COURSE NUMBER: Vm433	**COURSE TITLE:** Advanced Energy Solutions
CREDIT: 3	**PREREQUISITES:** Vm 235
TEXTBOOKS/REQUIRED MATERIAL: *Thermodynamics: An Engineering Approach*, 7th ed. in SI units, Cengel and Boles, 2008	**INSTRUCTOR:** Kwee-Yan Teh **DATE OF PREPARATION:** July. 10, 2012 **DATE OF UC APPROVAL:** Oct. 30, 2013
INSTRUCTOR(S): Kwee-Yan Teh	**SCIENCE/DESIGN:** n/a
CATALOG DESCRIPTION: Introduction to the challenges of power generation for a global society using the thermodynamics to understand basic principles and technology limitations. Covers current and future demands for energy; methods of power generation including fossil fuel, solar, wind and nuclear; associated detrimental by-products; and advanced strategies to improve power densities, efficiencies and emissions	**COURSE TOPICS:** 1. Conservation principle for mass, energy and entropy 2. Power producing devices 3. Work and heat transfer in ideal (reversible) and irreversible processes, 4. Thermodynamic relations and general properties 5. Mixtures of gases, applications with moist air 6. Combustion of hydrocarbon fuels, fuel cells 7. Chemical reactions and gaseous dissociation
COURSE STRUCTURE/SCHEDULE: Lecture: twice per week, 90 minutes each.	

COURSE OBJECTIVES [Course Outcomes in brackets]	1. To extend your knowledge of basic thermodynamic concepts required for quantitative understanding of advanced contemporary and future energy systems. 2. To help you develop critical and holistic understanding of the global energy challenge in technical as well as political, economic, regulatory and environmental terms.
COURSE OUTCOMES [Program Outcomes in brackets]	After completing Vm440, students should be able to: 1. Formulate performance and compute power for gas turbine cycle and steam turbine (Rankine) cycle [a,e] 2. Evaluate processes in moist air, evaporation and condensation of water [a,e] 3. Analyze processes that includes mixtures of gases and trace components [a,e] 4. Given a fuel type, compute the release of chemical energy and the adiabatic flame temperature [a,e] 5. Analyse the energy and entropy for a combustion process and evaluate the electrical potential for a fuel cell [a,e] 6. Use computational software to carry out systematic analysis of the energy processes and systems [k]
ASSESSMENT TOOLS [Course Outcomes in brackets]	Regular homework problems [1-9] Midterm and final exam [1-9]