



ME-618 Mechanical Engineering Measurements

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Textbook: J. P. Holman, Experimental Methods for Engineers, 7th Edition, McGraw Hill, 2001

References: R. J. Goldstein, Fluid Mechanics Measurements, Hemisphere Pub., 1983

1. Experiment Arrangement

Group 1 (thermofluids)	Flow Visualization & LDV
	Pumps
	Tubular Heat Exchanger
Group 2 (thermodynamics)	Gasoline Engine
	Diesel Engine
	Vapor-compression Cycle (A/C)
Group 3 (control)	PLC (Programmable Logic Control)
	PID (Proportional, Integral, Differential) Control
Group 4 (special topics)	Fluidization
	Precision Machining

2. Lecture Arrangement

- 1) Introduction to ME Measurement
 - Course structure & requirement
 - Lab report format
 - Sensor characteristics
- 2) Uncertainty Analysis
 - Random & biased (system) errors
 - Level of confidence
 - Uncertainty of a (ME) system
- 3) Basic Flow Measurement
 - Flow visualization
 - Flow-rate measurement

- Flow velocity measurement
- Flow friction measurement
- 4) Turbine Characteristics (Pumps)
 - Single pump
 - Pumps in series or parallel
 - Operation with flow systems
- 5) Heat Exchanger Characteristics
 - Temperature measurement
 - Co-axial tubular heat exchanger
 - Other heat exchanger
- 6) Data Analysis of Group-1 Experiments
 - Flow Visualization & LDV
 - Pumps
 - Tubular Heat Exchanger
- 7) Thermodynamic Cycles
 - Otto-cycle (gasoline engine)
 - Diesel-cycle (diesel engine)
 - Vapor-compression cycle (A/C)
- 8) Data Analysis of Group-2 Experiments
 - Gasoline engine
 - Diesel engine
 - Vapor-compression cycle
- 9) PLC
 - System configuration
 - Ladder Logic Diagram
- 10) Feed-back Control (PID)
 - Transfer function and block diagram
 - Controller design
- 11) Data Analysis of Group-3 Experiments
- 12) Gas-Solid Fluidization
 - Geldart classification
 - Fluidization characteristics
- 13) CAD/CAM Machining
 - CAD/CAM fundamentals
 - Precision machining
- 14) Data Analysis of Group-4 Experiments
 - Fluidization
 - Precision machining

3. Weekly Arrangement

Week	Content	
1	Lecture 1 & 2	Group-1
2	Lecture 3 & 4	
3	Lecture 5 & 6 (Lab Group-1)	
4	Lab Group-1	
5	Lecture 7 & 8	Group-2
6	Lab Group-2	
7	Midterm	
8	Lecture 9	Group-3
9	Lecture 10 & 11	
10	Lab Group-3	
11	Lecture 12 & 13	Group-4
12	Lecture 14 (Lab Group-4)	
13	Lab Group-4	
14	Review & Final	

4. Homework Assignment

- HW-1: Uncertainty analysis
- HW-2: Group-1 fundamentals
 - a) Pumps
 - b) Orifice & flow friction
 - c) T.C. (floating ref.)
 - d) $\overline{Nu} = f(Re, Pr)$ validation
 - e) Uncertainty analysis
- HW-3: Group-2 fundamentals
 - a) Theoretical vs. actual engine efficiency
 - Gasoline
 - Diesel
 - b) Vapor-compression cycle
 - c) Uncertainty analysis
- HW-4: Group-3 fundamentals
 - a) Ladder logics
 - b) Feed-back control