

Course title

MEMS Energy Harvesting from motion

Code

ENE9005

ECTS credits

5

Faculty

Faculty of Technology and Maritime S

Location

Høgskolen i Vestfold

Teaching Language

English

Participants

PhD-students at Vestfold University College and collaborating institutions

Prerequisite knowledge

Mathematics, Mechanics, MEMS-design and Microfabrication methods

Aim and Objectives

Upon completion of this course the student should be able to:

- be able to explain the most common energy conversion principles for micro energy harvesting from motion
- know the state of the art in vibration energy harvesting
- be able to make lumped models of vibration energy harvesters
- be able to perform theoretical analysis of device performance under narrow and wide band vibrations

Outline Syllabus

- basics of energy harvesting from motion
- electrostatic, piezoelectric and electromagnetic conversion for vibration energy harvesting
- load cycles and power management electronics
- vibration signals: harmonic, impulses, random noise
- linear transducers
- mechanical stoppers
- gas damping
- nonlinear conversion techniques
- lumped equivalent circuit modeling and simulation

Work Methods/Teaching

Lectures, homework assignments and independent project work.

Assessment /Method(s)

Project report. Pass/Fail grade

Compulsory Work / Exercises

- Compulsory assignments
- Project

Reading list

- Lecture notes, «Energy Harvesting from motion», Einar Halvorsen
- C.B. Williams and R.B. Yates, «Analysis of micro-electric generator for microsystems», *Proc. 8th Int. Conf. Solid-State Sens. Actuators, Eurosensors IX, Transducers*, vol. 1, pp. 369-327
- P.D. Mitcheson, T.C. Green, E.M. Yeatman and A.S. Holmes, «Architectures for vibration-driven micropower generators», *J. Microelectromech. Syst.*, vol. 13, pp. 429-440, 2004.
- E. Halvorsen, «Energy harvesters driven by broadband random vibrations», *J. Microelectromech. Syst.*, vol. 17, pp. 1061-1071, 2008.

Coordinator (Professional responsible)

Asc. Professor Einar Halvorsen