

## Advanced thermodynamics

2 units (selection)

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**Target** Quality of energy must be considered to promote effective utilization of energy as well as its quantity. Exergy is suitable for that purpose since it is based on the second law of thermodynamics. So understanding of exergy and its application to the practical systems are aimed to realize effective use of energy. The latter part is an introduction to energy and environmental problems in modern civilization based on enormous consumption of fossil fuel. Emphasis is placed on thermal engineering and fluid dynamical aspects of efficient utilization of energy and the relationship between global environment and material circulation.

**Outline** Exergy analysis is used to realize effective use of energy. Exergy is stated and its use is illustrated by presenting some examples. Lecture items are 1)About exergy, 2)Exergy flow in the steam power plant, 3)Exergy of combustion process, 4)Exergy flow in the co-generation system. In the latter part, emphasis is placed on the relation among the society, civilization, economics and technology from the viewpoints of global warming and/or huge consumption of energy.

**Keyword** *exergy, global warming on the earth, fossil fuels*

**Requirement** The knowledge of engineering thermodynamics.

**Goal**

1. Acquiring ability to apply exergy analysis to actual energy systems
2. Obtaining deeper understanding of entropy through examples of exergy analysis
3. Understandings of energy and environmental issues from global point of views.

**Schedule**

1. About exergy
2. Conservation of exergy
3. Calculation of exergy
4. Exergy flow of steam power plant
5. Second law analysis of combustion process
6. Exergy of fuel
7. Exergy flow of co-generation systems (1)
8. Exergy flow of co-generation systems (2)

9. Environmental economics and sociology

10. History of the earth

11. Global warming and carbon emissions of anthropological activities

12. Conventional and un-conventional resources

13. Renewable energy

14. Carbon dioxide capture and storage

15. Waste management and material circulation

16. Final examination

**Evaluation Criteria** Scores of reports and final test are used at a rate of 6 to 4.

**Textbook** Manuscripts prepared by the lecturer

**Contents** <http://cms.db.tokushima-u.ac.jp/cgi-bin/toURL?EID=216810>

**Student** Able to be taken by only specified class(es)

**Contact**

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