

EME 981-Advanced Fuel Technology

Credit Hours: 3

Pre-requisites: Nil

Course Objectives

- To introduce Advanced Fuel Technology in Methanol, Hydrogen and hydrazine.
- Chemical reactivity, Specification analysis, Fire hazards & storage and transportation

Course Contents

- Historical development of Methanol & Production of methanol
- Reactions and applications of methanol & Future opportunities and challenges
- Storage and handling aspects, Pure methanol & Methanol containing system
- Toxicity, Occupational health and environmental concerns & Production of methanol
- Thermodynamics and kinetics of methanol synthesis & Syngas preparation process
- Steam reforming of natural gas to methanol & Conversion of methanol to gasoline
- Conversion of methanol to olefins, Methanol fuel & Methanol as a fuel
- Methanol vehicle exhaust emissions & Future methanol engine and vehicles
- Methanol in heavy-duty engines & Outlook for fuel methanol
- Hydrogen An energy-dependent world & The basics of hydrogen
- History and development, why hydrogen as a fuel & Pros and cons into the future
- Production of Hydrogen from fossil electrolysis, Hydrogen from coal
- Hydrogen from methane & Hydrogen from Biomass pyrolysis /steam reforming
- Modeling of hydrogen separation & Storage and handling aspects
- Membrane for enhanced hydrogen production from Water
- Gas shift reaction, Hydrogen-metal systems & Mass storage of hydrogen
- Hydrogen storage for future energy systems & Fuel cell system model
- Transportation of gaseous hydrogen by pipelines & Hydrogen fuel
- Transportation of liquid hydrogen by truck or ship & Analysis and simulations
- Fuel cells, Progress in PEM fuel cell development & Hydrogen fueled transportation
- Fuel cell vehicles, Hydrazine Introduction & Physical properties of hydrazine
- Hydrazine chemistry, Production of hydrazine & Hydrazine handling aspects
- Decomposition and combustion of hydrazine & Hydrazine applications

Course Outcomes

- The graduates will be able to apply the gained knowledge in the research-related projects of fuel efficiency.

Recommended Reading (including Textbooks and Reference books)

- Hydrogen power of the future, Chris Hayhurst
- Hydrogen energy system: Production, utilization and future aspects, Y. Yurum
- Methanol production and use, Wu-Hsun Cheng, H.H. Kung Advances in Hydrogen Energy, G. Padro, F. Lau
- Prospectus for hydrogen and fuel cell, Control of fuel cell power systems: Principal, Modeling, Analysis and Feedback, Pukrushpau, Awa G., HueiPeng
- Hydrazine and its derivatives: Preparation, Properties, Applications, E. W. Schmidt