INSTITUT NATIONAL DES SCIENCES APPLIQUÉES LYON

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Vibrations

Rotordynamics

IDENTIFICATION

CODE : GM-5-S2-EC-MEDYR
ECTS : 3.0

HOURS

Lectures :	0.0 h
Seminars :	30.0 h
Laboratory :	0.0 h
Project :	0.0 h
Teacher-student contact :	30.0 h
Personal work :	20.0 h
Total :	50.0 h

ASSESSMENT METHOD

Project

TEACHING AIDS

Handouts

TEACHING LANGUAGE

French

CONTACT

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AIMS

The course has the objective to understand the dynamic behavior of rotating machines, to design them, to implement modifications in accordance with standards, to optimize their operation, to control their vibratory levels, and to detect potential failures as soon as possible. To this end, it is necessary to know how to establish a mechanical model, to understand the basic phenomena with quasi-analytical and Finite Element methods. With an engineer objective, the program addresses the assumptions formulation and the relevance of the solutions obtained. The chapter devoted to the dynamic behavior monitoring uses powerful signal processing tools to identify and locate faults.
The students must have autonomy, ability to synthesize and to interpret linear or nonlinear basic phenomena during these course-TD-TP sessions, using numerical and experimental demonstrators.

CONTENT

1- Rotor
Modeling of components ; Basic Phenomena ; Finite element modeling. API Standards ; Parametric instabilities and excitation ;Balancing methods. Experimental Demonstrator ; Industrial Illustrations and Applications

2- Aubages
Modeling of blades, axisymmetric assemblies ; Calculation of the Campbell diagram and responses

3- Nonlinear dynamics
Phenomena and basic techniques ;Application to rotating machines.

4- Follow-up of the behavior of the rotors
Troubleshooting and understanding of defects ;Interests of signal processing tools ; Experimental approach of bearing defects.

Tools used: FE codes ROTORINSA, ANSYS and Matlab software: behavior monitoring, nonlinear oscillator, balancing, etc.

BIBLIOGRAPHY

M. LALANNE, G. FERRARIS, Rotordynamics Prediction in Engineering, J. Wiley & Sons, 2nd Ed. 1998
H. DRESIG, F. HOLZWEISSIG, Dynamics of Machinery - Theory and applications. Springer, 2010
N. BACHSCHMID, P. PENNACHI E. TANZI, Cracked Rotors, A survey on static and dynamic behavior including modelling and diagnostic. Springer, 2010
G. GENTA, Dynamics of Rotating Systems. Springer, 2005
M.L. ADAMS, Jr, Rotating Machinery Vibration. From Analysis to Troushooting. CRC Press, 2010.
A.H. NAYFEH, B. BALACHANDRAN, Applied Nonlinear Dynamics, 686p, J. Wiley, 1995

PRE-REQUISITE

Vibration, computational methods, FEM, data processing