

EE-549

Propagation of acoustic waves

Martin Vincent

Cursus	Sem.	Type
Electrical and Electronical Engineering	MA1, MA3	Opt.

Language of teaching	English
Credits	3
Session	Winter
Semester	Fall
Exam	Written
Workload	90h
Weeks	14
Hours	3 weekly
Courses	2 weekly
Exercises	1 weekly
Number of positions	

Summary

Acoustics course at MSc level focusing mainly on audible acoustics, extended to wave propagation in solids and moving fluids, and also to infra and ultrasound fields, in order to provide a broad view of the world of sound.

Content

- 1 – Overview of the main current themes in acoustics
- 2 – Physical acoustics (basic equations of constitution)
- 3 – Radiating vibratory structures (with membrane and flexion waves)
- 4 – Acoustic/structure interactions (within acoustic/structure/fluid interactions)
- 5 – Standard analytical methods and more recent numerical modelling methods (finite elements, boundary equations, rays, ...)
- 6 – Optimisation and inverse problems (active control, acoustic imaging ...)

The first sessions set the framework and then evolve towards a less structured itinerary across the various acoustic domains in order to provide a global view of the subject, while providing practical skills. All the above chapters cannot be covered within the course so the content is adapted to the students' interests.

Keywords

Acoustics, Radiation, Vibration

Learning Prerequisites**Required courses**

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Learning Outcomes

By the end of the course, the student must be able to:

- Synthesize acoustic knowledge
- Formulate a problem
- Solve a problem analytically
- Explore a complex problem numerically

Transversal skills

- Set objectives and design an action plan to reach those objectives.
- Use a work methodology appropriate to the task.
- Communicate effectively, being understood, including across different languages and cultures.
- Take feedback (critique) and respond in an appropriate manner.

Teaching methods

- 1 – Lectures punctuated with mini-calculations by the participants concerning the order of magnitude of the quantities dealt with. Constant checking of full comprehension by M.Sc. student participants.
- 2 – Tutorials with supervision of exercises and problems

Expected student activities

- 1 – High degree of concentration during the sessions
- 2 – Assignments to assimilate the content 2h/week
- 3 - Assignments and personal reflexion on subtleties and in anticipation of future exercises and problems (at least 1h/week)

The reward for the efforts is considerable as it will result in the view from above coupled with concrete know-how mentioned above, which are expected from M.Sc. graduates.

Assessment methods

- 1 – Close supervision of the students' progress during the tutorials where they learn to take initiative
- 2 – Final written assessment of knowledge acquired

Resources

Bibliography

- 1 - Mandatory: Coursebook
Elements d'acoustique générale
Vincent Martin
PPUR 2007

(written in French but the scientific developments are readable by non French-speakers)

- 2 - Important : reflexion on problems given the previous years

- 3 - For information and motivation : scientific magazines centred on acoustics today, websites on the objects dealt with, some of them with animated images or films.

Ressources en bibliothèque

- [Elements d'acoustique générale / Martin](#)