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| <b>Research program:<br/>“Intelligent Mechatronic Systems”</b> |
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**Annex C**

**Department of Engineering and Applied Sciences**

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**Description**

The research project deals with the development of mechatronic devices characterized by the capability to interact with both the operator and the working environment.

In particular it is focused on parallel kinematics robotic systems to be used inside production lines mainly at the aim to perform:

- In line measurements and dimensional controls
- High precision positioning in space

The in line insertion of intelligent mechatronic systems, allowing to make automatic measurements and dimensional controls on components during production, leads to remarkable advantages preventing bad components to reach the end of the production process.

Besides, in some field as the automotive lighting, dimensional controls are nowadays made by means of manual or semi-automatic systems leading to a significant reduction of the productivity and to the risk to have errors.

The high precision positioning of objects in space is another important topic in industrial environment. As a matter of fact, there is frequently the need to move object from a position to another with very high accuracy, as for micro-manipulation, micro-assembly or, again, in measurements for dimensional control.

Being thought to operate inside the production line, these mechatronic systems must guarantee high performances also from the velocity point of view.

For this reason, one of the phases of the research project will be devoted to the study of the dynamic behavior of some mechanical transmission like ball screw and synchronous belts.

The study will be carried on both theoretically and experimentally. On one side, the state of art of the transmissions' models will be investigated; on the other side, experimental tests to evaluate the their dynamic performances will be made.

In order to achieve high dynamic and precision performances, it is important to define also a proper control systems; at this aim, a phase of the research project will concern the study and the definition of the most suitable control algorithm, in particular with reference to the force control and to the inverse dynamics control.