Course Type	Course Code	Name of the Course	L	T	P	Credits
DE	NCHD506	**Carbon Capture and Clean Energy**	3	0	0	3

Course Objective

- To acquire underlying principles of science and engineering of CO_2 capture from vents and exhausts of various processes
- To provide a blueprint for minimizing carbon footprint through the usage of technology e.g. power cycles, heat recovery, and heat utilization

Learning Outcomes

- Students will have enough knowledge about CCUS and various climate change mitigation technologies.

Unit No.	Description of Lectures	Contact Hours	Learning Outcome
1	**Introduction to fossil fuels & carbon emission:** World energy scenario, fossil fuel and emissions, importance of power plants and other processes of carbon emissions e.g., lime and cement manufacture, natural and synthesis gas processing plants, etc.	**8**	Basic introduction to fossil fuels and carbon emission scenario from different industries
2	**Combustion and gasification technologies**: Post-combustion treatment technologies, supercritical processes, fluidized beds, IGCC, oxyfuel gasification and combustion and clean-up processes, syngas from different energy sources, e.g. fossil fuels, biomass, gas reforming, partial oxidation, and other routes to syngas/hydrogen production, routes to alternative liquid fuels – synthetic and bio-diesel, DME, GTL, polygeneration.	**10**	Students will know the application of combustion and gasification technology in the context of CCUS
3	**Carbon capture:** Technology options for CO_2 capture, advantages and disadvantages of major CO_2 capture technologies, global issues and trends.	**8**	Students will be familiar with various technology options for carbon capture options
4	**Carbon storage & sequestration**: Storage options, technologies and field projects, carbon sequestration methods	**8**	Students will know the CO_2 storage and sequestration methods
5	**Highly efficient power generation**: Utilization and recovery of low-grade and waste heat, combined heat and power cycle, the emerging technologies.	**8**	Students will be acquainted with various high efficient power generation technologies in the context of CCS
	Total	**42**	

Textbooks:

1. Rackley, S. A. (2017). Cabon Capture and Storage. 2nd Ed. Butterworth-Heinemann.

Reference Books:

1. Herzog, H.J. (2018) Carbon Capture, MIT Press.
2. Kohl, A. L.; Nielsen, R. B. (1997) Gas Purification, 5th Ed., Gulf Publishing.
3. Higman, C. and Buggt, M. (2008) Gasification, 2nd ed., Gulf Professional Publishing.
4. Liu, K. Song, C. Subramani, V. (2010) Hydrogen and Syngas Production and Purification Technologies, AIChE, Wiley