FI567 Instrumentation System

Module name:	Instrumentation System	
Module level, if applicable:	Undergraduate	
Code:	FI567	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	6th	
Module coordinator:	Ahmad Aminudin	
Lecturer(s):	Ahmad Aminudin	
Language:	Bahasa Indonesia	
Classification within the curriculum	Elective course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and practical methods). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (Practical/project)	2 hours 30 minutes	20
Workload:	The total workload is 136 hours/8160 minutes (4.8 ECTS) per semester, consisting of 35 hours/2100 minutes lectures (1.24 ECTS), 42 hours/2520 minutes structured activities (1.48 ECTS) and 42 hours/2520 minutes self-study (1.71 ECTS) per week for 14 weeks, 17 hours/1020 minutes for two exams (0.6 ECTS).	
Credit points:	4.8 ECTS	
Pre-requisites course(s):	Analog Electronics, Digital Electronics, Metrology and Calibration	

<table>
<tr><td>Course Learning Outcomes (CLO):</td><td>After taking this course the students have ability to:
CLO1. Describe the characteristics of sensors and transducers
CLO2. Describe the knowledge of position, displacement and level measurement
CLO3. Apply ideas in the instrument design of speed and acceleration measuring
CLO4. Apply in the design and construct of force and torque measuring.
CLO5. Apply in the design and construct of pressure and temperature measuring
CLO6. Apply in the design and construct of flow measuring
CLO7. Apply in the design and construct of acoustic measuring
CLO8. Apply ideas in the design of a light measuring instrument
CLO9. Apply ideas in the design and construct of humidity measuring instruments
CLO10. Apply ideas in the design and construct of chemical measuring
CLO11. Describe how material works and sensor technology
CLO12. Make troubleshooting and manufacture instruments</td></tr>
<tr><td>Content:</td><td>In this course, students will study (i) Definition and characteristics of the instrument; (ii) Position-displacement and level measurements consist of potentiometric, capacitive, inductive, magnetic, optical, ultrasonic, radar sensors and level sensors; (iii) measurement of velocity and acceleration includes the characteristics of the accelerometer, capacitive accelerometer, piezoresistive accelerometer, thermal accelerometer and gyroscope ; (iv) Measurement of force and strain consisting of strain gauge and piezoelectric; (v) Pressure measurement consists of methods of mercury, bellows, membrane, thin plate, piezoresistive, capacitive (vi) flow measurement load dynamics of flow, pressure gradient technique, thermal transport, ultrasonic, electromagnet, mass flow; (vii) Acoustic sensors via resistive, condenser, piezoelectric and solid-state acoustic methods; (viii) Moisture sensors with capacitive, conductive, thermal, optical and oscillating methods; (ix) Light sensor via photodiode, phototransistor, photoresistor, thermopile, pyroelectric, IR sensor; (x) Temperature sensors with thermistor, thermoelectric, and PN semiconductors; (xi) Chemical sensors with electrochemical, biochemical and enzyme methods; (xii) Sensor materials and technology.</td></tr>
<tr><td>Study/exam achievements:</td><td>The final mark will be weight as follow:
<table>
<tr><th>No</th><th>CLO</th><th>Assessment Object</th><th>Assessment Techniques</th><th>Weight</th></tr>
<tr><td>1</td><td>CLO1 – CLO12</td><td>Subject specific competences:
a. Assignments
b. Exam
- Mid exam
- Final exam</td><td>
Written

Written test
Written test</td><td>
20 %

25%
25%</td></tr>
<tr><td>2</td><td>CLO3 - CLO10</td><td>Subject specific competences:
- Class Activity
- Project</td><td>
Performance
Performance</td><td>
10%
20%</td></tr>
<tr><td colspan="4">Total</td><td>100%</td></tr>
</table></td></tr>
</table>

Forms of media:	Board, LCD Projector, Laptop/Computer, Demonstration Equipment Package, LMS
Literature:	1. Instrumentation, Measurement and Analysis, BC Nakra KK Chaudhry, 2009, 3rd edition, McGraw-Hill Publishing Company 2. Morris, A. S., & Langari, R. (2015). *Measurement and instrumentation: Theory and application*. Academic Press. 3. Figliola, R.S., & Beasley, D.E. (2011). *Theory and Design for Mechanical Measurements*. John Wiley & Sons, Inc. 4. George, B., Roy, J. K., Kumar, V. J., & Mukhopadhyay, S. C. (2017). *Advanced interfacing techniques for sensors: Measurement circuits and systems for intelligent sensors*. Springer. 5. Fraden, J. (2015). *Handbook of modern sensors: Physics, designs, and applications*. Springer.

PLO and CLO mapping

	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1			√									
CLO2			√									
CLO3			√									
CLO4			√									
CLO5			√									
CLO6			√									
CLO7			√									
CLO8			√									
CLO9			√									
CLO10			√									
CLO11			√									
CLO12			√									