Indian Institute of Technology Kanpur
Proposal for a New Course

Course Number	MBAXXX
Course Title	Introduction to Hydrogen Economy: Technology, Economics, and Business Strategy
Credits	5 (3-0-0-0)
Duration of Course	Half Semester
Proposing Department	Department of Management Sciences (DoMS)
Pre-requisites	
Other Interested Faculty	-
Departments/IDPs which may be interested in the proposed course	SEE, Kotak School of Sustainability

Course Description: This course will introduce students to understanding of hydrogen's emerging role in the global transition toward a low-carbon and net-zero economy. The course adopts an interdisciplinary approach by integrating the technological foundations of hydrogen production, storage, transportation, and utilization with the economic principles, market dynamics, and business strategies that underpin the development of a competitive hydrogen economy. The course will introduce the hydrogen value chain, techno-economic assessment, cost competitiveness, investment analysis, financing mechanisms, policy and regulatory frameworks, carbon markets, supply chain management, and business model innovation.
Using case-based approach the course covers an introduction to social science perspective of decarbonisation, the role of public policy and civil society.

Learning Outcomes
Upon successful completion, students will have the knowledge and skills to:

- Explain the role of hydrogen in the global energy transition, including its technological, economic, and environmental significance in achieving net-zero emissions
- Analyze the hydrogen value chain using techno-economic principles, including cost assessment, market dynamics, investment appraisal, and financial feasibility
- Assess the influence of policies, regulations, carbon markets, and international hydrogen strategies on business opportunities, investment decisions, and market development.
- Evaluate hydrogen production, storage, transportation, and end-use technologies, and assess their technical feasibility, technology readiness, and commercial potential.

Content

S. No.	Broad Title	Topics	No. of Lectures
1	Introduction to the Hydrogen Economy	• Role of hydrogen in net zero emissions • Role of hydrogen in decarbonisation of hard-to-abate sectors: steel, cement, chemicals and refining • Types of hydrogen: grey, blue, green, pink, turquoise • Hydrogen as an energy carrier vs fuel vs feedstock	4

2	Hydrogen Technologies and Techno-Economic Fundamentals	• Hydrogen production technologies: Steam methane reforming; coal gasification; electrolysis; emerging technologies (biomass etc.) • Hydrogen storage and transport: Infrastructure • Levelized Cost of Hydrogen, CAPEX/OPEX , fuel price sensitivity, electricity price sensitivity, learning curves • Case studies of techno-economic feasibility from recently established hydrogen plants	3
3	Hydrogen Markets, Hydrogen Value Chain, and Business Models	• Markets: Hydrogen demand evolution and sectoral use cases; Existing demand sectors and new (anticipated) demand sectors; domestic demand and export potential • Hydrogen value chain and trade: Hydrogen value chain, role of certification and guarantees of origin, emerging global hydrogen trade routes and demand centres, export-oriented hydrogen economies and import-dependent regions • Business Models: types of business models emerging merchant hydrogen production, captive hydrogen production, hydrogen-as-a-service, infrastructure ownership models, electrolyzer leasing models, green ammonia export business models • Case study	3
4	Hydrogen Policy, Investment and Future Pathways	• Policy and Regulation: International hydrogen roadmaps, National hydrogen missions (EU, USA, India, Japan); types of policy instrument to incentivise hydrogen sector • Finance and investment: venture capital in hydrogen startups, public-private partnerships, risk-return trade-offs in hydrogen investments • Future Pathways: Opportunities – Impact on job creation, economic growth and Challenges: Technology risk and obsolescence, market demand uncertainty, infrastructure risk, lifecycle emissions considerations • Case study	4
		Total Number of Lectures	14

The duration of each lecture is 1 hours 15 minutes

C) Prerequisite: None

D) Short Summary for including in the Courses of Study Booklet:
Hydrogen Economy: Technology, Economics, and Business Strategy is an interdisciplinary course that examines hydrogen as a key enabler of the global clean energy transition. The

course integrates the technological foundations of hydrogen production, storage, transportation, and end-use applications with the economic principles, policy frameworks, and business strategies required for successful commercialization.

Recommended Books/References:

- Intergovernmental Panel on Climate Change (IPCC) (2022) Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report (AR6). Cambridge University Press. Chapter 6 (Energy Systems) and Chapter 11 (Industry).
- International Energy Agency (IEA) (2024) Global Hydrogen Review 2024.
- International Energy Agency (IEA) (2019) The Future of Hydrogen: Seizing Today's Opportunities.
- International Renewable Energy Agency (IRENA) (2022) Global Hydrogen Trade to Meet the 1.5°C Climate Goal: Part I – Trade Outlook for 2050.
- International Renewable Energy Agency (IRENA) (2020) Green Hydrogen Cost Reduction: Scaling up Electrolysers to Meet the 1.5°C Climate Goal.
- United Nations Industrial Development Organization (UNIDO) (2021) The Role of Green Hydrogen in Industrial Development.
- World Energy Council. (2022) International Hydrogen Strategies.
- National Hydrogen Mission, Government of India. (2023) National Green Hydrogen Mission: Policy Framework and Implementation Guidelines.

Proposer: Mousami Prasad
Date: July 06, 2026

DPGC convener:
Date:

This course is approved/not approved.
Chairperson, SPGC
Date: