مركز الوقت للتدريب
Time Training Center

ADVANCED MACHINERY DYNAMICS

COURSE

Introduction

Advanced Machinery Dynamics course is designed for professionals involved in the design, testing, and maintenance of rotating machinery. This intensive 5-day program delves into complex rotor dynamics, vibration diagnostics, and machinery health monitoring. Engineers, analysts, and researchers will benefit from the in-depth exploration of machine behavior, balancing methods, and diagnostic techniques. With real-world case studies and a focus on critical rotating machinery issues, this course provides valuable insights that are essential for those seeking to advance their expertise in machinery reliability and performance.

Learning Objectives

- Analyze complex rotor dynamic interactions
- Diagnose vibration anomalies using case studies
- Apply machine balancing techniques effectively
- Identify symptoms of fluid-induced instabilities
- Evaluate rotor-to-stator rub and thermal effects
- Understand design implications of bearings and shaft cracks

Course Details

Mode of Training	Classroom or Online
Duration	5 Days

Who Should Attend

- Engineers in machinery vibration diagnostics
- Rotating machinery design and maintenance engineers
- Postgraduate engineers and researchers in rotor dynamics
- Professors and academic professionals in mechanical fields

Certificate(s)

Participants who complete a minimum of 80% of the total training hours will receive a **Certificate of Completion** issued by **Time Training Center**. This certificate reflects their active participation and commitment to professional development in the relevant field.

Course Outline

Module 1: Foundations of Advanced Machinery Dynamics

- Review of basic vibration concepts (frequency, amplitude, phase)
- Modal analysis: theory and applications
- Introduction to rotor dynamics: critical speeds, unbalance response
- Types of machinery failures: fatigue, wear, misalignment
- Advanced topics in rotor dynamics: torsional vibration, subsynchronous resonance
- Introduction to transient vibration analysis
- Fundamentals of signal processing: filtering, spectral analysis
- Hands-on exercise: data acquisition sensors

Module 2: Advanced Vibration Analysis Techniques

- Operational deflection shapes (ODS): theory and measurement techniques
- Orbit analysis: interpretation of orbit plots, fault diagnosis
- Shock pulse method: principles and applications for bearing diagnostics
- Case study: analyzing vibration data from a centrifugal pump
- Advanced spectral analysis: order tracking, envelope analysis
- Time-domain analysis: transient events, impact detection
- Introduction to artificial intelligence (AI) in vibration analysis
- Hands-on exercise: analyzing vibration data software

Module 3: Software and Hardware

- In-depth exploration of data acquisition systems
- Software training: data acquisition and processing, report generation, diagnostic tools
- Hands-on session: setting up and calibrating sensors, collecting and analyzing data

Module 4: Troubleshooting Complex Machinery Problems

- Case studies: turbines, compressors, pumps
- Identifying root causes of failures
- Developing effective corrective actions
- Group discussions on best practices
- Laboratory demonstrations: troubleshooting simulated machinery faults

Module 5: Predictive Maintenance and Reliability

- Predictive maintenance strategies: vibration-based condition monitoring
- Developing and implementing vibration monitoring programs
- Setting alarm limits and maintenance thresholds

- Case study: improving machine reliability through vibration analysis
- Course conclusion and post-assessment evaluation

Methodology

We employ a comprehensive and applied learning strategy, integrating theory with real-world implementation:

- ❖ **Conceptual Learning**: Expert-led sessions on catalytic theory and engineering principles
- ❖ **Interactive Workshops**: Group exercises, presentations, and technical discussion forums
- ❖ **Case-Based Learning**: Industry-specific examples and troubleshooting scenarios
- ❖ **Technology Integration**: Digital tools, simulations, and catalyst modeling applications
- ❖ **Assessment**: Pre-tests, post-tests, and Competence Validation Exams for Certified courses to ensure knowledge transfer and skills validation

Note: Instructors may adjust the training approach to fit technical requirements or participant engagement levels.

Instructors

Our instructors for this course are highly experienced mechanical engineers and machinery diagnostics experts with over 10 years of industry experience in rotating machinery systems. Their backgrounds span sectors such as oil and gas, power generation, and heavy industries. Each trainer brings extensive real-world knowledge to the classroom, using relatable examples to demystify complex rotor dynamics and vibration issues. Detailed trainer profiles will be shared upon course confirmation.

About Time Training Center

Time Training Center is a leading professional training institute in Abu Dhabi that provides students and professionals with quality education and skill development programs. Time Training Center is accredited by the Abu Dhabi Center for Technical Vocational Education & Training (ACTVET) with a specialization in Computer and Management Training programs and certified by QA QC with ISO 9001:2015.

Operating in Abu Dhabi for over 3 decades, Time Training Center has established brand value as a high-quality Management & Technical Training Center in Abu Dhabi. We have also secured strong loyalty from corporate companies and associations with our holistic and practical teaching approach.

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