



# FREDERICK UNIVERSITY

School of Engineering and Applied Sciences  
Department of Mechanical Engineering

## COURSE OUTLINE

Programme of Studies:	<i>BSc in Automotive Engineering</i>	
Name of the Course:	<i>AUTO109 – Automotive Workshop</i>	
Target group and type:	<i>Automotive Engineering students 1<sup>st</sup> year</i>	
Level of the unit:	<i>BSc – 2<sup>nd</sup> Semester</i>	<i>Introductory</i>
Entrance requirements:	<i>None</i>	
Number of ECTS credits:	<i>2 (Average student working time: 50 hours)</i>	
Lecturer:	<i>Dr. Antonis Antoniou, Mr. Charalambos Athanasiou</i>	
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Competences to be developed:		Program Competences
1	Remember Engineering measurements, Internal combustion engine features and components and understand the function of Gas analyzers, Diagnostic units, Oscilloscopes, micrometers and other measuring instruments	A1
2	Illustration of various engine components, measurements taken off, surface roughness analyzed, manufacturing details illustrated.	A1,D1
3	Must differentiate between various materials, examining tear and wear on them. Also tests are carried out in a workshop environment.	D1
4	Checking of various engine parameters, judging on the results obtained supporting the outcomes	D1
5	Written reports and full workshop logbook must be kept were students must show clearly their point of view.	B1,C1, E1

Estimated student's work time distribution in hours:			
Contact hours		Student's private time	
Laboratory Work	33	Private Study	6
Visit to modern workshops of local industry	3	Lab Report	5
Lab Assessment	3		
Total:	39	Total:	11

Learning outcomes	Educational activities	Estimated student's work time in hours	Assessment
Students should be able to:			
<b>Engineering measurements:</b>			
Identify importance of measurements in engineering design and manufacturing. Classify the types of errors in measurements and the sources of errors. Distinguish between units in metric and imperial system and show how the conversions between the two systems is performed	Laboratory Work	3	<ul style="list-style-type: none"> <li>• Homework 1</li> <li>• Test 1</li> </ul>
	Private Study	0.5	
Show how the measurement of linear dimensions and line graduated instruments is accurately performed using: Machinist's rule, vernier caliper, micrometer (mechanic & digital) and gauge blocks.	Laboratory Work	3	
	Private Study	0.5	
Analyse the way measurement of angular dimensions is performed. This will include units, subdivisions, conversions, instruments and measuring methods (sine bar, sinus and tangent method, angle gauge blocks, bevel protractor, combination square) Understand the function and usage of comparative length-measuring instruments such the Dial indicator:	Laboratory Work	3	
	Private Study	0.5	
Understand form measurement (i.e. perpendicularity, flatness, etc). Analysis of dimensional tolerances which will include basic size, deviation and tolerance for a shaft and a hole according to ISO system. Also classification of types of fit, features of dimensional relationships between mating parts (allowance, clearance, interference, limit dimensions etc) are going to be defined. Finally surface texture and properties are to be discussed and will included mainly surface roughness.	Laboratory Work	3	
	Private Study	1	
	Lab Report	1	

<b>Internal Combustion Engines:</b>			
Analysis of main features and controls of internal combustion engines, including cooling system, lubrication system, valve train, crankshaft mechanism, etc	Laboratory Work	3	<ul style="list-style-type: none"> <li>• Homework 2</li> <li>• Homework 3</li> <li>• Test 1</li> </ul>
	Private Study	0.5	
Disassembly and rebuilt of an engine with various measurements and calculations taken out of the internal components.	Laboratory Work	6	
	Private Study	1	
	Lab Report	1	
Analysis of the Electronic fuel and ignition system with measurements to be taken off various sensors using a series of tools like fuel pressure gauge, multimeters and oscilloscopes	Laboratory Work	3	
	Private Study	0.5	
Understanding function of electric system (alternator, battery and starter) and some measurements to be taken off using tools like ammeter, voltmeter, tester light and hydrometer	Laboratory Work	3	
	Private Study	0.5	
	Lab Report	1	
<b>Gas Analyzer:</b>			
Understanding the main pollutants associated with vehicle exhaust emission and using a gas analyzer to measure them in live engine using either petrol or diesel fuels.	Laboratory Work	6	<ul style="list-style-type: none"> <li>• Homework 4</li> <li>• Homework 5</li> <li>• Test 1</li> </ul>
	Private Study	1	
	Lab Report	2	
<b>Visit to workshops of industry:</b>			
Visit to modern workshops of local industry to observe and gain knowledge of facilities and work environment	Laboratory Work	3	
Sub-Total:		47	
<b>Assessment Contact Hours</b>			
Test		3	
Total:		50	

## PART B: Complementary Material

### Course Content (Syllabus):

- **Engineering measurements**
  - Importance of measurements in engineering design and manufacturing. Types of errors in measurements / sources of errors, units in metric and imperial system, conversions between the two systems
  - Measurement of linear dimensions, Line graduated instruments: Machinist's rule, vernier caliper, micrometer (mechanic & digital), description, mode of use, accuracy, applications. Gauge blocks: Description, mode of use, accuracy, applications
  - Measurement of angular dimensions: Units, subdivisions, conversions, instruments and measuring methods (sine bar, sinus and tangent method, angle gauge blocks, bevel protractor, combination square)
  - Comparative length-measuring instruments – Dial indicator: Description, mode of use, accuracy, applications
  - Form measurement (perpendicularity, flatness, roundness, parallelism, eccentricity, etc). Definitions, symbols, instruments and measuring methods.
  - Dimensional tolerances: Basic size, deviation and tolerance for a shaft and a hole according to ISO system. Types of fit, features of dimensional relationships between mating parts (allowance, clearance, interference, limit dimensions etc)
  - Surface texture and properties: Surface roughness, measurement, units. Symbols for surface roughness in DIN, ASA and BS. Roughness parameters, instruments.
- **Internal Combustion Engine**
  - Main features and controls of internal combustion engines.
  - Cooling system, thermostat and cooling fan function
  - Lubrication system, oil pressure and temperature, viscosity
  - Electronic fuel and ignition system, full function and measurements to be taken from various sensors using a series of tool like fuel pressure gauge, multimeter and oscilloscope
  - Check the function of alternator, battery and starter using tool like ammeter, voltmeter, tester light and hydrometer
  - Measurements to be taken of some internal components of an engine, like piston, piston rings, liners, valve seats, crankshaft and camshaft.
- **Gas Analyzer**
  - Main features and controls of Gas Analyzers.
  - Pollutants measured by the Analyzers
  - Measurement of the efficiency of catalytic converters
  - Testing of Lambda sensors

### Teaching Methodology:

- Power Point Presentation
- Hand notes
- Workshop Visits

Assessment Weights			Total
Lab Reports	Lab Report 1	10%	40%
	Lab Report 2	15%	
	Lab Report 3	15%	

Test	60%
Attendance	

**Note:** The assessment weights for the course work and the laboratory work is decided by the Department before the beginning of the semester. The details on the number of tests/homework assignments projects etc, as well as their assessment weights are decided by the academic staff responsible for the course.

<b>Bibliography:</b>
<b>Textbooks:</b>
<ul style="list-style-type: none"> <li>• M.J. Nunney , Automotive Technology, SAE International, 3<sup>rd</sup> Edition, 1998</li> </ul>
<b>References:</b>
<ul style="list-style-type: none"> <li>• Automotive Electrical and Electronic Systems manual, by Haynes, Haynes Publishing, 1995</li> <li>• Theory and Design for Mechanical measurements, by R.S. Figliola D.E. Beasley, Willey publishers, 3<sup>rd</sup> ed. 2000</li> <li>• Fundamentals of Modern Manufacturing: Materials, Processes, and Systems by Mikell P. Groover, John Wiley &amp; Sons, 2<sup>nd</sup> edition 2001</li> </ul>