SYLLABUS

Date/ Revision 7 January 2016
Faculty Engineering
Approval

SUBJECT : THERMO FLUID SCIENCE 1

1. Identification of Subject:

Name of Subject :Thermo Fluid Science 1
Code of Subject : THFL-2110
SKS / ECTS :2/
Semester :3
Study Program :B-AVE
Lecturer :Neno Ruseno, S.T., M.Sc.

2. Competency

After having the course, students are expected to:

a) Understand concepts and definitions of thermodynamics.
b) Identify properties of a pure substance.
c) Understand about work and heat.
d) Describe about the first law of thermodynamics.
e) Understand about first law analysis for a control volume.
f) Understand about material removal processes.
g) Describe the second law of thermodynamics.
h) Understand about entropy.
i) Understand about second law analysis for a control volume.

3. Description of Subject:

This course provides an abbreviated version of standard thermodynamics, fluid mechanics, and heat transfer, covering topics that engineering students are most likely to need in their professional lives. Students in a combined thermal-fluids course can gain a basic understanding of energy and energy interactions, various mechanisms of heat transfer, and fundamentals of fluid flow.

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4. Learning Approach

Approach : Combination of Expository - inquiry and colaborative
Method : Discussion, question answer, sample problem, group work
Student Task : Home work, group report, group presentation
Media : LCD projector, slide.

5. Evaluation

a) Absence maximum : 25%
b) Participation in discussion : 5 points
c) Homework, Classwork : 5 points
d) Presentation, Simulation : 10 points
e) Daily Quiz : 20 points
f) Final Examination : 60 pointa

Total : 100 points

6. Contents/ Topics of Lecturing:

Week	Content/ Topics of Lecturing	Text Book Chapter	Remark
1	**Introduction and Overview:** Introduction to Thermal-Fluid Sciences; Thermodynamics; Heat Transfer; Fluid Mechanics; Importance of Dimensions and Units; Problem-Solving Technique.	Ch1 [1]	
2	**Basic Concepts of Thermodynamics:** Systems and Control Volumes; Properties of a System; Density and Specific Gravity; State and Equilibrium; Processes and Cycles; Temperature and the Zeroth Law of Thermodynamics; Pressure; The Manometer; The Barometer and Atmospheric Pressure.	Ch2[1]	
3	**Energy, Energy Transfer, and General Energy Analysis:** Introduction; Forms of Energy; Energy Transfer by Heat; Energy Transfer by Work; Mechanical Forms of Work; The First Law of Thermodynamics; Energy Conversion Efficiencies.	Ch3[1]	
4	**Properties of Pure Substances:** Pure Substance; Phases of a Pure Substance; Phase-Change Processes of Pure Substances; Property Diagrams for Phase-Change Processes; Property Tables; The Ideal-Gas Equation of State; Compressibility Factor—A Measure of Deviation From Ideal-Gas Behavior.	Ch4[1]	
5	**Energy Analysis of Closed Systems:** Moving Boundary Work; Energy Balance for Closed Systems; Specific Heats; Internal Energy, Enthalpy, and Specific Heats of Ideal Gases; Internal Energy, Enthalpy, and Specific Heats of Solids and Liquids.	Ch5[1]	
6	**Mass and Energy Analysis of Control Volumes:** Conservation of Mass; Flow Work and the Energy of a Flowing	Ch6[1]	

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	Fluid; Energy Analysis of Steady-Flow Systems; Some Steady-Flow Engineering Devices; Energy Analysis of Unsteady-Flow Processes.		
7,8	**The Second Law of Thermodynamics:** Introduction to the Second Law; Thermal Energy Reservoirs; Heat Engines; Refrigerators and Heat Pumps; Reversible and Irreversible Processes; The Carnot Cycle; The Carnot Principles; The Thermodynamic Temperature Scale; The Carnot Heat Engine; The Carnot Refrigerator and Heat Pump.	Ch7[1]	
9,10	**Entropy:** Entropy; The Increase of Entropy Principle; Entropy Change of Pure Substances; Isentropic Processes; Property Diagrams Involving Entropy; What is Entropy?; The *T ds* Relations; Entropy Change of Liquids and Solids; The Entropy Change of Ideal Gases; Reversible Steady-Flow Work; Isentropic Efficiencies of Steady-Flow Devices; Entropy Balance.	Ch8[1]	
11-13	**Power and Refrigeration Cycles:** Basic Considerations in The Analysis of Power Cycles; The Carnot Cycle and its Value in Engineering; Air-Standard Assumptions; An Overview of Reciprocating Engines; Otto Cycle: The Ideal Cycle for Spark-Ignition Engines; Diesel Cycle: The Ideal Cycle for Compression-Ignition Engines; Brayton Cycle: The Ideal Cycle for Gas-Turbine Engines; The Brayton Cycle with Regeneration; The Carnot Vapor Cycle; Rankine Cycle: The Ideal Cycle for Vapor Power Cycles; Deviation of Actual Vapor Power Cycles from Idealized Ones; How Can We Increase The Efficiency of The Rankine Cycle?; The Ideal Reheat Rankine Cycle; Refrigerators and Heat Pumps; The Reversed Carnot Cycle; The Ideal Vapor-Compression Refrigeration Cycle; Actual Vapor-Compression Refrigeration Cycle.	Ch9[1]	
14	**Rehearsal and Tutorial:** Rehearsal of all subject and students can ask for more detail.		
15	**Final Examination**		

7. Book Reference:

a) Main Text Book: [1] "Fundamentals of Thermal Fluid Sciences (SI Units), 4th Edition, 2012", Authors: Yunus Cengel, Robert Turner, John Cimbala, Publisher: Mc-GrawHill.

b) Supplement Textbooks:

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