Emerging Trends in Robotics

Day-1:

Mr. Srinath K – VP Mac Machine tools & automation
Mrs. Tanya Raghuvanshi – Founder Peer robotics

- Industry perspective of mobile robots
- AGV's & AMR's
- Essential features of an industry robot : Sensors-odometry-localization-navigation-object avoidance/detection
- Motor encoders – IMU's
- SLAM mapping and the concepts involved

Day-2:

Dr. HP Jawale – VNIT Nagpur
Dr. Ankur Jaiswal – MIT Manipal

- Robotic kinematics of closed chain manipulators
- links-joints-DOF
- Active & Passive joints
- Kinematic chains
- Mobility and DOF using Grubler's formula
- loop mobility criterion
- Classification of robotic manipulators
  - DOF/mobility
  - open/serial chains
  - parallel manipulators (stewart platform)
  - Multiple cooperating robots
  - Drives – electric/hydraulic/Pneumatic
- Issues in robotic manipulators

Day-3:

Dr. Anirban Nag – MIT Manipal
Dr. Lochan – MIT Manipal

- Robotic dynamics
- Equation of motion
- Newton-euler & Euler-Lagrange formulas
- Forward and inverse dynamics problems
- Generalised Lagrangian coordinates & Lagrangian equation of motion
- Checking correctness of the formulation – Total energy should be constant over peroid of time
- Robotic control
- PID & linear-non linear control
- SMC control for flexible manipulators

Day-4:

Dr. Asha C.S – MIT Manipal
Dr. Munnendra singh – MIT Manipal

- Image processing for robotic applications
- Image capture & pre-processing
- Application of Machine vision in industry (MVS)
- Object detection/avoidance
- image & video basics
- Stereo vision for sense of depth
- Color segregation with HSV with openCV
- Image histograms
- Sherlocks API
- Deep learning with computer vision
- CNN’s
- Autoencoders

Day-5:

Dr. Mayur Andulkar – BTU Germany

- Collaborative robots: an industry overview
- Difference between conventional caged bots & cobots
- Types of cobots
- Applications of cobots
- Programming cobots
  - Conventional
  - Demonstration
  - Deep reinforcement learning
- Issues with cobots
  - Safety – ISO/TS 15066
  - Cost
  - Expertise
  - Ease of use
  - Return on investment
  - Maintenance & support
- New opportunities & Existing solutions
- Virtual tour of MIT mechatronics lab