School of Architectural, Civil & Mechanical Engineering

VAM 3012 Signal Analysis (60 hrs / semester)
semester 2/2008

Lecturer: A/Professor Michael A. Sek. Room: D341, michael.sek@vu.edu.au
Unit information: www.staff.vu.edu.au/msek and acmeserver/shared/VAM/VAM3012/2008
Required Reading: www.staff.vu.edu.au/msek and www.staff.vu.edu.au/VRouillard
Recommended reading:
• T.Beckwith, R.Marangoni, Mechanical Measurements, Addison Wesley

Content:

Learning Outcomes:
Students will have developed an understanding of processes and key issues related to modern measurement and signal analysis principles and techniques relating to mechanical engineering practice. In particular, students will be able to solve a wide range of problems and carry out design tasks pertaining to sensor selection, calibration and evaluation, develop algorithms for a wide range of signal analysis techniques including first order system simulation, transient signals, synchronous averaging, moving rms analysis of broad-band random signals, Fourier analysis, spectral averaging and frequency response measurements. Students will have completed work designed to improve a number of generic skills including problem identification / formulation / solution, effective oral and written communication, experimental techniques, computer skills and the ability to use a systematic approach to engineering investigation and algorithm development as well as a capacity to undertake life-long learning.

METHOD
The unit will be delivered in PBL (Project Based Learning) mode, whereby the learning is initiated and influenced by the student. Learning will be centred on three broad activities (projects) namely:
A. Room acoustics – development of a software tool for the evaluation of acoustic reverberation time characteristics of a room for each octave (weeks 1 - 4).
B. Diesel engine thermodynamic and vibration signal analysis– measurement of cylinder pressure and engine block vibrations; development of a software tool to produce a cylinder pressure vs volume diagram; synchronous averaging of triggered signals and noise removal (weeks 5 – 8).
C. Spectral analysis and frequency response function—Development of a software tool for evaluating the average frequency response function of a system, e.g. the evaluation of vibration transmissibility and room-to-room sound transmission (weeks 9 – 12)

DELIVERY MODE:
Sixty hours per semester comprising on average:
- One 2-hour lecture/workshop/seminar FOCUSING on topics related to the current project.
- One 3- hour hands-on activities relating to the current project. This will include experimental design, algorithm development, software development and testing as well as team-based discussions and experimental work.

ASSESSMENT

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<tr>
<th>Three reports (based on experimental projects)</th>
<th>1 or 0</th>
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<td>A total of three comprehensive experimental projects are to be undertaken by all students enrolled in the subject. In 2008 the projects are:</td>
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<tr>
<td>A. Room acoustics – development of an instrument for measurement of acoustic reverberation characteristics for each octave.</td>
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<tr>
<td>B. Diesel engine thermodynamic and vibration signal analysis.</td>
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<td>C. Spectral analysis and frequency response function– evaluating the frequency response function of a system.</td>
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<td>Each experimental project is to be undertaken in small groups of 2-3 students, often in your own time. Experimental reports are due within four weeks, i.e. before the start of the following project</td>
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<td>One report per team will be assessed as satisfactory (1) or unsatisfactory (0). Reports can be resubmitted</td>
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<th>Seminar presentation</th>
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<td>Each student will be required to give a 10 minute oral presentation on one of the experimental topic of their choice</td>
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<td>Members of one team cannot select the same topic</td>
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<td>The oral presentation session will take place during week 12</td>
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<th>Final examination – closed book (3 hours)</th>
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FINAL GRADE = PRESENTATION + AVERAGE REPORT GRADE * EXAMINATION

BASIC RULES:
- All components of assessment are compulsory.
- Attendance and participation will be closely monitored.
- Additional assistance during consultation periods:
  - Quorum of at least one lab group.
  - Priority given to those with a good attendance and participation records
- Experimental projects:
  - Carried out in groups.
  - One report per group per experimental project by the due date.
  - Must register your intention to use equipment with Lab Technician (Room D328G) or the lecturer.
  - Dynamics Lab in Room D328 B is used as the primary facility.
  - Make sure you leave the equipment and the lab as you found them.