

## Fluid Energy Control

2 units (selection)

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**Target** This class introduces hydrodynamic characteristics of turbomachinery, behavior of internal flow and problems with it.

**Outline** Advanced concepts of fluid energy control and energy conversion. Performance characteristics, internal flow conditions and anomalous phenomena in fluid machinery. Performance improvement and noise reduction of turbomachinery by flow control. Utilization of renewable fluid sources such as hydro-dams, wind, wave and tides.

**Keyword** *energy conversion, turbomachinery, internal flow*

**Fundamental Lecture** “**Fluids Energy Conversion Engineering**”(1.0)

**Goal** To understand hydrodynamic characteristics of turbomachinery, behavior of internal flow and problems with it.

**Schedule**

1. Theory of centrifugal turbomachinery 1
2. Theory of centrifugal turbomachinery 2
3. Theory of axial turbomachinery 1
4. Theory of axial turbomachinery
5. Quasi three-dimensional flow analysis of turbomachinery
6. Turbulence modeling and numerical flow simulation 1
7. Turbulence modeling and numerical flow simulation 2
8. Mid-term test
9. Characteristics of turbocharger for automobile
10. Noise of turbomachinery 1
11. Noise of turbomachinery 2
12. Anomalous phenomena of turbomachinery 1 (cavitation, water hammer)
13. Anomalous phenomena of turbomachinery 2 (surging, rotating stall)
14. Application technology of natural flow energy 1 (wind turbine)
15. Application technology of natural flow energy 1 (small hydro turbine)
16. Term test

**Evaluation Criteria** As mid-term test of 50 points and term test of 50 points, it is made to be passing over sum total of 60 points.

**Textbook** Not used

**Reference** Will be introduced in the class

**Contents** <http://cms.db.tokushima-u.ac.jp/cgi-bin/toURL?EID=216901>

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