

ES4E3-15 Vibration of Civil and Mechanical Engineering Structures

24/25

Department

School of Engineering

Level

Undergraduate Level 4

Module leader

Stana Zivanovic

Credit value

15

Module duration

12 weeks

Assessment

30% coursework, 70% exam

Study location

University of Warwick main campus, Coventry

Description

Introductory description

ES4E3-15 Vibration of Civil and Mechanical Engineering Structures

Module aims

To explore the vibration effects on humans and sensitive equipment in a range of civil and mechanical engineering structures.

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.

- Introduction to vibration in civil and mechanical engineering structures
- Types of vibration
- Vibration properties (magnitude, frequency, duration)
- Components of a vibration measurement system
- Vibration analysis (signal representation in time- and frequency-domain; signal processing)

- Biodynamics of human body and vibration transmission
- Assessing vibration effects on humans and sensitive equipment
- Vibration limits according to national/international standards/guidelines

Learning outcomes

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

- Demonstrate an advanced understanding of different vibration sources and associated vibration characteristics [M1(M), M2 (M)].
- Demonstrate a systematic knowledge of the design and signal processing principles that underpin the development of vibration data acquisition systems [M1(M), M2(M), M4(M)].
- Demonstrate comprehensive understanding of human biodynamics and vibration transmission [M1(M), M2(M), M7(M)].
- Demonstrate an advanced understanding of complexities involved in evaluating the vibration effects on humans and sensitive equipment [M1(M), M2(M), M4(M), M17(M)].
- Critically assess vibration effects on humans and associated uncertainties by analysing an advanced experimental setup on an as-built structure [M1(M), M2(M), M7(M), M17(M)].
- Constructively evaluate and criticise relevant British and other standards and guidelines . (e.g. BS6841, ISO2631, UK National Annex to Eurocode 1) [M1(M), M2(M), M4(M), M17(M)].

Indicative reading list

Brandt, A. 2023. Noise and vibration analysis: signal analysis and experimental procedures, Wiley.
Mansfield, N. J. 2004. Human Response to Vibration, CRC Press.

Subject specific skills

1. Ability to conceive, make and realise a component, product, system or process
2. Ability to develop economically viable and ethically sound sustainable solutions
3. Ability to be pragmatic, taking a systematic approach and the logical and practical steps necessary for, often complex, concepts to become reality
4. Ability to seek to achieve sustainable solutions to problems and have strategies for being creative and innovative
5. Ability to be risk, cost and value-conscious, and aware of their ethical, social, cultural, environmental, health and safety, and wider professional engineering responsibilities

Transferable skills

1. Numeracy: apply mathematical and computational methods to communicate parameters, model and optimize solutions
2. Apply problem solving skills, information retrieval, and the effective use of general IT facilities
3. Communicate (written and oral; to technical and non-technical audiences) and work with others
4. Overcome difficulties by employing skills, knowledge and understanding in a flexible manner
5. Ability to formulate and operate within appropriate codes of conduct, when faced with an

ethical issue

6. Appreciation of the global dimensions of engineering, commerce and communication

Study

Study time

Type	Required
Lectures	20 sessions of 1 hour (13%)
Seminars	4 sessions of 1 hour (3%)
Practical classes	3 sessions of 1 hour (2%)
Other activity	13 hours (9%)
Private study	110 hours (73%)
Total	150 hours

Private study description

110 hours guided independent learning

Other activity description

10x1hours example classes, 1x3hrs in computer lab

Costs

No further costs have been identified for this module.

Assessment

You must pass all assessment components to pass the module.

Assessment group D7

	Weighting	Study time
Coursework - Written Report	30%	
Students critically analyse the data collected during the field work. (6 pages)		
Written Examination	70%	
Traditional written exam		

Weighting

Study time

- Answerbook Pink (12 page)
- Students may use a calculator
- Engineering Data Book 8th Edition
- Graph paper

Feedback on assessment

Coursework: individual feedback returned, and 1h feedback session for the whole class after return of the coursework.

Examination: publication of recent past examination papers and model solutions or mock paper and solutions where past papers do not exist. Cohort level feedback on examinations.

[Past exam papers for ES4E3](#)

Availability

Pre-requisites

To take this module, you must have passed:

- Any of
 - [ES2C3-15 Civil Engineering Materials and Structural Analysis](#)
 - [ES2D5-15 Planar Structures and Mechanisms](#)
 - [ES386-15 Dynamics of Vibrating Systems](#)

Courses

This module is Core optional for:

- Year 4 of UESA-H219 MEng Civil Engineering with Exchange Year

This module is Optional for:

- Year 4 of UESA-H116 MEng Engineering with Exchange Year
- Year 5 of UESA-H115 MEng Engineering with Intercalated Year

This module is Option list A for:

- Year 4 of UESA-H217 MEng Civil Engineering
- Year 5 of UESA-H218 MEng Civil Engineering with Intercalated Year
- Year 4 of UESA-H114 MEng Engineering