AUTOMATION IN MANUFACTURING

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PRE-REQUISITES : Knowledge of basic electronics and electrical engineering.

INTENDED AUDIENCE : UG, PG students of Mechanical, Production, Industrial Engineering, Mechatronics Engineering. Practicing engineers.

INDUSTRIES APPLICABLE TO : All automobile manufacturing, mobile phone manufacturing industry, aviation industry

COURSE OUTLINE :

Manufacturing industry contributes a major share in the GDP of our country. Application of automated systems is certainly improving the productivity of the manufacturing industry. In view of this, a course on "Automation in Manufacturing" is designed with the primary focus on the design and development of automated systems in the manufacturing. Initially the course introduces various automated systems being used in the manufacturing industry. Then the building blocks of a typical automated system are described. It presents a study on the principle of operation and construction details of sensors/transducers, actuators, drives and mechanisms, hydraulic and pneumatic systems. It also covers up the microprocessor technology, programming and CNC technology. The contents are lucidly presented with real-life examples. Case studies based on manufacturing industry applications are presented.

ABOUT INSTRUCTOR :

Prof. Shrikrishna N. Joshi has completed his doctoral studies in the area of Intelligent process modeling and optimization of electric discharge machining process from IIT Bombay, Mumbai, India in 2009. Currently, he is working as an Associate Professor in the Department of Mechanical Engineering at Indian Institute of Technology Guwahati, India. He was a visiting faculty at the Asian Institute of Technology (AIT), Bangkok, Thailand in 2015. His research interests include mechatronics and manufacturing automation, CAD/CAM, advanced and precision manufacturing processes with a focus on applications of laser in manufacturing, thin-wall machining and single point diamond turning. Four PhD students have been graduated under his supervision and right now, about 7 students are working on cutting-edge research problems. He has published about 60 research papers and twelve book chapters in refereed international journals and conferences. He has edited two books on "Laser-based manufacturing" and a book on Advances in Computational Methods in Manufacturing with Springer Nature. He has carried out sponsored and consultancy research work of about INR ten millions. The consultancy work was aimed at "Mechanization of Food Grain Handling Operations at FCI Godowns". Dr. Joshi has also developed a web course on Mechatronics and Manufacturing Automation under the scheme of NPTEL of MHRD, Govt. of India. The course was very well appreciated among the engineering industry, academia and research community. He has conducted this course at IIT Guwahati four times for B.Tech final year, M.Tech. and Ph.D students.

COURSE PLAN :

Week 1: Introduction: Importance of automation in the manufacturing industry. Use of mechatronics. Systems required.

Week 2: Design of an automated system: Building blocks of an automated system, working principle and examples.

Week 3: Fabrication: Fabrication or selection of various components of an automated system. Specifications of various elements. Use of design data books and catalogues.

Week 4: Sensors: study of various sensors required in a typical automated system for manufacturing. Construction and principle of operation of sensors.

Week 5: Microprocessor Technology: signal conditioning and data acquisition, use of microprocessor or micro controllers. Configurations. Working.

Week 6: Drives: electrical drives – types, selection criteria, construction and operating principle.

Week 7: Mechanisms: Ball screws, linear motion bearings, cams, systems controlled by camshafts.

Week 8: Mechanisms: Electronic cams, indexing mechanisms, tool magazines, and transfer systems.

Week 9: Hydraulic systems: hydraulic power pack, pumps, valves.

Week 10: Hydraulic systems: designing of hydraulic circuits.

Week 11: Pneumatic systems: configurations, compressors, valves, distribution and conditioning.

Week 12: CNC technology: basic elements, interpolators and programming.