STABILITÉ DES MACHINES TOURNANTES

STABILITY OF ROTATING MACHINES

Lecturers: **Laurent BLANC, Fabrice THOUVEREZ**

| Lecturers : 16.0 | TC : 0.0 | PW : 8.0 | Autonomy : 0.0 | Study : 4.0 | Project : 0.0 | Language : AN

Objectives

Rotating machines as systems for propulsion (turbojet engines...), energy production (windmills, alternators...) or ay system needing to rotate a shaft (pump, gyroscope, centrifuges...) hold an important place in everyday life. These machines obey the laws of dynamics and often evolve in a multiphysical context: fluid-structure interaction, mechatronics. This lesson's purpose is to provide the key elements for such systems modelling, concentrating on stability aspects. Indeed this point is essential because a lot of energy is concentrated in these machines and their stability is major concern for their good functionning as well as for safety.

Keywords : Rotating machine. Stability. Vibration

Programme	I/ Reminder of rotating elastic structure equations, modal characterictics in fixed and rotating frame. II/ Linear systems stability analysis: equations with constants coefficients, equations with periodic coefficients. Introduction to non-linear systems stability III/ Rotors stability problems: phenomenological analysis, analysis of structural elements leading to instabilities: • Symmetry, dissipation, buckling in rotating parts • Bearings characteristics • Rotor / stator coupling • Fluid-structure coupling • Non - linear phenomena causing instability (bifurcation...)
Learning outcomes	• To understand rotordynamics specific points • To know how to put into equations rotordynamics problems • To know how to assess for a rotating machine dynamics and stability • To know the different organs of a turbomachine
Independent study	Objectifs : To get informed of rotating machines state of the art Méhodes : Research papers analysis, by binoms + presentation to the group
Core texts	R. Bigret, *STABILITÉ DES MACHINES TOURNANTES ET DES SYSTÈMES*, Publication CETIM, 1997 F. F. Ehrich *HANDBOOK OF ROTORDYNAMICS*, Krieger Publishing Company, 2004 M. I. Friswell, J. E. T. Penny, S. D. Garvey and A. W. Lees*DYNAMICS OF ROTATING MACHINES*, Cambridge Aerospace series, 2010
Assessment	Lab mark Paper comment mark Written exam mark