ALL. B

STUDENTS' ANNUAL ACTIVITY REPORT CYCLE XXXV YEAR 2019/2020

- Name and Surname **Hadi RAHMEH**
- Dottorato in **Mechanical Engineering**
- Department **Department of Mechanical and Aerospace Engineering (DIMEAS)**
- Coordinator **Prof. Luca GOGLIO**
- Tutor **Prof. Nicola AMATI**
- Macroarea

  Modelling, design and control of Hybrid Electric Vehicles HEVs

- Short description of research activity (maximum 20 lines)

  Recent stringent environmental regulations coupled with an unstable oil market have pushed car manufacturers towards the development of advanced powertrains to assist or replace the conventional internal combustion engine (ICE) based traction. Among theses solutions, HEVs have gained a considerable interest and are projected to gain an important market share in the next couple of decades. A lot of research in the HEVs field has been centered around reducing the carbon footprint and fuel consumption of the vehicle.
  The research work is aimed at:
  1. **Development and analysis of models for several mild hybrid electric vehicles architectures (P0, P2, P3) with the use of Simulink software.**
  2. **Development of several HEVs power management strategies (Rule based, ECMS, Dynamic optimization, Fuzzy logic) with the aim of reducing emissions.**
  3. **Electric machine sizing for different HEVs architectures and vehicle weight classes.**
  4. **Battery sizing of a plug-in HEV in line following WLTP regulations**

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

  1. **01UJJRO – Automotive transmissions (manual, non-manual and hybrid) (20h – III level course, hard skills, Politecnico di Torino)**
  2. **01TAJRO – Servosystems: Characteristics, analytical tools and application to a use case: aircraft flight controls (24h – III level course, hard skills, Politecnico di Torino)**
  3. **01IHENE – Trazione elettrica (60h – II level course, hard skills, Politecnico di Torino)**
  4. **01QORRO – Writing Scientific Papers in English (15h – soft skills, Politecnico di Torino)**
  5. **Simdrive training from DAYCO (20 hours, Online training on Microsoft teams)**
  6. **WLTP cycles training from DAYCO, Prof. F Cavallino (16 hours, Online training on Microsoft teams)**

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

  Design of axial and radial active magnetic bearings AMBs and electric motor for the rotor of an Inertial Sea Wave Energy Converter with the aim of improving the efficiency and energy production of the system under the ISWEC project.

- 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

    1. **Dayco Europe S.r.l.**
    2. **Wave for Energy S.r.l.**

- List of accepted papers

Rahmeh H., Bonfitto A., Ruzimov S. (2020, August). " Fuzzy Logic vs Equivalent Consumption Minimization Strategy for Energy Management in P2 Hybrid Electric Vehicles". In Proceedings of the ASME 2020 International Design Engineering Technical Conferences and Computers and Information in Engineering Conference (IDETC-CIE 2020), 22nd International Conference on Advanced Vehicle Technologies (AVT). (IDETC2020-22431).

Torino, 17/09/2020

Signature of Tutor

Signature of the Phd student

The Coordinator