

Energi Terbarukan

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| Course Brief Description: | This course studies the concepts of energy, conversion of energy, and renewable energy in agriculture. The topics include the concept of energy and law of the conservation of energy (the 2nd law of thermodynamics), harvesting of biomass energy (combustion, pyrolysis, gasification and biogas), solar energy, and hydro energy. |
| Course Learning Objectives: | At the end of the lesson, students are expected to be able to: [1] Explain renewable energy sources to be used in agriculture [2] Complete energy conversion calculations from various energy sources. |
| Related Expected Learning Outcomes (ELOs): | <ul style="list-style-type: none">• ELO-3: Apply knowledge of mathematics, sciences, and engineering principles in agricultural fields.• ELO-4: Use quantitative analysis, information technology and critical thinking in agricultural engineering profession.• ELO-7: Ability to design simple equipment, components, or processes needed in agricultural engineering operations. |
| Teaching Method | <ul style="list-style-type: none">• Lecture and in-depth discussion• Tutorial• Independent assignment |
| Grading Policy | <ul style="list-style-type: none">• Quiz and Assignment : 20%• Exam : 80% |
| Reference | <ul style="list-style-type: none">• Karogirou, Solteris. 2009. Solar Energy Engineering: Processes and System. Academic Press. San Diego• Sørensen, Bent. 2007. Renewable Energy Conversion, Transmission and Storage. Academic Press. San Diego.• Sukandarrumidi, Herry Zadrak Kotta dan Djoko Wintolo. 2014. Energi Terbarukan : Konsep Dasar Menuju Kemandirian Energi. Gadjah Mada University Press, Yogyakarta.• Teodorita Al Seadi, Dominik Rutz, Heinz Prassl, Michael Köttner, Tobias Finsterwalder, Silke Volk, and Rainer Janssen. 2008. Biogas – Handbook. University of Southern Denmark, Esbjerg. |
| Lecturer Name | <ul style="list-style-type: none">• Dr. Ir. Supratomo, DEA• Dr. Ir. Abdul Waris, MT• Diyah Yumeina RD, STP., M.Agr., Ph.D |

Course Outline

| Lecture | Topic |
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| 1 | INTRODUCTION |
| | Energy Basics |
| | Types of Energy |
| | Units, Standards of Measurement, and Conversions |
| | Alternative and Renewable Energy |
| 2 | BASIC PRINCIPLES OF ENERGY CONVERSION |
| | Laws of Thermodynamics |
| | Conversion between energy forms |
| 3 | SOLAR RADIATION |
| | Solar Power |
| | Energy Balance of the Earth |
| | Apparent Motion of the Sun in the Sky |
| | Availability of Solar Radiation on Earth |
| 4 - 7 | SOLAR THERMAL |
| | Flat-Plate Collectors |
| | Concentrating Solar Power |
| | Solar Hot Water |
| | Crop Drying |
| | Photovoltaics |
| 8 | MID - TEST |
| 9 - 11 | BIOMASS ENERGY |
| | Biomass combustion for power generation |
| | Direct combustion |
| | Gasification |
| | Pyrolysis |
| | Biogas |
| 12 - 13 | HYDROPOWER |
| | Hydropower Basic Concepts |
| | Water Turbines |
| | Water Energy and Power Calculations |
| 14 - 15 | WIND POWER |
| | Wind Power Basics |
| | Wind Turbine Types |
| | Wind Energy and Power Calculations |
| 16 | FINAL TEST |