16AG202 FARM POWER AND RENEWABLE ENERGY SOURCES

Hours Per Week :

L	T	P	C
2	-	2	3

Total Hours :

L	T	P
30	-	30

WA/RA	SSH/HSH	CS	SA	S	BS
5	40	5	8	5	-

Course Description and Objectives:

This course provides a basic knowledge of various sources of power to perform field operations in agriculture. The objective of this course is to empower the students to think of different sources of energy to meet the farming requirements.

Course Outcomes:

The student will be able to :

- understand the fundamentals of I.C. engine.
- acquire the basic information on use of renewable energy for agricultural applications.

SKILLS:

- ✓ *Identify specifications of engines required for field operations.*
- ✓ *Design solar operated cooker, water heater and lamp.*

ACTIVITIES:

- *Design and fabricate briquetting machine for small scale farmers.*
- *Preparation of biomass briquettes.*
- *Development of solar energy operated sprayer, cooker and lamps.*
- *Design of small scale rice husk gasifier.*

UNIT - 1 **L-06**

I.C ENGINES: Sources of farm power conventional and non conventional energy sources, Classification of tractors and IC engines, Review of thermodynamic principles of IC (CI and SI) engines and deviation from ideal cycle, Study of engine components and their construction, Operating principles and functions.

UNIT - 2 **L-06**

SYSTEMS OF I.C ENGINE: Engine systems- Valves and valve mechanism, Fuel and air supply, Cooling, Lubricating, Ignition, Starting and electrical systems; Study of constructional details, Adjustments and operating principles of these systems.

UNIT - 3 **L-06**

FUEL AND FUEL TEST: IC engine fuels -their properties and combustion of fuels, Gasoline tests and their significance, Diesel fuel tests and their significance; Detonation and knocking in IC engines, Study of properties of coolants, Anti freeze and anti corrosion materials, Lubricant types and study of their properties, Engine governing systems.

UNIT - 4 **L-06**

BIOMASS AND WIND ENERGY: Energy sources - Introduction, Classification, Energy from biomass; Types of biogas plants, Constructional details, Principles of combustion, Pyrolysis and gasification, Types of gasifiers; Briquetting, Types of briquetting machines; Wind energy, Types of wind mills, Constructional details and application of wind mills; Modern applications and future potential of renewable energy sources.

UNIT - 5 **L-06**

SOLAR ENERGY: Solar energy, Solar flat plate and focusing plate collectors, Solar air heaters, Solar space heating and cooling, Solar energy applications / Solar energy gadgets, Solar cookers, Solar water heating systems, Solar grain dryers, Solar refrigeration system, Solar ponds, Solar photo voltaic systems, Solar lantern, Solar street lights, Solar fencing, Solar pumping systems.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS Total hours: 30

1. CI engine; Engine parts and functions, working principles etc.
2. Valve system and Injection.
3. Air cleaning system and Fuel supply system of SI engine.
4. Cooling system and fan performance, thermostat and radiator performance evaluation.
5. Part load efficiencies and governing.
6. Lubricating system and adjustments.
7 Electrical system and Ignition system of IC Engine.
8. Preparation of biomass sample and determination of calorific value.
9. Estimation of ash content, fixed carbon, volatile matter and moisture content of biomass.
10. Demonstration of down draft throat less and with throat rice husk gasifier.
11. Working of a fixed dome type and floating drum type biogas plants.
12. Biodiesel preparation.
13. Measurement of basic solar parameters and demonstration of solar water heater.
14. Demonstration of solar cooker.

TEXT BOOK:

1. J. B. Liljedahl, P. K. Turnquist, D. W. Smith and Makoto Hoki, “Tractors and Their Power Units”, 4th edition, CBS Publishers, 2004.

REFERENCE BOOKS :

1. S. C. Jain and C. R. Roy, “Farm Tractor Maintenance and Repair”, 3rd edition, Tata McGraw-Hill Publishing , New Delhi, 2012.

2. G. D. Rai, “Non- Conventional Energy Sources”, 5th edition, Khanna Publishers, New Delhi, 2010.

3. Jagdishwar Sahay, “Elements of Agricultural Engineering”, Standard Publishers Distributors, 2010.

WEB LINK:

1. http://ecoursesonline.iasri.res.in/course/view.php?id=539