DEPARTMENT OF AEROSPACE ENGINEERING
IIT KANPUR

Instructor: C.Venkatesan

Helicopter Theory: Dynamics and Aeroelasticity

Course outline:

1. Historical Development
2. Rotor Configurations
3. Elements of hovering and vertical flight
4. Forward flight
5. Performance estimation
6. Rotor blade idealization
7. Blade flap response
8. Trim analysis of helicopters
9. Uncoupled flap, lag and torsion dynamics of rotor blade
10. Flap-lag, flap-pitch, lag-pitch coupling
11. Introduction to coupled flap-lag, flap-torsion stability (time permits)
12. Elements of helicopter stability

References:

1. Gessow, A. and Myers, G.C., Aerodynamics of Helicopter, Frederick Unger Pub. Co., New York, 1952.
2. Bramwell, A.R.S., Helicopter Dynamics, Edward Arnold Pub., London, 1976.
3. Stepniewski, W.Z., Rotary Wing Aerodynamics, Vols. 1 and 2, Dover Publications, 1984.
4. Johnson, W. Helicopter Theory, Princeton Univ. Press, New Jersey, 1980
5. Prouty, R.W., Helicopter performance, Stability and Control, R.E. Krieger Pub. Co., Florida, 1990
6. Venkatesan, C., Lecture Notes: Helicopter Technology, Dept. of Aerospace Engg., IIT Kanpur.
7. Padfield, G.D., Helicopter Flight Dynamics: The Theory and application of flying qualities and simulation modeling, AIAA series, 1996
8. Leishman, J.G., 'Principles of Helicopter Aerodynamics, Cambridge University Press, 2000.
9. Seddon, J., Basic Helicopter Aerodynamics, AIAA series, 1990
10. Bielawa, R.L., Rotary Wing Structural Dynamics and Aeroelasticity, AIAA series, 1992.