FACULTAD	0	ELECTIVO	Cred.en Especialidad : 140.00
INGENIERÍA ELECTRÓNICA	PREGRADO EN FACULTAD	0	ELECTIVO	Cred.en Especialidad : 140.00
INGENIERÍA AMBIENTAL Y SOSTENIBLE	PREGRADO EN FACULTAD	8	OBLIGATORIO	Cred.en Especialidad : 110.00

Tipos de requisito

04 = Haber cursado o cursar simultáneamente

05 = Haber aprobado o cursar simultáneamente

06 = Promedio de notas no menor de 08

07 = Haber aprobado el curso

III. DESCRIPCIÓN DEL CURSO

Sustainable energy can be defined as an energy source that provides society with energy-derived advantages without negative impacts to natural systems and appropriate consideration to related social and economic implications. The course exposes students to the principles of sustainability and sustainable energy, provides an introductory overview of the current major sources of energy and related environmental and societal impacts, and takes an introductory look at where the world may find sustainable energy sources in the future.

This course is designed to increase the student understanding of the role of energy in modern society, the link between energy consumption, environmental degradation, societal impacts and alternative energy approaches for the future.

IV. SUMILLA

This course is designed to increase the student understanding of the role of energy in modern society, the link between energy consumption and environmental degradation, and alternative energy approaches.
Through the student work in the course program, the student will be able to: Understand the current major sources of energy and how each of these sources is used; Understand the environmental impacts associated with extraction, transportation and use of the current major sources of energy; Identify what are the alternative sources of energy that are being pursued, their limitations and the prospects for alternative sources replacing traditional sources of energy; Be familiar with the role of energy in a modern society, the link between energy use and economic advancement and energy conservation as an alternative to energy consumption; Know the scientific evidence behind global warming; Understand how energy is used in developing countries and the link between economic advancement and energy consumption in the globe; Understand the relationship between energy use and consumer behavior.

V. OBJETIVOS

Through the student work in the course program, the student will be able to:

- Understand the current major sources of energy and how each of these sources is used;
- Understand the environmental and societal impacts associated with extraction, transportation and use of the current major sources of energy;
- Identify what are the alternative sources of energy that are being pursued, related environmental and societal impacts, their limitations and the prospects for alternative sources replacing traditional sources of energy;
- Be familiar with the role of energy in a modern society, the link between energy use and economic advancement and energy conservation as an alternative to energy consumption;
- Know the scientific evidence behind global warming;
- Understand how energy is used in developing countries and the link between economic advancement and energy consumption in the globe;
- Understand the relationship between energy use and consumer behavior.

The course contributes to the achievement of the following Student Outcomes:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.
3. an ability to communicate effectively with a range of audiences.
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

VI. PROGRAMA ANALÍTICO

CAPÍTULO 1 **INTRODUCTION TO ENERGY AND SUSTAINABILITY. PAST AND CURRENT WORLD ENERGY DEMAND AND SUPPLY. ENERGY USE BY SECTORS. (.5 semanas)**

CAPÍTULO 2 **ENERGY FUNDAMENTALS. FORMS OF ENERGY. UNITS OF ENERGY. THE FIRST AND SECOND LAW OF THERMODYNAMICS. IDEAL HEAT ENGINES. (1 semanas)**

CAPÍTULO 3 **NON-RENEWABLE AND RENEWABLE ENERGY. PRIMARY AND SECONDARY ENERGY SOURCES. (1 semanas)**

CAPÍTULO 4 **ELECTRICAL ENERGY GENERATION AND TRANSMISSION. (.5 semanas)**

CAPÍTULO 5 **COAL FORMATION. COAL RESERVES AND MINING. TYPES OF COAL. COAL CONSUMPTION. COAL AND THE ENVIRONMENT. (1 semanas)**

CAPÍTULO 6 **CRUDE OIL FORMATION, DRILLING AND REFINING. CRUDE OIL RESERVES AND CONSUMPTION. OIL, TRANSPORTATION AND ENVIRONMENT. (.5 semanas)**

CAPÍTULO 7 **NATURAL GAS FORMATION, EXTRACTION AND TRANSPORTATION. UNCONVENTIONAL SOURCES. NATURAL GAS CONSUMPTION. NATURAL GAS AND THE ENVIRONMENT. (1 semanas)**

CAPÍTULO 8 **NUCLEAR ENERGY. RADIOACTIVITY. NUCLEAR REACTORS. URANIUM RESOURCES. ENVIRONMENTAL AND SOCIETAL CONCERNS. THE CHERNOBYL AND FUKUSHIMA DISASTERS. (1 semanas)**

CAPÍTULO 9 **HYDROPOWER. HYDROLOGICAL CYCLE. HYDROPOWER IN THE WORLD. ENVIRONMENTAL CONCERNS. (1 semanas)**

CAPÍTULO 10 **GEOTHERMAL ENERGY. PHYSICS OF GEOTHERMAL RESOURCES. RESOURCES. TYPES OF GEOTHERMAL PLANTS. ENHANCED GEOTHERMAL SYSTEMS. ENVIRONMENTAL IMPLICATIONS. (1 semanas)**

CAPÍTULO 11 **SOLAR ENERGY. GENERAL CHARACTERISTICS. PASSIVE AND ACTIVE SOLAR THERMAL ENERGY FOR BUILDINGS. SOLAR THERMAL ELECTRIC SYSTEMS: CONCENTRATING SOLAR POWER. SOLAR PHOTOVOLTAIC SYSTEMS. SUSTAINABILITY ATTRIBUTES. (1 semanas)**

CAPÍTULO 12 **BIOENERGY. CHARACTERIZING THE BIOMASS RESOURCE. RELEVANCE TO ENERGY PRODUCTION. PRODUCTION. BIOMASS TO ELECTRICITY AND FUELS. ENVIRONMENTAL ISSUES. (.5 semanas)**

CAPÍTULO 13 **WIND ENERGY. INTRODUCTION TO WIND. WIND RESOURCES. WIND MACHINERY AND GENERATING SYSTEMS. ENVIRONMENTAL ISSUES. (1 semanas)**

CAPÍTULO 14 **OCEAN POWER. WAVE AND TIDAL ENERGY. ENVIRONMENTAL ISSUES. (1 semanas)**

CAPÍTULO 15 **ELECTROCHEMICAL ENERGY STORAGE. BATTERIES. MODERN LITHIUM ION BASED BATTERIES. HYDROGEN AS ENERGY STORAGE. INSIGHTS OF HYDROGEN PRODUCTION. HYDROGEN STORAGE AND TRANSPORT. GENERATION OF ELECTRICAL ENERGY IN A HYDROGEN FUEL CELL. (.5 semanas)**

CAPÍTULO 16 **CLIMATE CHANGE. CARBON CAPTURE AND SEQUESTRATION AND CARBON MITIGATION POLICIES. (.5 semanas)**

CAPÍTULO 17 **ENERGY AND RESIDENTIAL BUILDINGS. ROLE OF ENERGY IN SOCIETY (.5 semanas)**

CAPÍTULO 18 **FUTURE ENERGY PORTFOLIOS. NUCLEAR FUSION. INTRODUCTION TO GEOENGINEERING. (.5 semanas)**

VII. METODOLOGÍA

During the lectures the content will be presented using slides and blackboard. The instructor will assign various assignments to complement academic lectures. These may include: readings, quizzes, discussions and in-class cooperative activities, essays, individual tasks, reports, presentations and more. Punctual attendance of students and active class participation are necessary and will be an important part of student grade.

VIII. EVALUACIÓN

Sistema de evaluación

N°	Codigo	Tipo de Evaluación	Cant. Eval.	Forma de aplicar los pesos	Pesos	Cant. Eval. Eliminables	Consideraciones adicionales	Observaciones
1	Nf	Nota Unica	1	Por Promedio	Nf=1	0		

Modalidad de evaluación: 4

Fórmula para el cálculo de la nota final

(1Nf) / 1

Aproximación de los promedios parciales No definido

Aproximación de la nota final No definido

Consideraciones adicionales

This course applies the evaluation mode 4 or special assessment, which states that the instructor will submit one sole grade to the school. The course grade will include individual assignments, essays, reading quizzes, semester project, cooperative activities, and others.

IX. BIBLIOGRAFÍA

Referencia obligatoria

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  Oxford ; New York : Oxford University Press in association with the Open University, c2004
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  Energy and the Environment: Scientific and Technological Principles. Oxford University Press.
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  Hinrichs, R., & Kleinbach, M.
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  Energy: its use and the environment. Cengage Learning.
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  Kahhat, R. F.; Ziegler, K. E.; Margallo, M.; Aldaco, R.; Irabien, A.; Vazquez, I.
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  Waste To Energy Potential In Latin America. In 7th International Symposium on Energy from Biomass and Waste VENICE 2018 (pp. 1-10) PADOVA: CISA Publishers.
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  MacKay, David J. C.
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  Sustainable energy : without the hot air
  Cambridge, Reino Unido : UIT, 2009.
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  Cambridge, MA : MIT Press, 2005.
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  Vázquez-Rowe, I., Kahhat, R., Larrea-Gallegos, G., & Ziegler-Rodriguez, K.
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  Peru's road to climate action: Are we on the right path? The role of life cycle methods to improve Peruvian national contributions
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  Verán-Leigh, D., & Vázquez-Rowe, I.
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  Life cycle assessment of run-of-river hydropower plants in the Peruvian Andes: a policy support perspective
  The International Journal of Life Cycle Assessment, 24(8), 1376-1395.
- Libro
  Ziegler, K. E.; Margallo, M.; Aldaco, R.; Vazquez, I.; Kahhat, R. F.
  2019
  Transitioning from open dumpsters to landfilling in Peru: Environmental benefits and challenges from a life-cycle perspective.
  Journal of Cleaner Production, 229, pp. 989-1003.

X. POLÍTICA CONTRA EL PLAGIO

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