

EAS 6155 – HELICOPTER DYNAMICS
Common Course Syllabus

Catalog Description: 3 CREDITS. Helicopter configurations, actuator disc theory, ducted fans and actuator discs, blade element theory, autorotation, axial flight and forward flight conditions, flapping dynamics, stability in axial and forward flights and multi-blade coordinates and trimming.

Goals: The course is designed to introduce the students to the concept of vertical flight by a lifting rotor. They will investigate helicopter dynamics in vertical and forward flight concerning performance, stability and vibration.

Topics:

1. Introduction to helicopter rotor and configurations
2. Momentum, blade element and combined momentum-blade element theories of vertical flight
3. Performance in hovering and forward flights
4. Autorotation
5. Momentum theory in forward flight
6. Flapping Dynamics
7. Lead-lag dynamics
8. Mathematics of Rotating Systems
9. Dynamic inflow theory
10. Ground and air resonance
11. Static and dynamic stall
12. Vibration and vibration reduction

Course Outcomes:

1. The students will be able to analyze and quantify helicopter performance, stability and vibration.
2. The students will be able to apply helicopter theories to investigate idealized cases of windmills, ceiling fans and propellers of boats and airplanes.
3. The students will be able to develop a computer code to predict the stability of helicopter and other systems with periodically varying coefficients.

Prepared by G. Gaonkar – 4/01, modified 6/02