Subject Description Form

Subject Code	AP30001
Subject Title	Applied Acoustics
Credit Value	3
Level	3
Pre-requisite/ Co-requisite/ Exclusion	AP20003
Objectives	To provide students with an introductory overview to a wide range of acoustics terminology and phenomena, including: the theory and principles of acoustics; environmental noise and vibration measurements; principles of ultrasound; transducers and applications in medicine and industry.
Intended Learning Outcomes	Upon completion of the subject, students will be able to: (a) apply the basic theory and principles of audible sound and ultrasound in calculations and measurements; (b) measure sound pressure level and equivalent continuous noise level using a sound level meter; (c) describe different causes of noise problems and find remedies to control the noise; (d) calculate the reverberation time of a room and suggest how to design a room with optimal reverberation time; (e) describe the piezoelectric effect and know how to construct an ultrasonic transducer; (f) measure thickness and defects of an opaque object using ultrasonic non-destructive testing; and (g) assess vibration dose value using an accelerometer.
Subject Synopsis/ Indicative Syllabus	**Principles of acoustics**: behaviour of sound waves in air; radiation of sound from a point source in the free field; inverse square law decay; relationship between sound pressure; sound power; and sound intensity levels; acoustic impedance; room acoustics. **Environmental noise measurements and control**: the nature of noise; noise criteria and rating curves; other standards of noise control (L_{eq} etc.); the measurement of noise levels and isolation; studies on the reduction of industrial noise and noise from construction work; vibration. **Ultrasound transduction and applications**: piezoelectric materials; transducer construction; field patterns at near field and far field; applications: solid state physics; medicine; non-destructive testing and underwater acoustics.
Teaching/Learning Methodology	**Lecture**: The concepts related to selected topics in acoustics will be explained. Examples will be used to illustrate the concepts and ideas in the lecture's. The students are free to request help. Assignment sets will be given to assess the learning progress of students. **Tutorial**: 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.

Multimedia acoustics teaching software will be used to let the student explore various acoustical topics in an interactive way. Finally, presentation on specific acoustic applications allows students to develop a deeper understanding of the subject in relation to engineering science and industrial practices.

Laboratory: 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 results and complete laboratory reports during the laboratory sessions.

Assessment Methods in Alignment with Intended Learning Outcomes	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 includes assignments, laboratory report and tests which aim at checking the progress of students throughout the course, assisting them in self-monitoring their performances. Laboratory sessions are designed to provide hands-on experiences to the students on specialized acoustical instruments. The final examination will be used to assess the knowledge acquired by the students, as well as to determine the extent in which they have achieved the intended learning outcomes.

Student Study Effort Expected	Class contact:	
	• Lecture	26 h
	• Tutorial	6 h
	• Laboratory	9 h
	Other student study effort:	
	• Self-study	79 h
	Total student study effort	120 h

Reading List and References	Kinsler, Frey, Coppens and Sanders, "Fundamentals of Acoustics", 4th Edition, 2000, Wiley.
	Berg and Stork, "The Physics of Sound", 3rd Edition, 2005, Pearson.
	Smith, Peters and Owen, "Acoustics and Noise Control", 2nd Edition, 1996, Longman.