

Engineering, Built Environment and Information Technology

Mechatronics

– here *mechanics* and *electronics* meet

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Mechatronics is a combination of the principles of mechanics, electronics and computing. Mechanical engineers are interested primarily in the mechanical nature of objects and will therefore focus on the design, manufacture and maintenance of physical systems.

Mechanical engineers led the early development of aircraft and automobiles where motion was controlled through mechanical systems. Initially aircraft were equipped with cables or hydraulic systems that physically connected the pilots with the flaps or control surfaces of the aircrafts. The pilots' own energy was therefore used to move the flaps. In the automotive industry, physical linkages were used to control the motion of the vehicle body to improve the safety and comfort of the occupants.

The advent of electronics led to the development of small devices that can be used to control actuators such as motors. This allowed electrical energy to be applied to mechanical systems. Devices could be easily rotated or moved by using simple electronic components and electrical actuators. The further development of sensors allowed

electronics to sense the physical world. An electronic system can now record the temperature of an object, the force applied to a system, the positions of objects and much more.

The invention of microprocessors, which can effectively act as brains for electronic systems, allowed electronics to use sensor inputs to apply energy to mechanical systems to obtain desired outcomes. Aircraft now use sensors to interpret what the pilot wants to do, and a processor decides which actuators should be used to move the flaps to the optimal position to ensure that the aircraft will do exactly what the pilot wants to do. In automobiles, actuators are used to engage vehicles' brakes when collisions are detected without the drivers having to do anything.

Mechatronics uses sensors to sense what is happening and a processor to take the sensor information and decide which actuators to actuate to ensure that a mechanical system does what needs to be done. Whether this process is used to control robots to manufacture more robots or to develop autonomous robots that can move from one point to another through obstacles without human intervention, a combination of mechanical and electronics expertise is used. Almost all mechanical systems currently in use are equipped with sensors, actuators and processors to

make them safer and more efficient for human use.

What do you have to study to become a mechatronics engineer? Some universities offer dedicated mechatronics degrees, but at most universities you will register for a degree in either Mechanical Engineering or Electric/Electronic/Computer Engineering. At UP, for example, the Mechanical Engineering curriculum includes courses in electrical engineering, electronics, programming and control systems, which provide for all the building blocks of mechatronics. Furthermore, final-year students can choose Mechatronics as an elective and also complete a mechatronics-related final-year research project. Should you consider a degree specifically in mechatronics, it may be worthwhile remembering that although your knowledge will become broader and more multidisciplinary, you may end up lacking the in-depth knowledge gained by completing the more traditional undergraduate degrees (such as Mechanical Engineering) and specialising later, or simply working as the mechanical engineer in a multidisciplinary team.

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