

Minor Area on ‘Renewable Energy’

Renewable energy experts are needed for developing sustainable sources of energy without impacting the environment extensively, to meet our growing energy demands. With this motivation, we would like to propose the minor area with **20 credits** on “Renewable Energy” for developing human resources to tackle the complex issues arising out of the environmental impacts as well as to address the fast depleting conventional energy resources.

(1) Solar Energy Utilization	ESL 770 - 3 0 0
(2) Solar photovoltaic Devices and systems	ESL 755 - 3 0 0
(3) Solar Architecture	ESL 840 - 3 0 0
(4) Solar Thermal Power generation	ESL XX - 3 0 0
(5) Wind Energy and Hydro power systems	ESL 768 - 3 0 0
(6) Bioconversion and Processing of waste	ESL 732 - 3 0 0
(7) Biomass – A Renewable Energy Source	Proposed New Course*
(8) Economics and Financing of Renewable Energy Systems	ESL 742 - 3 0 0
(9) Alternative Fuels for Transportation	ESL875 - 3 0 0
(10) Energy Laboratories	ESP 713 - 0 0 6

- New Course template is attached

COURSE TEMPLATE for BIOMASS –A RENEWABLE ENERGY SOURCE

1.	Department/Centre proposing the course	CENTRE FOR ENERGY STUDIES
2.	Course title (<45 characters)	BIOMASS –A RENEWABLE ENERGY SOURCE
3.	L-T-P structure	3-0-0
4.	Credits	3
5.	Course Number	ESL-
6.	Status (category for program)	M.Tech
7.	Pre-requisites (course no./title)	

8.	Status vis-à-vis other courses (give course number title)	
8.1.	Overlap with any UG/PG of the Dept./Centre	
8.2.	Overlap with any UG/PG of other Dept./Centre	
8.3.	Supercedes any existing course	

9.	Not allowed for (indicate program name)	
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10.	Frequency of offering	☐ Every sem ☐ 1 st sem ☐ 2 nd sem ☐ Either sem
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11.	Faculty who will teach the course Prof.D.K.Sharma & Prof. (Mrs.) M.G. Dastidar
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12.	Will the course require visiting faculty?	
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13.	Course objective (about 50 words) : Major objective is to teach the students about the biofuels as one of the important renewable energy source. Availability of biomass is important. Different conversion technologies are important and how these can afford the production of cleaner and efficient fuels. Establishment of bioeconomy would help in the replacement of fossil fuels with biomass.
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14.	Course content (about 100 words) (include laboratory/design activities): First generation biofuels from biomass :- Biogas-animal dung and agroresidues and other cellulose wastes, ethanol from wheat or corn, sugar cane,sweet sorghum,beet roots, grapes,starch etc,pyrolysis of biomass.Direct combustion of biomass,Improved stoves routes. Second Generation Biofuels:- Biodiesel from oil seeds, Gasification of agroresidues,sawdust etc, Micro-power generation through biomass gasifiers,waste incineration fluidized bed combustion of biomass. Third Generation Biofuels:- Algae based Biodiesel, Ethanol,Hydrogen, alcohols from agroresidues,chemical composition of lignocellulosic biomass,fuels and chemicals from each component biomass(Hemicellulose,Cellulose, and Lignin), Chemical, Thermochemical and Biochemical processes, Availability of biomass,petrocrops, aquatic biomass and its potential,concept of bioeconomy and biorefineries. .
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15. Lecture outline (with topic and number lectures)

Module no.	Topic	No. of hours
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
COURSE TOTAL (14 times 'L')		

16. Brief description of tutorial activities

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17. Brief description of laboratory activities

Module No.	Experiment description	No. of hours
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
COURSE TOTAL (14 times 'P')		

18. Suggested texts and reference materials

STYLE: Author name and initials, Title, Edition, Publisher, Year.

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19. Resources required for the course (itemized & student access requirement, if any)

19.1	Software	
19.2	Hardware	
19.3	Teaching aides (videos etc)	
19.4	Laboratory	
19.5	Equipment	
19.6	Classroom infrastructure	
19.7	Site visits	

20. Design content of the course (Percent of student time with examples, if possible)

20.1	Design-type problems	
20.2	Open-ended problems	
20.3	Project-type activity	
20.4	Open-ended laboratory work	
20.5	Others (please specify)	