

## STUDENTS' ANNUAL ACTIVITY REPORT CYCLE 34 YEAR 2020

- Name and Surname **Rizwan Ahmed**
- Dottorato in **INGEGNERIA MECCANICA**
- Department **DIMEAS**
- Coordinator **Prof. Luca GOGLIO**
- Tutor **Prof. Stefano ZUCCA and Prof. Christian M. FIRRONE**
- Macroarea
- **Experimental Investigation and Numerical Modeling Of Non-Linear Structural Dynamics of Shrouded Turbine Blades**
- Short description of research activity (maximum 20 lines)

Rotating turbine blades are highly stressed mechanical components of jet engines during operation. Apart from high static loads caused by centrifugal forces, oscillating forces of the working fluid result in forced vibrations. An important consideration during the mechanical design phase is to estimate and reduce the vibration amplitudes in order to avoid high cycle fatigue (HCF) failure. Friction damping is one of the methods that is used to achieve this since it provides effective damping with simpler structure and can endure extreme operating environments. Various friction damping methods are applied e.g. under platform dampers, shroud, snubber or blade to root contacts depending on the type of turbomachinery and mechanical boundary conditions. The nonlinear dynamics of frictionally damped bladed disks has been widely studied being a subject of research for many years.

Within this project a test rig for shrouded blade dynamics will be designed and developed to collect experimental database. The data will then be used to validate numerical models developed for nonlinear forced response and contact force calculation.

- Training activities carried out during the year (courses, seminars, etc.); for each activity specify the nature, duration, and location

S.No.	Course Title	Location	Hours
<i>HARD SKILLS TRAINING</i>			
1	Aeroelastic tailoring - modeling, design, manufacturability and experiments	POLITO	15
2	Advanced aspects of the finite element method	POLITO	20
3	Automotive transmissions (manual, non-manual and hybrid)	POLITO	20
4	Numerical Modeling and Simulation	POLITO	50
5	Structural mechatronics: systems and technologies	POLITO	20
6	GTE Samara Summer School 2019 (Lectures + Practical) GTE Design and Construction Friction and Wear GTE blade, disk and rotor dynamics	SAMARA UNIVERSITY, RUSSIA	30
7	Tutorial Course on TEX / LATEX	POLITO	4
		<b>Total Hard Skill Hours</b>	<b>159</b>
<i>SOFT SKILLS TRAINING</i>			
8	Communication	POLITO	5
9	Entrepreneurial Finance	POLITO	5
10	Project management	POLITO	5
11	Public speaking	POLITO	5
12	Research integrity	POLITO	5
13	Time management	POLITO	2
14	Writing Scientific Papers in English	POLITO	15
15	Italian language I level	POLITO	
		<b>Total Soft Skill Hours</b>	<b>42</b>

- Possible participation in further research activities during the year (research projects and agreements)

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- Possible participation in internal activities to support teaching during the year (specify on which courses, named as “subject expert”)

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- Stays at other research institutions during the year

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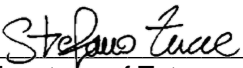
- Collaborations with companies during the year

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- List of accepted papers

Ahmed, R., Firrone, C.M., Zucca, S., Design and Calibration of a Tri-directional Contact Force Measurement System, BSSM's 15th International Conference on Advances in Experimental Mechanics, Sept 2020 - *Conference Postponed to Sept 2021*

Date, 18/09/2020

  
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Signature of Tutor

  
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Signature of Tutor

  
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Signature of the Phd student

The Coordinator

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