Syllabus for B.Tech – Energy Engineering

Course Number & Title: EN303 Hydrogen and Fuel Cell Technology	
L-T-P-C: 3-0-0-6	
Offered in (Odd/ Even / Any): Semester V	
Pre-Requisite: Nil	
Preamble / Objectives (Optional): This course provides the comprehensive view about various hydrogen production methods and fuel cell technologies. This course will serve as a guide for hydrogen related technologies and advancement	
Course Content/ Syllabus: Introduction to hydrogen energy, various hydrogen production methods, types of electrolyzer: proton-exchange membrane, alkaline, solid oxide, alkaline, microbial, efficiency, open circuit voltage, and losses, type of fuel cells: proton-exchange membrane, alkaline, anion exchange membrane, solid oxide, microbial, storage, fueling fuel cell, component of fuel cells, fuel cell calculations, design of integrated hydrogen energy systems, fuel-cell electric vehicle and applications	
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.	J Larminie, A L Dicks, Fuel Cell Systems Explained, 2nd Edition, Wiley, 2013.
2.	X Li, *Principles of Fuel Cells*, Taylor and Francis, 2005.
Reference Books: (Format: Authors, *Book Title in Italics font,* Volume/Series, Edition Number, Publisher, Year.)	
1.	I Dincer, C Zamfirescu, *Sustainable Hydrogen Production,* Elsevier, 2017.
2.	I Dincer, H Ishaq, *Renewable Hydrogen Production*, Elsevier, 2021.
3	G Naterer, I Dincer, C Zamfirescu, Hydrogen Production from Nuclear Energy, Springer, 2015.
4	B Sorensen, G Spazzafumo, *Hydrogen and Fuel Cells: Emerging Technologies and Applications,* 3rd Edition, Academic Press, 2018.