

Subject Description Form

Subject Code	AP20008
Subject Title	Waves
Credit Value	3
Level	2
Pre-requisite/ Co-requisite/ Exclusion	AP10009
Objectives	To provide a fundamental understanding of the principles of waves in general and light waves in particular.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (a) possess a rigorous understanding of basic wave phenomena; (b) solve practical problems on waves; and (c) recognize the importance of waves in other branches of physics.
Subject Synopsis/ Indicative Syllabus	<p>Partial differential equations (PDE): first order PDE, Laplace equation, wave equation, initial and boundary value problems, method of characteristics, separation of variables.</p> <p>Wave theory: harmonic waves, plane and spherical waves, principle of superposition, d'Alembert's solution, standing waves, beats, dispersion and group velocity.</p> <p>Mechanical waves: transverse waves on a string, longitudinal waves in a thin bar and in a fluid, sound waves, energy propagation, derivations of the wave equations, boundary conditions.</p> <p>Light waves: electromagnetic waves, polarization, Poynting vector, intensity, light propagation in a medium, Fresnel equations for reflection and refraction, reflectance, transmittance and absorbance.</p> <p>Interference: temporal and spatial coherence, amplitude-splitting interferometers and applications, Fabry-Perot interferometer.</p> <p>Diffraction: Fraunhofer diffraction pattern of single, double and many slits, diffraction grating and grating spectrometer, resolution, circular aperture.</p> <p>Polarization: polarization by reflection and scattering; dichroism and birefringence, retarders, photoelasticity; optical activity; electro-optic and magneto-optic effects, optical modulators.</p>
Teaching/Learning Methodology	<p>Lecture: The fundamentals in the computational study of nonlinear systems will be explained. Examples will be used to illustrate the main concepts and ideas. Students are encouraged to raise questions when meeting difficulties.</p> <p>Tutorial: Students work on given problem sets either individually or through interaction among each other. They are encouraged to raise questions and discuss any issues with</p>

	<p>the instructor. These problem sets provide the opportunities to apply the knowledge gained from the lectures and to consolidate what have been learned.</p>																											
<p>Assessment Methods in Alignment with Intended Learning Outcomes</p>	<table border="1"> <thead> <tr> <th rowspan="2">Specific assessment methods/tasks</th> <th rowspan="2">% weighting</th> <th colspan="3">Intended subject learning outcomes to be assessed (Please tick as appropriate)</th> </tr> <tr> <th>a</th> <th>b</th> <th>c</th> </tr> </thead> <tbody> <tr> <td>(1) Continuous assessment</td> <td>40</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>(2) Examination</td> <td>60</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>Total</td> <td>100</td> <td></td> <td></td> <td></td> </tr> </tbody> </table> <p>The continuous assessment is based on assignments and a mid-term test. The examination is a three-hour written final examination. Various kinds of questions will be set in both components to assess the intended learning outcomes.</p>				Specific assessment methods/tasks	% weighting	Intended subject learning outcomes to be assessed (Please tick as appropriate)			a	b	c	(1) Continuous assessment	40	✓	✓	✓	(2) Examination	60	✓	✓	✓	Total	100				
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<p>Reading List and References</p>	<p>Textbooks: G. King, “Vibrations and Waves”, Manchester Physics Series, Wiley, 2009.</p> <p>References: D. Halliday, R. Resnick and J. Walker, “Fundamentals of Physics”, 9th Edition, Wiley, 2010. E. Hecht, “Optics”, 4th Edition, Addison Wesley, 2001. A.P. French, “Vibrations and Waves”, The M.I.T. Introductory Physics Series, W.W. Norton & Co., 1971. M.L. Boas, “Mathematical Methods in the Physical Sciences”, 3rd Edition, John Wiley & Sons, 2005.</p>																											