Definitive Module Document (DMD)

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Module Code:MAAD0022

Title of Module
Full Title: Dynamics and Performance of Mechanical Systems
Short Title: Dynamics of Mech Sys

MODULE

MAAD0022 (A 05/6)

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Version: 1

Credit Points: 15

Level / ECTS Level: M

First Offered: 26/9/2005 00-00-00

6. Home Department:
AAD

7. Departments(s) contributing to teaching:

9. Module Aims:
- extend the students understanding of dynamic motion

- develop an understanding of condition monitoring techniques and appreciate the role of condition monitoring in reliability/maintenance management.

10a. Learning Outcomes: Knowledge and Understanding:
- be able to demonstrate an understanding in depth of advanced methods of modelling dynamic motion

- be able to select appropriate equipment to implement condition monitoring on mechanical systems

- be able to explain the benefits of different reliability/maintenance techniques

10b. Learning Outcomes: Skills and Attributes:
- be able to simulate the dynamic performance of a mechanical system

- be able to analyse the performance of a mechanical system using condition monitoring techniques

11. Module Content
11a Module Content:
This module will extend the students understanding of dynamic motion in mechanical systems using advanced mathematical modelling techniques to predict mechanical system behaviour and hence its performance. Condition monitoring / and Fault diagnosis methodologies will be used to measure mechanical system performance. Application of such techniques as used in a reliability/maintenance management strategy of mechanical systems is considered. The module will make use of simulation and laboratory facilities and in house as well as industrial based case studies.

11b. Further details on how the learning outcomes of the module will be achieved:
The intended learning outcomes are facilitated through a combination of approaches to learning and teaching, typically this will include lectures, tutorials, assignments and experimental work. Case studies will be included in lectures and tutorials. Some tutorials will involve the use of appropriate simulation software. Laboratory experiments will be on an open access basis wherever possible. These activities will be supported by the module team and by encouraging the students to access a variety of resources through StudyNet.

The module will begin with some revision/bridging tutorials on mathematical tools such as vector mechanics and matrix algebra which will be used extensively throughout the module.

The dynamic motion in mechanical systems will be studied through lectures, tutorials and some case studies. Specific topics includes- a review of planar vector kinematics and application to 3D situations, angular momentum, moments and products of inertia, Euler equations and Euler angles, with applications to robotics and gyroscopic motion, assumptions used in modelling systems, derivation of equations of motion, influence coefficients, generalised coordinates, Lagrange method, matrix methods, Eigen-values and vectors, complex matrices and various solutions for forced damped multi-body vibration systems.

Condition monitoring techniques will be studied as a means to ascertain the health of mechanical system and hence measure and enhance its dynamic performance to aid in reliability/maintenance management strategy. The main focus would be on rotating machinery by using in-house / laboratory based and appropriate industrial case studies. Specific topics will include- transducers and sensors for measuring vibration and noise, data acquisition and signal processing, time and frequency domain methods and spectrum analysis, fault identification through dynamic testing and modal investigation of machines and structures. Other related topics are also covered such as preventative maintenance strategies including scheduling, benefits compared to alternatives, implementation issues and the management of change. Reliability/maintenance management concepts include- six-big losses, criticality/risk assessment, types of failure, diagnostic analysis, predictive, preventive, productive, reactive, reliability-centred maintenance (RCM).

Where relevant and appropriate the role of reliability - centred maintenance and condition monitoring on environmental issues will be subject to discussion and consideration.

12. Language of Delivery:
English

13. Language of Assessment:
English

14. Assessment Details (Academic):
Coursework: 40

Exam: 60

Other: One 3-hour end of course examination to assess learning outcomes 1, 2, 3, 4 and 5

1 dynamics experimental assignment to assess learning outcomes 1 and 4

1 condition monitoring case study report to assess learning outcomes 2, 3 and 5

1 interim phase test to assess outcomes 1, 2, 3, and 5

Assessment Notes:
Passes are required in ICA and overall.

15. Locations(s):
UH HATFIELD

16. Pre and Co-Requisite:
Pre-Requisite

Co-Req

Prohibited

17. Subject Board of Examiner/s:

18. Comments