



DEPARTMENT OF ENERGY ENGINEERING

COURSE PLAN – PART I			
Name of the programme and specialization	M. Tech. Energy Engineering		
Course Title	BIO ENERGY TECHNOLOGIES		
Course Code	EN602	No. of Credits	3
Course Code of Pre-requisite subject(s)	NIL		
Session	January 2021	Section (if, applicable)	NA
Name of Faculty	Dr. M. Premalatha Dr. T. Mathimani	Department	Energy Engineering
Official Email	<a href="mailto:latha@nitt.edu">latha@nitt.edu</a> <a href="mailto:mathimani@nitt.edu">mathimani@nitt.edu</a>	Telephone No.	+919894600407
Name of Course Coordinator(s) (if, applicable)	NA		
Official E-mail	<a href="mailto:latha@nitt.edu">latha@nitt.edu</a>	Telephone No.	+91-431-2503103
Course Type (please tick appropriately)	<input checked="" type="checkbox"/> Core course	<input type="checkbox"/> Elective course	
<b>Syllabus (approved in BoS)</b>			
Sources and Classification - Chemical composition, properties of biomass - Energy plantations. Size reduction, Briquetting, Drying, Storage and handling of biomass Feedstock for biogas, Microbial and biochemical aspects - operating parameters for biogas production. Kinetics and mechanism- High rate digesters for industrial waste water treatment Incineration- Processing for liquid fuel production. Pyrolysis - Effect of particle size, temperature, and products obtained. Gasification - Effect of pressure, temperature, steam and oxygen. Industrial effluents [Food waste, Textile, Distilleries, Glue, paper and pulp, Dairy and miscellaneous]; Waste to Energy [Domestic sewage, Municipal solid wastes]; Biorefineries; Biohydrogen production. Combustion of rice husk and woody biomass - Life Cycle Analysis of biofuels - Environmental aspects of biofuel utilization - Techno-economic features of bio-fuels			
<b>COURSE OBJECTIVES</b>			
The course aims to educate the students about the sources and classification of biomass. Also aims to teach about their thermochemical conversion and biochemical conversion processes and the life cycle assesment and techno economic features.			
<b>MAPPING OF COs with POs</b>			
Course Outcomes	Programme Outcomes (PO) (Enter Numbers only)		
1. To understand the biomass and its constituents for various applications	1,2,4,6,7,8,11 & 12		



2. To study biochemical, chemical methods of biomass conversion for sustainable environment	
3. To obtain knowledge on liquid fuel production and characterization	
4. To learn and apply thermochemical processing of various feedstock's for fuel production	
5. To experiment different wastes for sustainable energy	

**COURSE PLAN – PART II**

**COURSE OVERVIEW**

The course aims to educate the students about the biomass and its constituents for various applications, thermochemical processing, biochemical and chemical methods of biomass conversion for sustainable environment and finally educate to apply them in problem of energy engineering.

**COURSE TEACHING AND LEARNING ACTIVITIES**

( Add more rows)

S.No.	Week/Contact Hours	Topic	Mode of Delivery
1	Week 1 to 4	Sources and Classification - Chemical composition, properties of biomass - Energy plantations. Size reduction, Briquetting, Drying, Storage and handling of biomass	PPT, MS teams
2	Week 5	Class test 1	PPT, MS teams
3	Week 5 to 8	Feedstock for biogas, Microbial and biochemical aspects - operating parameters for biogas production. Kinetics and mechanism- High rate digesters for industrial waste water treatment	PPT, MS teams
4	Week 9 to 11	Incineration- Processing for liquid fuel production. Pyrolysis - Effect of particle size, temperature, and products obtained. Gasification - Effect of pressure, temperature, steam and oxygen.	PPT, MS teams
3	Week 11	Class test 2	PPT, MS teams
5	Week 12 to 14	Industrial effluents [Food waste, Textile, Distilleries, Glue, paper and pulp, Dairy and miscellaneous]; Waste to Energy [Domestic sewage, Municipal solid wastes]; Biorefineries; Biohydrogen production.	PPT, MS teams



6	Week 15 to 17	Combustion of rice husk and woody biomass - Life Cycle Analysis of biofuels - Environmental aspects of biofuel utilization - Techno-economic features of bio-fuels	PPT, MS teams
7	Week 18	End semester examination	PPT, MS teams

**COURSE ASSESSMENT METHODS (shall range from 4 to 6)**

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Class Test 1*	Week 5	50 Minutes	25
2	Class Test 1*	Week 11	50 Minutes	25
3	Assignment	Week 8	1 day	10
4	Report and presentation on biomass	Week 14	1 day	10
CPA	Compensation Assessment**	Week 15	50 Minutes	25
5	Final Assessment **	Week 18	120 Minutes	30

\*MCQ will be conducted through class marker online tool

\*\*mandatory; refer to guidelines on page 5

**COURSE EXIT SURVEY** (mention the ways in which the feedback about the course shall be assessed)

Feedback about the course will be collected by institute through student's MIS portal

**COURSE POLICY** (including compensation assessment to be specified)

**MODE OF CORRESPONDANCE (E-mail/phone)**

Students can meet the course faculty in Department of Energy and Environment (DEE-MAIN) or contact at [latha@nitt.edu](mailto:latha@nitt.edu).

**COMPENSATION ASSESSMENT POLICY**

Compensation assessment will be conducted only for students who miss in class test on valid/genuine reasons of medical or other emergencies.

**ATTENDANCE POLICY** (A uniform attendance policy as specified below shall be followed)

- At least 75% attendance in each course is mandatory.
- A maximum of 10% shall be allowed under On Duty (OD) category.
- Students with less than 65% of attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

**ACADEMIC DISHONESTY & PLAGIARISM**

- Possessing a mobile phone, carrying bits of paper, talking to other students, copying



from others during an assessment will be treated as punishable dishonesty.

- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.
- The above policy against academic dishonesty shall be applicable for all the programmes.

**ADDITIONAL INFORMATION, IF ANY**

**Text Books and Reference**

1. V V N Kishore, "Renewable Energy Engineering and Technology", Teri.
2. Chakraverthy A, "Biotechnology and Alternative Technologies for Utilization of Biomass or Agricultural Wastes", Oxford & IBH publishing Co, 1989.
3. Mital K.M, "Biogas Systems: Principles and Applications", New Age International
4. publishers (P) Ltd., 1996.
5. Nijaguna, B.T., Biogas Technology, New Age International publishers (P) Ltd., 2002
6. VVN Kishore, Renewable energy engineering and Technology, Principles and Practices, TERI, 2009.
7. Venkata Ramana P and Srinivas S.N, "Biomass Energy Systems", Tata Energy Research Institute, 1996.
8. Rezaiyan. J and N. P. Cheremisinoff, "Gasification Technologies, A Primer for Engineers and Scientists", Taylor & Francis, 2005
9. Khandelwal. K. C. and Mahdi S. S, "Bio-Gas Technology", Tata McGraw-Hill Pub. Co. Ltd, 1986.
10. Bioenergy and Biofuel from Biowastes and Biomass edited by Samir Kumar Khana, ASCE Publications, 2010

**FOR APPROVAL**

Course Faculty M. Sundha

CC- Chairperson

Dr A ARUNAGIRI

HOD M. Sundha



**Guidelines**

- a) The number of assessments for any theory course shall range from 4 to 6.
- b) Every theory course shall have a final assessment on the entire syllabus with at least 30% weightage.
- c) One compensation assessment for absentees in assessments (other than final assessment) is mandatory. Only genuine cases of absence shall be considered.
- d) The passing minimum shall be as per the regulations.

B.Tech. Admitted in				P.G.
2018	2017	2016	2015	
35% or (Class average/2) whichever is greater.		(Peak/3) or (Class Average/2) whichever is lower		40%

- e) Attendance policy and the policy on academic dishonesty & plagiarism by students are uniform for all the courses.
- f) Absolute grading policy shall be incorporated if the number of students per course is less than 10.
- g) Necessary care shall be taken to ensure that the course plan is reasonable and is objective.