

SUSTAINABLE ENERGY (SENR)

SENR 615 Oil and Gas Geopolitics **3 Credits**
Grade Mode: Standard Letter, Audit/Non Audit

This course focuses on geopolitical aspects of the oil and gas industry starting with an introduction of history of oil and gas and the geopolitics. It provides a global understanding of sources of crude oil and natural gas; current statistics of oil and gas reserve and production; economic analysis and environmental impacts of the oil and gas industry; finance and current market share; the future of this fossil fuel industry versus sustainable energy resources.

SENR 724 Solid State Physics **3 Credits**
Grade Mode: Standard Letter, Audit/Non Audit

The course covers the physics concepts that describe the electrical, optical and thermal properties of materials and their energy related applications as well as some of the advanced techniques that are used to study these properties. Course topics include: (i) Perfect crystals and defects, (ii) electronic properties, (iii) Optical properties, (iv) thermal properties, (vi) Properties of Nanomaterials.

SENR 727 Science and Engineering of Thin Films and Interfaces **3 Credits**
Grade Mode: Standard Letter, Audit/Non Audit

It introduces fundamentals of thin films and their applications in solar PV

SENR 740 Energy Resources, Generation, Science and Technology **3 Credits**
Grade Mode: Standard Letter, Audit/Non Audit

It introduces comparatively basic technology and economic aspects of various energy resource technologies

SENR 741 Oil and Gas Technology and Economics **3 Credits**
Grade Mode: Standard Letter, Audit/Non Audit

This course focuses on various aspects of the oil and gas industry; the history of oil and gas and the geopolitics of the industry; sources of crude oil and natural gas; current statistics of oil and gas reserve and production; the process from extraction to consumer delivery (Well to Wheel); natural gas in Qatar; natural gas processing, transport, and storage; economic analysis and environmental impacts of the oil and gas industry; petroleum finance and current market share; the future of this fossil fuel industry versus sustainable energy resources.

SENR 742 The Life Cycle of Oil and Gas Fields **3 Credits**
Grade Mode: Standard Letter, Audit/Non Audit

This course focuses on the life cycle of an oil and gas fields; specifically, the upstream component. It discusses the technical, theoretical and operational aspects for this component. Drilling technologies and operations, formation evaluations, well testing, and production strategies will be studied. Moreover, it focuses on the recovery mechanisms, enhanced oil recovery, reservoir simulation and management, the life cycle of a well and the abandonment process. Finally, it discusses the environmental effects for this component of the oil and gas industry and how it has decreased over the past decades.

SENR 743 Photovoltaic Solar Technology **3 Credits**
Grade Mode: Standard Letter, Audit/Non Audit

This course focuses on various aspects of the oil and gas industry; the history of oil and gas and the geopolitics of the industry; sources of crude oil and natural gas; current statistics of oil and gas reserve and production; the process from extraction to consumer delivery (Well to Wheel); natural gas in Qatar; natural gas processing, transport, and storage; economic analysis and environmental impacts of the oil and gas industry; petroleum finance and current market share; the future of this fossil fuel industry versus sustainable energy resources.

SENR 744 Renewable Energy Systems **3 Credits**
Grade Mode: Standard Letter, Audit/Non Audit

This course is about comparative discussions of renewable energy systems

SENR 750 Energy Storage Devices and Systems **3 Credits**
Grade Mode: Standard Letter, Audit/Non Audit

This course is an introduction to the fundamentals and applications of lithium ion batteries, and the classifications of the different cathodes, electrolytes and anodes based on their physicochemical, structural and thermal properties. The course also reviews the electrochemical reactions, kinetics and transport mechanisms, and interfacial phenomena in batteries. Projects dealing with the application of lithium ion batteries for electric vehicles and solar energy will be included.

SENR 754 Smart Power Grids **3 Credits**
Grade Mode: Standard Letter, Audit/Non Audit

Smart Power Grids course will provide fundamental insights into century long energy studies that aims to match the demand with the supply, as well as a decade long research and development efforts in Smart Energy Grids to improve the energy efficiency, reliability, and environmental aspects of the power grids. More specifically, the course will provide a rich introduction to the new multi-disciplinary field of smart grids and it will cover variety of special topics including demand response, advanced metering networks, communication and sensing technologies, distributed energy generation and storage, electric vehicles, wide-area power system monitoring, energy markets, and cyber-security.

SENR 755 Micro-grids: Operation, Management and Planning **3 Credits**
Grade Mode: Standard Letter, Audit/Non Audit

It is about applications of smart grid technologies for small scale applications