MECH4320

ENGINEERING MECHANICS 3

Contents

Summary of the course

This course is a sequel to courses in Engineering Mechanics (MMAN1300 and MMAN2300) where you will have studied the dynamics of particles, rigid bodies and mechanisms under a number of simplifying assumptions –

Student learning outcomes

This course is designed to address the below learning outcomes and the corresponding Engineers Australia Stage 1 Competency Standards for Professional Engineers as shown. The full list of Stage 1 Competency Standards may be found in Appendix A.

After successfully completing this course, you should be able to:

Learning Outcome		**EA Stage 1 Competencies**
1.	Explain and describe principles and components of Rigid Body Dynamics, the Mechanics of Deformable Bodies and their inter-relationships formally and informally, in writing and verbally, to technical experts, peers and lay people.	1.1, 1.3 3.2, 3.4
2.	Model, approximate, analyse and simulate the kinematics of rigid bodies in three dimensions using appropriate computational tools as necessary. Model materials using modern continuum mechanics formulations	1.1, 1.2, 1.3 2.1, 2.2 3.2, 3.4
3.	Model, approximate, analyse and simulate the mechanics of rigid and deformable bodies in three dimensions using Newton-Euler and basis-free formulations and appropriate computational tools as necessary.	1.1, 1.2, 1.3 2.1, 2.2 3.2, 3.4
4.	Apply the principles of engineering mechanics to the dynamics of particles and rigid bodies in three dimensions. Apply the principles of equilibrium, minimum potential energy and objectivity to the mechanics of deformable bodies.	1.1, 1.3 2.1
5.	Discern the relevant principles that must be applied to describe or measure the equilibrium or motion of dynamic sys0 0 1 ETQqium prir	

4. Course schedule

This is a preliminary course schedule for 2016 S2, small topic changes or rearrangements in topic order are to be expected.

Week		Topics	Readings
1	**Mechanics of Rigid Bodies**	Kinematics and kinetics of particles in three dimensions Coordinate systems Motion with reference to moving frames	AED: Ch. 1.1-4, Ch. 2.1-3, Ch. 3.6-7
2		Work, energy and momentum for particles Conservative forces Co-variant and contra-variant basis vectors	AED: Ch. 1.5, Ch. 3.1-2, Ch. 6.2
3		Kinematics of rigid bodies in three dimensions Centre of mass Angular momentum and the inertia tensor	AED: Ch. 3.1-2, Ch. 4.1, Ch. 5.2
4		Kinematics of rigid bodies in three dimensions Principal axes, Euler Angles Newton-Euler formulation of rigid body dynamics	AED: Ch. 4.2, Ch. 5.1-4
5		Moment-free motion of rigid bodies Work, energy and power for a rigid body	AED: Ch. 5.6, Ch. 8.1
6		Applications in rigid body dynamics: - Static and dynamic balancing of rotors - Gyroscopes and Spinning tops	AED: Ch. 8
7	**Mechanics of Deformable Bodies**	Introduction to vector and tensor algebra and calculus: - Indicial notation	

5 Assessment

Assessment overview

Assessment

Provisional Examination timetables are generally published on myUNSW in May for Semester 1 and September for Semester 2

For further information on exams, please see the Exams section on the intranet.

Calculators

You will need to provide your own calculator, of a make and model approved by UNSW, for the examinations. The list of approved calculators is shown at student.unsw.edu.au/exam-approved-calculators-and-computers

It is your responsibility to ensure that your calculator is of an approved make and model, and to obtain an “Approved” sticker for it from the School Office or the

These and many other relevant resources are available at the UNSW Library: *http://info.library.unsw.edu.au/web/services/services.html*

7

Feedback on the course is gathered periodically using various means, including the Course and Teaching Evaluation and Improvement (CATEI) process, informal discussion in the final class for the course, and the School's Student/Staff meetings. Your feedback is taken seriously, and continual improvements are made to the course based, in part, on such feedback.

In this course, recent improvements resulting from student feedback include:

- More reasonable workload, in line with typical 6UOC subject
- Better textbooks
- Improved structure
- More learning resources and more practice questions

8. Academic honesty and plagiarism

UNSW has an ongoing commitment to fostering a culture of learning informed by academic integrity. All UNSW students have a responsibility to adhere to this principle of academic integrity. Plagiarism undermines academic integrity and is not tolerated at UNSW. *Plagiarism at UNSW is defined as*

Repeated plagiarism (even in first year), plagiarism after first year, or serious instances, may also be investigated under the Student Misconduct Procedures. The penalties under the procedures can include a reduction in marks, failing a course or for the most serious matters (like plagiarism in an honours thesis) even suspension from the university. The Student Misconduct Procedures are available here:
www.gs.unsw.edu.au/policy/documents/studentmisconductprocedures.pdf

Further information on School policy and procedures in the event of plagiarism is available on the intranet.

9. Administrative matters

All students are expected to read and be familiar with School guidelines and polices, available on the intranet. In particular, students should be familiar with the following:

- Attendance, Participation and Class Etiquette
- UNSW Email Address
- Computing Facilities
- Assessment Matters (including guidelines for assignments, exams and special consideration)
- Academic Honesty and Plagiarism
- Student Equity and Disabilities Unit
- Health and Safety
- Student Support Services

Dr. David C. Kellermann
15 July 2016