Seoul National University of
Science & Technology
232 Gongneung-ro,Nowon-gu,
Seoul 01811 Korea

MSDE Module Descriptor

Module Title Energy Studies	**Module Code** MSDE 216	**Semester (Sem 1 / Sem 2)** Sem 2
Credits 10	**Level** 4	**Professor and email** Jihwan An Jihwanan@seoultech.ac.kr
Delivery Method Lecture	**Delivery Location** SeoulTech, Mugung Hall	

Module Synopsis

This module aims to provide the student the basic knowledge of thermodynamics, fluid mechanics, heat transfer and related thermal equipments and machines. Students learn about the 21st Century Grand Challenges, especially those related to energy and water problems. They learn about the energy-work-heat relationship and properties of change in pressure-volume-temperature relationships and their practical value calculations.
The learning outcomes cover an understanding of global and social responsibility, and skills of applying scientific principles to practical problems, planning and conducting a investigative project, and understanding the importance of teamwork and leadership.
Assessment is through mid-term and final examinations.

Outline Syllabus

Overview of Energy Study
Basic concepts and definitions. Introduction of thermodynamics, fluid mechanics, and heat transfer

First law of thermodynamics
Energy conservation law. Understanding of energy and work. Cycle.

Evaluating Properties
p-v-T relation. Retrieving thermodynamic properties. Internal energy, enthalpy and specific heats.

Control volume analysis using energy
Concept of control volume. Conservation of mass and energy for a control volume.

Second law of thermodynamics
Understanding of 2nd law. Irreversibility. Thermodynamic cycle. Maximum performance measure for cycles. Carnot cycle.

Fluid mechanics
Fluid statics. Hydraulic force and moment. Pressure measurements. Buoyancy
Momentum equation. Bernoulli equation. Energy equation. Internal and external flow.

Heat transfer
1st law in heat transfer. Surface energy balance. Conduction, convection, and radiation. Blackbody radiation.

Indicative Reading

1) Recommendations for purchase by students

Principles of Engineering Thermodynamics (8th ed.), Moran, Shapiro, Boettner, Bailey, Wiley

2) Books

1) Energy Studies, W. Shepherd and D.W. Shepherd, Imperial College, 2014

2) Energy- Technology and Directions for the Future, John R. Fanchi, 2004

NOTIONAL STUDENT WORKLOAD	**Hours**
MODE OF DELIVERY (FT / PT / DL)	FT
Lectures	45
Seminars	5
Tutorials	
Laboratories/studios/practical	
Directed learning	20
Independent Learning	30
Work experience/fieldwork	
Other: eg formal presentation	
Total Workload 100 hours for a 10 credit module 200 hours for a 20 credit module	100

Module Learning Outcomes	
KU1,2,4	KU1. Demonstrate basic knowledge of the scientific and mathematical foundations of engineering to solve basic problems. KU2. Perform simple analysis of familiar engineering systems. KU4. Define and investigate simple problems and familiar constraints that occur in engineering design with the aid of basic tools.
IPSA 1,4	IPSA1. Demonstrate the use of fundamental approaches to solving readily defined engineering problems. Illustrate solutions to basic engineering problems.
PVA 2,3	PVA2. Demonstrate creativity in discussing solutions to standard problems. PVA3. Able to evaluate how sustainable engineering techniques may be applied to engineering systems and products

Assessments	Assessment Type	Weighting %	Mid-Term/interim/final
Coursework			
Project			
Quiz			
Test			
Laboratory			
Exam	Problem solving Problem solving	40% 60%	Midterm Final
Presentation			