ES190-15 Dynamics and Thermodynamics

20/21

Academic year
20/21
Department
School of Engineering
Level
Undergraduate Level 1
Module leader
Peter Brommer
Credit value
15
Module duration
10 weeks
Assessment
30% coursework, 70% exam
Study location
University of Warwick main campus, Coventry

Description

Introductory description

This module is designed to provide all School of Engineering students a foundation on which to build further study of bodies in motion and thermodynamics as applied to any engineering discipline.

Module web page

Module aims

To present the fundamental concepts of dynamic mechanical systems and the nature of thermodynamic systems that underpin many branches of engineering science.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

The module is divided into two themes:

(A) Dynamics

- Ai. Fundamental laws governing dynamics: gravitational attraction, Newton's laws;
- Aii. Kinematic analysis in 1-D and 2-D covering both linear and angular systems and examples of their application, to include the polar form of the velocity and acceleration vector and rigid body kinematics;
- Aiii. Kinetics of 1-D systems including examples with variable acceleration, concept of conservative forces;
- Aiv. Alternative dynamic analysis methods: impulse-momentum and energy methods and examples of their application.
  (B) Thermodynamics
- Bi. Thermodynamic Properties
- Bii: The First Law
- Biii: The Second Law
- Biv: Heat Transfer and Heat Exchangers
  The module also includes 2 laboratory exercises.

Learning outcomes

By the end of the module, students should be able to:

- Dynamic Mechanics: To understand the basic principles that operate in dynamic mechanical systems, and to achieve an understanding of Kinematics in 1-D and 2-D space using Cartesian and polar co-ordinate systems.
- Thermodynamics: To be able to apply 1st Law of Thermodynamics in open and closed systems.
- Dynamic Mechanics: To be able to quantify Kinetic problems in 1-D, with some applications considering variable acceleration.
- Dynamic Mechanics: To appreciate impulse-momentum and energy methods and their application to quantify dynamic engineering systems.
- Thermodynamics: To develop an understanding of the thermodynamic properties of systems, the nature of heat, and apply this knowledge.
- Thermodynamics: To be able to apply the 2nd Law of Thermodynamics and understand entropy and apply this knowledge.
- Whole course: To develop an ability to make appropriate assumptions to simplify and thus model real-life Engineering problems.

Indicative reading list

For Thermodynamics :

1. "Thermodynamics for Engineers, Third Edition" by M.C. Potter, C.W. Somerton, Schaum's Outlines, 2014, ISBN: 978-0-07-183082-9.
2. "Basic Engineering Thermodynamics" by P.B. Whalley, Oxford University Press, 1992, ISBN: 978-0-1985-6255-9.
3. "Equilibrium Thermodynamics, Third Edition" by C.J. Adkins, Cambridge University Press,

1982, ISBN: 978-0-5212-7456-2.

For Dynamics :
(1) F. Beer and E. Russell Johnston Jr., Vector Mechanics for Engineers: Dynamics (2009).
(2) R. C. Hibbeler, Engineering Mechanics: Dynamics (2012).
(3) A. M. Bedford, Engineering Mechanics: Dynamics (2007).

View reading list on Talis Aspire

Subject specific skills

SM1p Knowledge and understanding of scientific principles and methodology necessary to underpin their education in their engineering discipline, to enable appreciation of its scientific and engineering context, and to support their understanding of relevant historical, current and future developments and technologies.

SM2p Knowledge and understanding of mathematical and statistical methods necessary to underpin their education in their engineering discipline and to enable them to apply mathematical and statistical methods, tools and notations proficiently in the analysis and solution of engineering problems.

EA1p Understanding of engineering principles and the ability to apply them to analyse key engineering processes.

D6p Communicate their work to technical and non-technical audiences.

ET6p Knowledge and understanding of risk issues, including health & safety, environmental and commercial risk, and of risk assessment and risk management techniques.

EP3p Ability to apply relevant practical and laboratory skills

EP8p Ability to work with technical uncertainty

Transferable skills

Appreciate the importance of concepts such as motion, forces, energy, heat transfer in everyday life.

Write concise reports of technical events.

Apply mathematical and computational methods to find answers.

Apply problem solving skills in the search for unknown quantities.

Study

Study time

Type	Required
Lectures	30 sessions of 1 hour (20%)
Practical classes	2 sessions of 4 hours (5%)
Other activity	11 hours (7%)
Private study	51 hours (34%)
Assessment	50 hours (33%)
Total	150 hours

Private study description

- 55 hours of guided independent learning

Other activity description

- 4 hours of examples lectures
- 1 Computer-based formative test
- 4 hours revision Lectures
- 1 hour laboratory briefings
- 1 hour laboratory feedback

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Students can register for this module without taking any assessment.

Assessment group D6

	Weighting	Study time
Inertia laboratory assignment	15%	5 hours
Laboratory assignment (up to 5 pages) on the laboratory exercise.		
Energy Balance laboratory assignment	15%	5 hours
Laboratory assignment (up to 5 pages report plus 2 pages data sheet as annex) on the laboratory exercise.		
QMP	70%	40 hours
2 * 1 hour QMP online tests to be scheduled in same time slot with short break inbetween		

	Weighting	Study time
~Platforms - QMP		

Feedback on assessment

- Model solutions to past papers.
- Support through advice and feedback hours.
- Feedback on marked laboratory assignments.
- Feedback on computer-based formative test (dynamics).
- Cohort-level feedback on final exam.

Past exam papers for ES190

Availability

Post-requisite modules

If you pass this module, you can take:

- ES480-15 Dynamic Analysis of Mechanical Systems

Courses

This module is Core for:

- Year 1 of UESA-H335 BEng Automotive Engineering
- Year 1 of UESA-H161 BEng Biomedical Systems Engineering
- Year 1 of UESA-H216 BEng Civil Engineering
- Year 1 of UESA-H63W BEng Electronic Engineering
- Year 1 of UESA-H113 BEng Engineering
- Year 1 of UESA-HN15 BEng Engineering Business Management
- Year 1 of UESA-HH75 BEng Manufacturing and Mechanical Engineering
- Year 1 of UESA-H315 BEng Mechanical Engineering
- Year 1 of UESA-HH35 BEng Systems Engineering
- Year 1 of UESA-HN11 BSc Engineering and Business Studies
- Year 1 of UESA-H336 MEng Automotive Engineering
- Year 1 of UESA-H163 MEng Biomedical Systems Engineering
- Year 1 of UESA-H217 MEng Civil Engineering
- Year 1 of UESA-H63X MEng Electronic Engineering
- Year 1 of UESA-H114 MEng Engineering
- Year 1 of UESA-HH76 MEng Manufacturing and Mechanical Engineering
- Year 1 of UESA-H316 MEng Mechanical Engineering
- Year 1 of UESA-HH31 MEng Systems Engineering
- Year 1 of UESA-H605 Undergraduate Electrical and Electronic Engineering
- Year 1 of UESA-H606 Undergraduate Electrical and Electronic Engineering MEng