

## Subject Description Form

<b>Subject Code</b>	AP20002
<b>Subject Title</b>	Materials Science
<b>Credit Value</b>	3
<b>Level</b>	2
<b>Pre-requisite/ Co-requisite/ Exclusion</b>	Nil
<b>Objectives</b>	To introduce the basic concepts of materials science, and to illustrate processing-structure-property relationships in typical materials.
<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) categorize materials and describe the differences between materials of different categories;</li> <li>(b) describe the structure of atoms and nature of atomic bondings; make simple calculations related to interactions of atoms in solids;</li> <li>(c) describe crystal structures and different types of imperfections in solids; make calculations related to theoretical density of crystals;</li> <li>(d) describe the phenomena and explain the mechanisms of atomic diffusion; make calculations based on Fick's laws of diffusions;</li> <li>(e) describe typical phenomena related to phase change in materials; pursue compositional and structural information of different phases in materials by using equilibrium phase diagrams;</li> <li>(f) describe typical mechanical behaviors in metals and explain the relationships among structure and properties in these materials; and</li> <li>(g) describe typical structures of materials at atomic and microscopic levels and describe the general principles and/or techniques for acquiring such structural information.</li> </ul>
<b>Subject Synopsis/ Indicative Syllabus</b>	<p><b>Materials:</b> classifications of materials.</p> <p><b>Materials structures:</b> atoms, atomic bonding; crystal structures; unit cells; defects; microstructure; amorphous; diffusion; phase and phase diagram; x-ray diffraction.</p> <p><b>Materials properties:</b> mechanical properties; thermal behaviors.</p>
<b>Teaching/Learning Methodology</b>	<p><b>Lecture:</b> The concepts related to materials science will be explained. Examples will be used to illustrate the concepts and ideas in the lecture. Students are free to request help. Assignment sets will be given to assess the learning progress of students.</p> <p><b>Tutorial:</b> Various teaching and learning activities will be conducted in tutorial sessions to consolidate the teaching in lectures. Students will work on problem sets in the tutorials, which provide them opportunities to apply the knowledge gained in lectures.</p> <p><b>Laboratory:</b> Three experiments will be conducted, covering selected topics highlighted in intended learning outcomes. Students will work in groups and conduct the experiments under the guidance of the teaching staff. They are required to analyze their experimental</p>

	results and complete lab reports during the laboratory sessions.								
<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	g
	(1) Continuous assessment	40	✓	✓	✓	✓	✓	✓	✓
	(2) Examination	60	✓	✓	✓	✓	✓	✓	✓
	Total	100							
Continuous assessment consists of assignments, laboratory reports and mid-term test. The continuous assessment will assess the students' understanding of basic concepts and principles in materials science. Examination will be conducted to make a comprehensive assessment of students' intended learning outcomes as stated above.									
<b>Student Study Effort Expected</b>	Class contact:								
	• Lecture		33 h						
	• Tutorial		6 h						
	• Laboratory		6 h						
	Other student study effort:								
	• Self-study		75 h						
	Total student study effort		120 h						
<b>Reading List and References</b>	Materials Science and Engineering: an Introduction (W.D. Callister, John Wiley & Sons (Asia) Pte Ltd), 8 <sup>th</sup> Edition, 2009.								
	Foundations of Materials Science and Engineering (W.F. Smith and J. Hashemi, McGraw.Hill), 5 <sup>th</sup> Edition, 2009.								
	The Science and Engineering of Materials (D.R. Askeland and P.P. Phule, Thomson, Brooks/Cole), 6 <sup>th</sup> Edition, 2010.								