Industrial Robotics and Mechatronics

The program is introduced jointly by universities UK International, UK and Ministry of Human Resource Development, Government of India through British council India and Study in India, to fund outward student mobility of around 300 students from the UK to India through study in India program. The aim is to support the employability of UK graduates, recognizing the positive correlation between international experience, academic performance and graduate employability. The program will also enhance and sharpen the required skills among the Indian engineering graduates and make them employable in industry.

The duration of the program is 4 weeks during June-July with minimum batch of 12 students and maximum of 20 students.

To meet the immediate trained human resource requirements of different industries, the course is proposed for Mechanical Engineering graduates. The objective of the course is:

(i)   To offer suitable candidates to industry
(ii)   To help young UK, Non-UK and Indian graduates to find jobs through appropriate training.

The program will be delivered by the faculties of NIT Meghalaya with additional support from practicing executives from industry and other institutes.

Sl. No.	Name of the Topics	Contact Hour
1.	Mechatronics and Automation	25
2.	Industrial Robotics	30
3.	Industrial IOT	25

Mechatronics and Automation

Module I   (1 hours)
Fundamentals- Mechatronics in Industrial automation, product development and design.

Module II   (5 hours)
Mechatronics elements -Data acquisition, sensors, transducers, signal processing devices.

Module III   (12 hours)
Actuators- Hydraulic systems, flow, pressure and direction control valves, actuators, and supporting elements, hydraulic power packs, pumps. Design of hydraulic circuits.
Pneumatics- production, distribution and conditioning of compressed air, system components and graphic representations, design of systems.
Electrical actuators- servo motor, steeper motor, dc motor, induction motor drive, BLDC motor drives.

Module III   (3 hours)
Controller- Microprocessors, microcontrollers, PID controllers and PLCs.

Module III   (4 hours)
Automation- closed loop control, open loop control, automation and system integration, adaptive control.

Industrial Robotics

Module I   7 hours)
Workspace Analysis- Workspace analysis of Four axis, and Six axis robots, Perspective transformation, Work envelope of Four and six axis robots, Workspace fixture.

Module II   (5 hours)
Mechatronics elements -Data acquisition, sensors, transducers, signal processing devices.

Module III   8 hours)
Object Recognition And Feature Extraction- Image segmentation- Edge linking-Boundary detection-Region growing- Region splitting and merging- Boundary Descriptors-Freeman chain code- Regional Descriptors- recognition-structural methods- Recognition procedure, structured illumination, Camera calibration.

Module IV   (8 hours)
Robot grasping- Review of Rigid Body Motion, Review of Manipulator Kinematics, Trajectory Tracking, Intro to Grasping, Grasp Quality Metrics, Grasp Planning, Robust Grasping.

Module V   (7 hours)
Trajectory Planning- Trajectory planning, Pick and place operations, Continuous path motion, Interpolated motion, Straight-line motion

Industrial IOT
Syllabus
(Total Hours: 25)

Module I   8 hours)
Cyber Physical Systems and Next Generation Sensors, Collaborative Platform and Product Lifecycle Management, Augmented Reality and Virtual Reality, Artificial Intelligence, Big Data and Advanced Analysis, Basics of Industrial IoT: Industrial Processes-Part I, Part II, Industrial Sensing & Actuation, Industrial Internet Systems.

Module II   (8 hours)
IIoT-Introduction, Industrial IoT: Business Model and Reference Architecture: IIoT-Business Models, IIoT Reference Architecture. Big Data Analytics and Software Defined Networks: SDN in IIoT, Data Center Networks, Industrial IoT: Security and Fog Computing: Cloud Computing in IIoT

Module III   9 hours)
Application of IIOT: Application Domains: Healthcare, Power Plants, Inventory Management & Quality Control, Plant Safety and Security (Including AR and VR safety applications), Facility Management. Application Domains: Oil, chemical and pharmaceutical industry, Applications of UAVs in Industries, Case studies. Self-Referential Structures and Introduction to Lists; Advanced Topics