



The University of Southern Queensland

## Course specification

### Description: Dynamics II

| Subject | Cat-nbr | Class | Term    | Mode | Units | Campus    |
|---------|---------|-------|---------|------|-------|-----------|
| MEC     | 3403    | 54455 | 2, 2006 | EXT  | 1.00  | Toowoomba |

|                                   |        |
|-----------------------------------|--------|
| <b>Academic group:</b>            | FOENS  |
| <b>Academic org:</b>              | FOES02 |
| <b>Student contribution band:</b> | 2      |
| <b>ASCED code:</b>                | 030701 |

### STAFFING

Examiner: Ahmad Sharifian  
Moderator: Thanh Tran-Cong

### REQUISITES

Pre-requisite: MEC2401 and MAT2100

### SYNOPSIS

The application of the principles of Mechanics abounds in our daily life. Buildings and bridges are designed to operate under normal conditions with the help of the principles of Statics. Under extraordinary conditions such as earthquake or high wind speed, the design is governed by the principles of Dynamics (loading conditions vary significantly with time). Mechanical systems are inherently dynamic. Moving parts exist in many products and equipment: simple household electrical appliances, office equipment, cars, robots, production factories, mining, construction, agricultural machineries, ships, aeroplanes and spacecrafts, etc. Knowledge of dynamics plays an essential role in the design and analysis of any of these systems. Apart from pure mechanical functionalities, modern systems incorporate more robust and accurate control with the help of electronic devices. Flexible and intelligent systems such as robots, computer controlled factories, autonomous vehicles are now common. These achievements are possible because very detailed and accurate system dynamics is understood and advanced electronics and control are available. This advanced course covers the formulation of vector mechanics for general three dimensional systems of rigid bodies and the theory of vibration and its applications. The principles and methods covered are essential to the understanding of mechanical systems.

### OBJECTIVES

The course objectives define the student learning outcomes for a course. The assessment item(s) that may be used to assess student achievement of an objective are shown in parenthesis. On completion of this course, students should be able to:

1. analyse the kinematics and kinetics of 3D rigid bodies;
2. demonstrate an understanding of and apply Lagrange's equations and/or Newton's Laws of Motion to model the dynamic behaviours of engineering systems;

3. solve the mathematical models of engineering systems to determine their dynamic characteristics;
4. determine and assess the vibrational behaviour of systems of discrete bodies having single and multiple degree-of-freedom, with or without viscous damping;
5. demonstrate an understanding of and apply the principles of vibration theory, vibration measurements and control;
6. develop simple computer programs to analyse the dynamics of engineering systems

## TOPICS

| Description                      | Weighting (%) |
|----------------------------------|---------------|
| 1. Space rigid body kinematics   | 20.00         |
| 2. Space rigid body kinetics     | 35.00         |
| 3. Theory of multi-DOF vibration | 45.00         |

## TEXT and MATERIALS required to be PURCHASED or ACCESSED

ALL textbooks and materials are available for purchase from USQ BOOKSHOP (unless otherwise stated). Orders may be placed via secure internet, free fax 1800642453, phone 07 46312742 (within Australia), or mail. Overseas students should fax +61 7 46311743, or phone +61 7 46312742. For costs, further details, and internet ordering, use the 'Textbook Search' facility at <http://bookshop.usq.edu.au> click 'Semester', then enter your 'Course Code' (no spaces).

*MATLAB*, Prentice Hall,

(Student Edition (Manual and CD))

Balachandran, B and Magrab, E B 2004, *Vibrations*, Thomson Publication,

## REFERENCE MATERIALS

Reference materials are materials that, if accessed by students, may improve their knowledge and understanding of the material in the course and enrich their learning experience.

Meriam, J L & Kraige, L G 2002, *Engineering Mechanics: Dynamics*, 5th edn, Wiley, Vol 2. (SI Version)

Rao, S S 2003, *Mechanical Vibrations*, 4th edn, Addison Wesley,

Vicker, JJ, Pennock, GR & Shigley, J E 2003, *Theory of Machines and Mechanisms*, 2nd edn, Oxford University Press,

## STUDENT WORKLOAD REQUIREMENTS

| ACTIVITY       | HOURS |
|----------------|-------|
| Assessment     | 30.00 |
| Directed Study | 52.00 |
| Examinations   | 3.00  |
| Private Study  | 70.00 |

## ASSESSMENT DETAILS

| Description             | Marks out of | Wtg(%) | Due date               |
|-------------------------|--------------|--------|------------------------|
| ASSIGNMENT              | 300.00       | 30.00  | 15 Sep 2006            |
| 3 HOUR OPEN EXAMINATION | 700.00       | 70.00  | END S2<br>(see note 1) |

### NOTES

1. Student Administration will advise students of the dates of their examination during the semester.

## IMPORTANT ASSESSMENT INFORMATION

- 1 Attendance requirements:  
There are no attendance requirements for this course. However, it is the students' responsibility to study all material provided to them or required to be accessed by them to maximise their chance of meeting the objectives of the course and to be informed of course-related activities and administration.
- 2 Requirements for students to complete each assessment item satisfactorily:  
To satisfactorily complete an individual assessment item a student must achieve at least 50% of the marks or a grade of at least C-. (Depending upon the requirements in Statement 4 below, students may not have to satisfactorily complete each assessment item to receive a passing grade in this course.)
- 3 Penalties for late submission of required work:  
If students submit assignments after the due date without prior approval then a penalty of 10% of the total marks gained by the student for the assignment will apply for each working day late.
- 4 Requirements for student to be awarded a passing grade in the course:  
To be assured of receiving a passing grade a student must achieve at least 30% in each of the weighted assessment items and at least 50% of the total weighted marks available for the course.
- 5 Method used to combine assessment results to attain final grade:  
The final grades for students will be assigned on the basis of the weighted aggregate of the marks (or grades) obtained for each of the summative assessment items in the course.
- 6 Examination information:  
In an Open Examination, candidates may have access to any material during the examination except the following: electronic communication devices, bulky materials, devices requiring mains power and material likely to disturb other students.
- 7 Examination period when Deferred/Supplementary examinations will be held:  
Any Deferred or Supplementary examinations for this course will be held during the examination period at the end of the semester of the next offering of this course.
- 8 University Regulations:  
Students should read USQ Regulations 5.1 Definitions, 5.6. Assessment, and 5.10 Academic Misconduct for further information and to avoid actions which might contravene University Regulations. These regulations can be found at the URL <http://www.usq.edu.au/corporateservices/calendar/part5.htm> or in the current USQ Handbook.

## **ASSESSMENT NOTES**

- 1 The due date for an assignment is the date by which a student must despatch the assignment to the USQ. The onus is on the student to provide proof of the despatch date, if requested by the Examiner.
- 2 Students must retain a copy of each item submitted for assessment. This must be despatched to USQ within 24 hours if required by the Examiner.
- 3 In accordance with University's Assignment Extension Policy (Regulation 5.6.1), the examiner of a course may grant an extension of the due date of an assignment in extenuating circumstances.
- 4 The Faculty will normally only accept assessments that have been written, typed or printed on paper-based media.
- 5 The Faculty will NOT accept submission of assignments by facsimile.
- 6 Students who do not have regular access to postal services or who are otherwise disadvantaged by these regulations may be given special consideration. They should contact the examiner of the course to negotiate such special arrangements.
- 7 In the event that a due date for an assignment falls on a local public holiday in their area, such as a Show holiday, the due date for the assignment will be the next day. Students are to note on the assignment cover the date of the public holiday for the Examiner's convenience.
- 8 Students who have undertaken all of the required assessments in a course but who have failed to meet some of the specified objectives of a course within the normally prescribed time may be awarded one of the temporary grades: IM (Incomplete - Make up), IS (Incomplete - Supplementary Examination) or ISM (Incomplete -Supplementary Examination and Make up). A temporary grade will only be awarded when, in the opinion of the examiner, a student will be able to achieve the remaining objectives of the course after a period of non directed personal study.
- 9 Students who, for medical, family/personal, or employment-related reasons, are unable to complete an assignment or to sit for an examination at the scheduled time may apply to defer an assessment in a course. Such a request must be accompanied by appropriate supporting documentation. One of the following temporary grades may be awarded IDS (Incomplete - Deferred Examination; IDM (Incomplete Deferred Make-up); IDB (Incomplete - Both Deferred Examination and Deferred Make-up).

## **OTHER REQUIREMENTS**

- 1 Students will require access to e-mail and internet access to USQConnect for this course.
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