Syllabus for B.Tech – Energy Engineering

Course Number & Title: EN207 – Biomass, Biofuels and Biorefinery	
L-T-P-C: 3-0-0-6	
Offered in (Odd/ Even / Any):Semester IV	
Pre-Requisite: Nil	
Preamble / Objectives (Optional): This course provides an insight to the basics of biomass, various conversion technologies and the different types of products that can be obtained upon successful conversion. The course also deals with various products such as biofuels, platform chemicals, polymers etc. Finally, integrated biorefinery concepts, types of biorefinery has been discussed. The course will enable students to develop necessary skills to design appropriate biomass based fractionation technique as per the need.	
Course Content/ Syllabus: World energy scenario, consumption pattern, fossil fuel depletion and environmental issues; biomass feedstock: agricultural and its residues, animal residues, microorganisms for biofuels and biochemical; biomass and bio-fuels properties; biomass pretreatment: physical, thermal, and microbial conversion processes; bio-diesel, bio-oil and bio-char; bio-ethanol and bio-butanol; bio-gas, bio-hydrogen, and bio-methanol : generation and utilization, fundamentals, fermenter designs; value added products from biomass; biorefinery: basic concepts, types of bio refineries, bio refinery feedstocks and properties, economics; integrated biorefinery approach.	
Books (In case UG compulsory courses, please give it as “Text books” and “Reference books”. Otherwise give it as “References”.	
Text Books: (Format: Authors, *Book Title in Italics font,* Volume/Series, Edition Number, Publisher, Year.)	
1.	D L Klass, *Biomass for Renewable Energy, Fuels, and Chemicals*, Academic Press, Elsevier, 2006.
2.	P Basu, *Biomass Gasification, Pyrolysis and Torrefaction*, Academic Press, Elsevier, 2013.
Reference Books: (Format: Authors, *Book Title in Italics font,* Volume/Series, Edition Number, Publisher, Year.)	
1.	A A Vertes, N. Qureshi, H.P. Blaschek, H. Yukawa (Eds.), *Biomass to Biofuels : Strategies for Global Industries*, Wiley, 2010.
2.	S Yang, H A El-Enshasy, N. Thongchul (Eds.), *Bioprocessing Technologies in Biorefinery for Sustainable Production of Fuels, Chemicals and Polymers*, Wiley, 2013.
3.	S T Yang (Ed.), *Bioprocessing for Value Added Products from Renewable Resources*, Elsevier, 2007.