ALL. B

SCHEDA PER LA RELAZIONE ANNUALE DEL DOTTORANDO XXXI CICLO

- Nome e Cognome: **Ali Farokhi Nejad**

□ Dottorato in **MECCANICA**

□ **CLUSTER**_____

- Ciclo 31 Anno di Corso 2015/2016
- Dipartimento di afferenza: Dipartimento di Ingegneria Meccanica e Aerospaziale (DIMEAS)
- Coordinatore: **Prof. Luigi GARIBALDI**
- Tutore: **Prof. G. Chiandussi**

  Area Culturale di Interesse (in Italiano e Inglese): Multi body dynamic (MBD) and finite element method (FEM) analysis

- Breve descrizione dell'argomento della tesi o dell'Area Culturale di Interesse (massimo 20 righe, in Italiano e Inglese)

The energy and fuel consumption are important issues in the automotive industry. In order to satisfy the ecological regulation and to produce an environmental friendly product, car manufacturers are willing to design optimized vehicles. Regarding power and fuel economy, the transmission system is one of the main effective parts of the vehicle. The essential component of the transmission systems is the synchronizer. The synchronizer has to be designed in order to obtain smooth gear changes as well as reduced noise and vibration. However, ease of transmission operation and comfort are further synchronizer tasks at which recently has been paid attention.
Several studies have been carried out in order to increase the shifting quality. Changing geometry, material and different lubrication conditions were considered as a solution to improve the shifting performance. To better understand the synchronization process, several mathematical and numerical models have been proposed. Although several models have been proposed, no three dimensional model regarding deformability was reported. Despite of effect of inertia and high rotational speed during the synchronization process the necessity of 3D modeling is highlighted.
This present study aims to develop a multi body dynamic (MBD) model for simulation of the synchronizer's phenomenological behavior during shifting process. Firstly, the MBD model is simulated and then the FEM-MBD model in two different domains (frequency and structural) will be created. Once the FEM-MBD model will be available, it would be improved by taking into consideration the thermal and friction coefficients. In order to validate the model, experimental data will be obtained by using the Oerlikon Graziano test rig. The validated data from finite element modeling will be transferred to the optimization software to generate the correlation factors. The correlation factors yields to precise evaluation of the behavior of every synchronizer component during the shifting process. The validated model will help to identify some unknown random phenomena that are happening during synchronizer operation.

- Attività di formazione svolta nell'anno (corsi, seminari, etc.); per ogni attività specificare natura, durata e sede

Seminar Title	Duration	Place
MATLAB, Simulink and physical modeling for Mechanical and Aerospace Engineering	4 hrs	POLITO
Modellare e simulare in Simscape	2hrs	WEBINAR
The Monte Carlo Method	30 hrs	DISAT,POLITO

Course Title	CFU	Skill type	status	Duration	Place of the course
Aspetti avanzati del metodo degli elementi finiti	4	HARD	superato	20 hrs	DIMEAS,POLITO
Modellizzazione avanzata di problemi strutturali con elementi finiti	6	HARD	superato	30 hrs	DIMEAS,POLITO
Multiscale structural mechanics (didattica di eccellenza)	3	HARD	superato	15 hrs	DIMEAS,POLITO
Progettazione dinamica di ingranaggi	4	HARD	superato	20 hrs	DIMEAS,POLITO
Short Course on Enterpreneurship	1	SOFT	superato	7 hrs	POLITO
Strumenti e applicazioni del systems engineering	6	HARD	superato	30 hrs	DIMEAS,POLITO
Writing Scientific Papers in English	3	SOFT	superato	15 hrs	CLA-POLITO

- Eventuale partecipazione del Dottorando ad ulteriori attività di ricerca nell'anno (progetti e convenzioni di ricerca)

  Collaboration in two different project as a numerical analyzer expert . The outcome of those project is two ISI journal papers with Politecnico di Torino affiliation.

- Eventuale partecipazione del Dottorando ad Attività interne di supporto alla didattica nell'anno (specificare su quali corsi, e se eventualmente il Dottorando sia stato nominato Cultore della Materia)

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- Eventuali soggiorni presso altri Centri di Ricerca nell'anno

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- Eventuali collaborazioni con imprese nell'anno

  Since November 2015 until now the current Ph.D. project performed at Oerlikon Graziano R&D center in Rivoli, Turin.

- Elenco delle Pubblicazioni del Dottorando

  1- Alipour, R., & Nejad, A. F. (2016). Creep behaviour characterisation of a ferritic steel alloy based on the modified theta-projection data at an elevated temperature. *International Journal of Materials Research*, *107*(5), 406-412.

  2- Faridmehr, I., Razavykia, A., & Nejad, A. F. (2016). Effect of Web Holes and Bearing Stiffeners on Flexural-Shear Interaction Strength of Steel Cold-Formed C-Channel Sections. *Latin American Journal of Solids & Structures*, *13*(6).

  3- Conference paper: ready to submit

  Estimation of Synchronization Time for the Transmission System through Multi body Dynamic Analysis

  4- Journal paper: under preparation

  Study On a Synchronization Mechanism Through Multi body Dynamic Analysis

Torino,

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Firma del Tutore

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Firma del Dottorando

Il Coordinatore

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