

## Subject Description Form

<b>Subject Code</b>	AP10007
<b>Subject Title</b>	Applied Physics Laboratory
<b>Credit Value</b>	3
<b>Level</b>	1
<b>Pre-requisite/ Co-requisite/ Exclusion</b>	Nil
<b>Objectives</b>	Through lectures and experiments, this subject will provide experimental techniques and laboratory safety measures for applied physics and materials science. Data treatment and analyzing skills and basic electronic practice such as circuit assembly are also included.
<b>Intended Learning Outcomes</b>	<p>Upon completion of the subject, students will be able to:</p> <ul style="list-style-type: none"> <li>(a) analyze experimental data by least-squares fit method with first and higher order polynomials, and perform error analysis;</li> <li>(b) describe results by a written report containing tabulation of data and graphical illustrations;</li> <li>(c) use a CRO to measure electrical signals, and an AC bridge to determine capacitance and inductance; and</li> <li>(d) apply thermocouples, thermistors and IR thermometers to measure temperature.</li> </ul>
<b>Subject Synopsis/ Indicative Syllabus</b>	<p><b>Measurement techniques:</b> standards of fundamental units and derived units; Length: micrometer; caliper.</p> <p><b>Temperature:</b> thermocouple; resistance temperature detector (RTD); thermistor; IR radiometer.</p> <p><b>Time and frequency:</b> counter and timer; determination of polarization orientation.</p> <p><b>Basic instrumentation:</b> electronic circuit assembly; use of CRO; function generator; pulse generator; digital multimeter and AC bridge for LCR measurement.</p> <p><b>Data treatments:</b> precision; accuracy and resolution. Gaussian distributions; systematic and random errors; error estimations; propagation of errors; significant figures; least-squares fit to a straight line and second order polynomial.</p> <p><b>Laboratory:</b> experiments on dynamics, dielectric and mechanical properties, mechanical testing.</p>
<b>Teaching/Learning Methodology</b>	The data processing methods and the principles of the laboratory experiments are introduced in lectures in parallel with the laboratory sessions. This would help students to develop better understandings of the physical principles and to build up their capability to write high-quality experimental reports. The working principles of the equipment are presented in the laboratory manuals and the key points and precautions are highlighted at the beginning of the laboratory class. During the laboratory session, technician and teaching assistant will assist students to solve unexpected problems and lead them through

	<p>the difficult parts. In addition, a presentation session will be arranged for students to form groups to present on any topics related to the experiments. This encourages students to go for in-depth self study, broadens their knowledge and improves their communication skills in technical discussions.</p>							
<b>Assessment Methods in Alignment with Intended Learning Outcomes</b>	Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)					
			a	b	c	d	e	f
	(1) Continuous assessment	40	✓	✓	✓	✓	✓	✓
	(2) Practical examination	20	✓	✓	✓	✓	✓	✓
	(3) Written test	40	✓	✓	✓	✓	✓	✓
	Total	100						
<p>Students are expected to excel in physical understanding and practical operation. The continuous assessment includes the laboratory reports and log books. Written test and practical examination can evaluate the capabilities of the students in problem solving and practical operation.</p>								
<b>Student Study Effort Expected</b>	Class contact:							
	• Lecture		13 h					
	• Laboratory		39 h					
	Other student study effort:							
	• Laboratory report preparation		39 h					
	• Laboratory manual reading, assignment preparation and lecture notes review		29 h					
	Total student study effort		120 h					
<b>Reading List and References</b>	<p>Bevington, P R, et al., Data Reduction and Error Analysis for the Physical Sciences, 2nd Edition, McGraw-Hill, 1992.</p>							
	<p>Bernard, C H, et al., Laboratory Experiments in College Physics, 7th Edition, Wiley 1995.</p>							