

AEROSPACE

SHORT COURSES

Aircraft Structures: Analysis and Design – ONLINE (AERO0105)

Instructor: Mark S. Ewing

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.

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 requirements
- Component design concepts
- Design for damage tolerance
- Design for durability
- Certification of structure
- Continued airworthiness aging fleets

Course Outline

- 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
- 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
- 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
- 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
- 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 Online Registration fee: \$2,195*

Regular Online Registration fee: \$2,395

**Early registration fee is available if you register and pay at least 7 days prior to the course start*

Registration is open until the first day of the course; however, early registration is encouraged.

Course Materials

Course materials, including outlines, presentation copies, and supplementary materials, will be accessible through Canvas, KU's online learning system. Instructions to access Canvas will be provided upon completed registration.

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.

Instructor Bio

Mark S. Ewing is former chairman of the aerospace engineering department and is currently the director of the Flight Research Laboratory at the University of Kansas. Previously, he served as a senior research engineer in the structures division at Wright Laboratory, Wright-Patterson Air Force Base, and as an associate professor of engineering mechanics at the U.S. Air Force Academy. His research interests include structural vibrations and structural acoustics, especially as related to fiber-reinforced composites. Ewing is a past recipient of the University of Kansas School of Engineering Outstanding Educator Award. He holds a B.S. in engineering mechanics from the U.S. Air Force Academy, an M.S. in mechanical engineering and a Ph.D. in engineering mechanics, both from Ohio State University.

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