Course no.:	ENR 163
Course title:	Biofuels and decentralized energy systems
Core or elective:	Elective
Number of credits:	3
Number of lectures-tutorials-practicals:	28-14-0
Course coordinator:	Dr. Priyanka Kaushal

Evaluation procedure

- Assignments : 20%
- Two Minor Exams : 20% each
- Major Exam : 40%

Course Objectives:

The aim of this elective course is to make the students understand and appreciate the importance and pivotal role of biofuels in general and in the context of environmental constraints and strategy of attaining energy security, access and independence in India. The idea is to introduce traditional and modern energy use; rural energy databases; rural energy planning and integration with other developmental activities; outline of energy resources; the feed stocks and technologies for production of biofuels.

Several case studies will be presented along with experiences from industries/NGOs to acquaint the students with the practical issues of energy access programme.

S. No.	Topic	Allotted time (hrs.)		
		L	T	P
1	Traditional and modern energy use; Methods of accounting the role of traditional energy in the overall energy system. Energy consumption patterns in rural areas from NSS data. Trends of rural energy consumption.	3	3	0
2	Need and development of rural energy data bases (REDB); methodologies for building REDB. Case studies of REDB	3	3	0
3	Energy access in rural India, access to clean energy: power and cook stove; rural industries and social development.	4	0	0
4	Use of efficient/appropriate/renewable energy technologies for rural areas. Technologies/products for cooking, water heating, drying, irrigation pumping, small/micro enterprises, lighting, motive power etc.	2	0	0
5	Syngas and poly-generation, chemical conversion of syngas to methanol and ethanol and some advanced fuels like bio butanol, bio propanol.	2	2	0
6	Bio CNG: biogas to green vehicle fuel; anaerobic digestion; Bio gas opportunities: Landfill gas, agricultural and industrial wastewater and additional sources of methane.	2	2	0
7	Bioethanol: First and second generation ethanol; production technologies World scenario; challenges and some solutions.	4	0	0

8	Biodiesel: Feedstock for biodiesel, manufacturing processes for biodiesel, value addition by utilization of by products, Environmental impacts of bio-diesel, biodiesel from algae, biodiesel engines.	2	0	0
9	Pyrolysis oil: fast pyrolysis technologies; composition and issues of bio-oil; Bio-oil up gradation technologies	2	0	0
10	Case study: Jatropha and lessons learnt	4	4	0
	Total	**28**	**14**	**0**

Suggested readings:

1. TERI/ASTRA Publication

2. Biofuels engineering process technology, Caye Dapcho, John Nghiem, Tata McGraw Hill

3. Biofuels, Wim Soetaert, Erik Vandamme, John Wiley & Sons

4. An Assessment of the Biofuels Industry in India, Prepared by Joseph B. Gonsalves United Nations Conference on Trade and Development

Reviewers:

Dr. Veena Joshi, Director, Energy and Environment, Swiss Development Cooperation, Delhi

Dr. SN Srinivas, UNDP, Delhi

Dr. Banwari Lal, TERI, Delhi

Dr. Alok Adholeya, TERI, Delhi