Propulsion Systems for UAVs and General Aviation Aircraft (AERO0440)

Instructor: Ray Taghavi

Course Highlights

• Fundamentals of aircraft propulsion systems, engine types and aircraft engine selection
• Aircraft spark-ignition, diesel and Wankel engines
• Two-stroke and four-stroke cycle engines
• Aircraft engine classification by cylinder arrangement, cooling, cycle, etc.
• Carburetion, ignition and lubrication systems
• Aviation fuels
• Propellers
• Engine testing and simulations
• Electric propulsion
• Overview of turbo-propeller and turboshaft engines
• Engines for special applications, UAVs, RPVs, blimps, etc.

Course Description

This course provides an in-depth understanding of the state-of-the-art propulsion issues for UAVs and general aviation aircraft, including propulsion options, cycle analysis, principles of operation, systems, components, performance and efficiencies.

Who Should Attend?

Designed for propulsion engineers, aircraft designers, aerospace industry managers, educators, and research and development engineers from NASA, the FAA, and other government agencies.

Learning Objectives

• A broad knowledge of engines for UAVs and general aviation aircraft and their operation
• Engine selection process for a specific aircraft and UAVs
• Aircraft Engine Systems: Carburetion, fuel injection, FADEC, ignition and lubrication
• The advantages and disadvantages of different propulsion options
• Engine classifications based on cycle, cylinder arrangement, cooling, etc.
• Propellers: classifications, practical issues, definitions and systems
• Engine scaling
• Small engine simulations
• Electric propulsion
• Aircraft engine testing

Course Outline

• Day One
  • Overview: Fundamentals of aircraft propulsion systems, engine types and aircraft engine selection
  • Aircraft reciprocating engines: spark ignition and diesel engines: theory and cycle analysis, four stroke and two stroke cycles; brake horsepower, indicated horsepower and friction horsepower; engine parameter, efficiencies, classifications and scaling laws; practical issues

Day Two
  • Aircraft reciprocating engines (continued): components and classification: cylinder, piston, connecting rod, crankshaft, crankcase, valves and valve operating mechanism; lubrication systems, pumps, filters, oil coolers, etc.; induction system, supercharging, cooling (air and liquid), exhaust engine installation and compound engine; engine knocks (pre-ignition and detonation), aviation fuels, octane and performance number, backfiring and afterfiring

Day Three
  • Aircraft reciprocating engines (continued): carburetion and fuel injection systems, FA DEC; magneto (high and low tension), battery and electronic ignition systems, ignition boosters and spark plugs
  • Rotary engines: propeller: theory, types airfoils, material, governors, feathering, reversing, synchronizing, synchrophasing, de-icing, anti-icing and reduction gears

Day Four
  • Small gas turbine engines: cycles, inlets, compressors, combustors, turbines, exhaust systems, thrust reversers and noise suppressors; turbojet, turboprop, turboshift, turbofan and propfan engines

Day Five
  • Engine noise: sources, suppression, measurement techniques and practical issues
  • Foreign Object Damage (FOD): ice, sand, bird
  • Engines for special applications: UAVs, RPVs, HALE, blimps

Classroom hours / CEUs
35.00 classroom hours
3.5 CEUs

Certificate Track
Aircraft Design, Unmanned Aircraft
Course Fees
Early registration course fee: $2,495 if you register and pay by the early registration deadline (45 days out).

Regular registration course fee: $2,695 if you register and pay after the early registration deadline.

U.S. Federal Employee Discount
This course is available to U.S. federal employees at 10% off the registration fee. To receive the federal employee discount, you must enter the code **FGVT116** during the checkout process. Please note that you must validate your eligibility to receive this discount by entering your U.S. government email address (ending in .gov or .mil) when creating your online registration profile. This discount is available for both the early registration and regular registration fees.

Netherlands Defence Academy Discount
This course is available to Netherlands Defence Academy employees at a discounted registration fee. Please contact the NDA Procurement and Contracting department for details. Please note that you cannot register using our online system when requesting this discount.

This class is available for delivery at your company.
Your company can realize substantial savings by bringing an aerospace short course to your workplace. On-site delivery is ideal for organizations that need to train 10 or more employees on a specific topic. For more information on on-site course delivery, or to request a cost proposal, please contact us at 913-897-8782, or email us at ProfessionalPrograms@ku.edu.

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