

## **ME430 TERM PROJECTS TOPICS FOR INTERNAL COMBUSTION ENGINES COURSE**

The term project will be prepared in groups of 3-5 people on the topics given below or on a topic you determined and approved by the course lecturer. A written report will be submitted in the last weeks of the semester (date to be determined later), and a 15-minute presentation will be made in the classroom using projection devices. The term project will affect your total grade by 10%.

The students will create the groups, and the groups and selected topics will be determined by March 25, 2024, at the latest.

- Fuel systems used in diesel (Compression Ignition) engines
  - Common rail technology
  - Diesel pump types and working principles
- Fuel systems used in gasoline (Positive Ignition) engines
  - Single-point and multi-point spray systems
  - Direct injection systems
- What are HCCI engines? How do they work?
- What are RCCI engines? How do they work?
- Boosting (Overcharging) methods in internal combustion engines
  - Effects of electric turbocharging systems on internal combustion engine performance and emissions
  - Turbocharger applications (Turbocharger geometries-Variable cross section)
  - Supercharging applications
- Exhaust gas reduction methods used in internal combustion engines
  - Alternative fuels (Biofuels, synthetic fuels, hydrogen etc.)
  - Catalytic converters, particulate traps
  - What is an EGR system? How does it work?
  - The potential of carbon capture and storage technology in reducing emissions
- What are the shapes of the combustion chamber? What are the design criteria?
- Variable valve timing (VVT)
- What is a Wankel engine? How does it work?
- In-cylinder pressure and temperature analysis
- Artificial intelligence and machine learning applications in ICE
- Development of hydrogen-fueled ICEs
- Use of ceramic matrix composite materials in ICEs
- Production of ICE parts using 3D printing technology and its effect on engine technology
- Use of nano-technology in ICEs
- Effectiveness of emission control policies in motor vehicles
- Electrification and hybrid engine technologies (Working principles of hybrid and electric engines, Different hybrid engine types and their advantages, Effects of hybrid and electric motors on emissions and fuel consumption, Future electric engine technologies and trends)

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