

## Subject Description Form

<b>Subject Code</b>	ME566																																
<b>Subject Title</b>	Industrial and Environmental Measurement Technology																																
<b>Credit Value</b>	3																																
<b>Level</b>	5																																
<b>Pre-requisite/ Co-requisite/ Exclusion</b>	Students should have basic knowledge in Mechanical Engineering; Building Services; Civil & Structural Engineering, Manufacture Engineering. Some working experience in industries is desirable.																																
<b>Objectives</b>	To provide students with knowledge of advanced measurement technology and applications in industry.																																
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will be able to:</p> <ol style="list-style-type: none"> <li>possess state-of-the-art knowledge and skills in the area of random data analysis, various measurement techniques, including flow, temperature / heat, force, etc;</li> <li>apply their knowledge, skills and hand-on experience, gained from the subject, to the measurement of flow systems and data analysis;</li> <li>extend their knowledge of mechanical engineering to different situations of engineering context and professional practice; and</li> <li>have recognition of the need for, and an ability to engage in life-long learning.</li> </ol>																																
<b>Subject Synopsis/ Indicative Syllabus</b>	<p><b>Random Signal Analysis:</b> Probability density function, time-average, variance, skewness and kurtosis of signals; auto-correlation and cross-correlation functions; power spectral density function of a signal; spectral phase and coherence between two random signals; ensemble averaging technique.</p> <p><b>Flow Measurement:</b> Thermal anemometers; laser Doppler velocimetry; particle imaging velocimetry; flow visualization techniques.</p> <p><b>Temperature and Heat Measurements:</b> Fibre-optic grating sensors; constant current anemometer and thermocouples; surface temperature sensing with thermochromic liquid crystals and laser interferometry.</p> <p><b>Vibration Measurement:</b> Vibration measurement system; fibre-optic Bragg grating sensors, transducers, piezoelectric accelerometers, force transducers, laser vibrometers, strain gauge, electromechanical shakers and hammers.</p>																																
<b>Teaching/Learning Methodology</b>	<ol style="list-style-type: none"> <li>The teaching and learning methods include lectures/tutorial sessions, homework assignments, test, case study report and examination.</li> <li>The continuous assessment and examination are aimed at providing students with integrated knowledge required for industrial and environmental measurement technology.</li> <li>Technical/practical examples and problems are raised and discussed in class/tutorial sessions.</li> </ol> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="width: 50%;">Teaching/Learning Methodology</th> <th colspan="4">Intended subject learning outcomes</th> </tr> <tr> <th style="width: 12.5%;">a</th> <th style="width: 12.5%;">b</th> <th style="width: 12.5%;">c</th> <th style="width: 12.5%;">d</th> </tr> </thead> <tbody> <tr> <td>1. Lecture</td> <td style="text-align: center;">√</td> <td style="text-align: center;">√</td> <td style="text-align: center;">√</td> <td style="text-align: center;">√</td> </tr> <tr> <td>2. Tutorial</td> <td style="text-align: center;">√</td> <td style="text-align: center;">√</td> <td style="text-align: center;">√</td> <td style="text-align: center;">√</td> </tr> <tr> <td>3. Homework assignment</td> <td style="text-align: center;">√</td> <td style="text-align: center;">√</td> <td style="text-align: center;">√</td> <td style="text-align: center;">√</td> </tr> <tr> <td>4. Case study report and presentation</td> <td style="text-align: center;">√</td> <td style="text-align: center;">√</td> <td style="text-align: center;">√</td> <td></td> </tr> </tbody> </table>				Teaching/Learning Methodology	Intended subject learning outcomes				a	b	c	d	1. Lecture	√	√	√	√	2. Tutorial	√	√	√	√	3. Homework assignment	√	√	√	√	4. Case study report and presentation	√	√	√	
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<b>Assessment Methods in Alignment with Intended Learning Outcomes</b>	Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed			
			a	b	c	d
	1. Homework assignment	20%	√	√	√	√
	2. Test	20%	√	√		
	3. Case study report and presentation	20%	√	√	√	
	4. Examination	40%	√	√	√	√
Total	100%					
<p>Explanation of the appropriateness of the assessment methods in assessing the intended learning outcomes:</p> <p>Overall Assessment:  <math>0.40 \times \text{End of Subject Examination} + 0.60 \times \text{Continuous Assessment}</math></p> <p>The continuous assessment consists of three components: homework assignments, test, and case study report &amp; presentation. They are aimed at evaluating the progress of students study, assisting them in self-monitoring of fulfilling the respective subject learning outcomes, and enhancing the integration of the knowledge learnt.</p> <p>The examination is used to assess the knowledge acquired by the students for understanding and analyzing the problems critically and independently; as well as to determine the degree of achieving the subject learning outcomes.</p>						
<b>Student Study Effort Expected</b>	Class contact:					
	▪ Lecture		24 Hrs.			
	▪ Tutorial/Case study/Laboratory		15 Hrs.			
	Other student study effort:					
	▪ Self Study		45 Hrs.			
	▪ Case study report preparation and presentation		21 Hrs.			
	Total student study effort		105 Hrs.			
<b>Reading List and References</b>	<ol style="list-style-type: none"> <li>1. Goldstein R. J., <i>Fluid Mechanics Measurements</i>, Taylor &amp; Francis, latest edition.</li> <li>2. Beckwith, T. G., Marangoni R. D. and Lienhard J. H., <i>Mechanical Measurements</i>, Addison-Wesley Publishing Company, latest edition.</li> <li>3. Bendat J. S. and Piersol A. G., <i>Engineering Applications of Correlation and Spectral Analysis</i>, John Wiley &amp; Sons, Inc. latest edition.</li> </ol>					