Aircraft Structures: Analysis and Design (AERO0100)

Instructor: Mark S. Ewing

Course Highlights
- Structural design overview
- Aircraft loads
- Metals
- Fiber-reinforced composites
- Material selection
- Design to static strength
- Mechanical joints
- Mechanics of thin-walled and built-up structure
- Design to buckling and stiffness
- Component design
- Design for damage tolerance
- Design for durability
- Certification
- Continued airworthiness of the aging fleet

Course Description
This course is an introduction to analysis and design of aircraft structures. Course content includes design criteria, structural design concepts, loads and load paths, metallic and composite materials; static strength, buckling and crippling, durability and damage tolerance, practical design considerations, certification and repair. Analysis exercises and a design project are included to better involve students in the learning process.

Who Should Attend?
This course is designed for engineers, engineering managers, certification authorities and educators whose responsibilities include aircraft structures.

Learning Objectives
- Primary requirements for certifiable structural design: static strength, durability and damage tolerance, and how these requirements impact design
- Fundamentals of determining aircraft loads
- Properties and capabilities of composite and metallic structural materials
Course Outline

Day One
- Structural design overview: evolution of structural design criteria; historical context of safe life, fail safety and damage tolerance; FAA airworthiness regulations
- Design requirements for static strength, fail safety and damage tolerance, durability, flutter avoidance, crashworthiness and maintainability
- Basic design concepts: limit load, ultimate load, factors of safety, margin of safety
- Aircraft loads: inertial loads, load factor; design exercise

Day Two
- Metals: Product forms, physical and mechanical properties, failure modes, design allowables; thermomechanical processing
- Fiber-reinforced, laminated composites: product forms, physical and mechanical properties; failure modes; design allowables; processing
- Material selection: aluminum, titanium, steel, composites and emerging structural materials;
- Design to static strength: highly loaded tension structures; combined loads; design exercise

Day Three
- Mechanical joints: bolts and rivets; bonded and welded joints; lugs and fittings; design exercise
- Thin-walled structures: review of bending and torsion for compact beams
- Thin-walled structures: introduction to shear flow analysis of thin-walled beams

Day Four
- Semi-tension field beams; design exercise;
- Brief introduction to the finite element method
- Design to buckling and stiffness requirements: buckling of thin-walled and built-up structures
- Component design: wings and empennages, fuselage, landing gear, attachments

Day Five
- Design for damage tolerance: crack growth in structures; introduction to fracture mechanics; critical crack length; analysis exercise; widespread fatigue damage; inspection scheduling
- Design for durability: fatigue; analysis exercise; corrosion
- Certification: analysis and validation requirements, component and aircraft testing requirements
Continued airworthiness of aging fleets: widespread fatigue damage; repairs; analysis exercise

Classroom hours / CEUs
35.00 classroom hours
3.5 CEUs

Certificate Track
Aircraft Design, Aircraft Structures

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 FGV116 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.

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CONTACT US:

KU Professional and Continuing Education (KUPCE)
Aerospace Short Course Program
12600 Quivira Road, RC 125
Overland Park, Kansas  66213
Email: ProfessionalPrograms@ku.edu
Phone: 913-897-8530 (Registration)