

# *Automation (21-541)*

*Advanced Manufacturing Laboratory  
Department of Industrial Engineering  
Sharif University of Technology*

*Session # 1*



## *Course Description*

- *Instructor*
  - *Omid Fatahi Valilai, Ph.D. Industrial Engineering Department, Sharif University of Technology*
  - *Email: [FValilai@sharif.edu](mailto:FValilai@sharif.edu), Tel: 6616-5706*
  - *Website: [Sharif.edu/~fvalilai](http://Sharif.edu/~fvalilai)*
- *Recommended prerequisite*
  - *Manufacturing process I (21-418)*
  - *CIS (21-774)*
- *Class time*
  - *Saturday- Monday 16:30-18:00*
- *Course evaluation*
  - *Mid-term (25%)*
  - *Final exam (40%)*
  - *Quiz (5%)*
  - *Exercise (Manufacturing Lab.) (30%)*

## Course Description (Continued ...)

- **Mid-term session:**
  - Saturday: 6<sup>th</sup> Ordibehest 1393, 16:30 ~ 18:00
- **Final Exam:**
  - Monday: 19<sup>th</sup> Khordad 1393, 15:00 ~ 17:30
- **Reference:**
  - Benhabib, Beno; “Manufacturing: Design, Production, Automation, and Integration”, 2003, Marcel Dekker Inc, New York
  - Radhakrishnan, P.; Subramanian, S.; Raju, V.; “CAD/CAM/CIM”, 3rd edition, 2005, New age international (P) limited publishers, New York
  - Abouel Nasr, Emad; Kamrani, Ali K.; “Computer-Based Design and Manufacturing: An Information-Based Approach”, 2007, Springer, New York



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Automation (21541), Session #1

3

## Course Description (Continued..)

- **Contents:**
  - Introduction to manufacturing automation and CIM (Computer Integrated Manufacturing) (3 sessions)
  - Product lifecycle management (PLM) from automation and CIM perspective (4 sessions)
  - Computer-Aided Design (CAD) (7 sessions)
  - Computer-Aided Process Planning (CAPP) (6 sessions)
  - Computer-Aided manufacturing (CAM) (7 sessions)

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Automation (21541), Session #1

5

## Course Description (Continued..)

- **Contents:**
  - *Introduction to manufacturing automation and CIM (Computer Integrated Manufacturing) (3 sessions)*
  - *Introduction to types of manufacturing systems*
  - *Automation & CIM relation with enterprise information systems (ERP, Accounting, Inventory, marketing...)*
    - *Automation and CIM development history*
    - *CIM hardware and software considerations (focuses on Database concept)*

## Course Description (Continued..)

- **Contents:**
  - *Product lifecycle management (PLM) from automation and CIM perspective (4 sessions)*
  - *Automation & CIM role in Product development*
    - *Product development cycle*
    - *Concurrent engineering and automation & CIM considerations*
  - *Automation & CIM role in PLM*
    - *Overview of PLM CIM software solutions*
    - *Components of PLM software solutions in automation & CIM*

## Course Description (Continued..)

### ▪ Contents:

- *Computer-Aided Design (CAD)*
  - *Introduction*
    - *Graphic primitives*
  
- *Geometric modeling*
  - *Geometric modeling techniques*
  - *Geometric data exchange*

(7 sessions)

## Course Description (Continued..)

### ▪ Contents:

- *Computer-Aided Process Planning (CAPP)*
  - *Introduction*
    - *Process planning primitives*
  
  - *Process planning software solutions*
    - *Architecture considerations of Process planning software solutions*
    - *Information requirements of process planning software solutions*
    - *Process planning systems*
  
- *CAPP integration with CAD*
  - *Computer-Aided Process Planning based on CAD software solutions*

(6 sessions)

## Course Description (Continued..)

### ▪ Contents:

- *Computer-Aided manufacturing (CAM)*
  - *Introduction*
    - *Manufacturing automation primitives*
  - *Types of automation systems*
    - *Pneumatic automation*
    - *Hydraulic automation*
    - *Automation systems using programmable logic controllers*
  - *CNC machining*
    - *Introduction to CNC machining*
    - *Types of CNC machines*
    - *Integration of CAD/CAPP with CNC machining operations*

(7 sessions)

## Course Aims

- *Raise interest for industrial automation systems.*
- *Understand industrial control systems, their purpose and structure.*
- *Understand the terms used in publications and standards*
- *Be able to analyze a plant and propose automation solutions*
- *Compare the solutions used in automation with other domains*
- *Analyze the reliability, availability and safety of a system*
- *Become rapidly productive in an industrial company or public utility service.*

## *Introduction to manufacturing automation and CIM (Computer Integrated Manufacturing)*

- **Automation:**
  - *Set of all measures aiming at replacing human work through machines (e.g. automation is applied science)*
  - *The technology used for this purpose (e.g. this company has an automation department)*
- **Automation:**
  - *Replacement of human work through machines (e.g. the automatisisation of the textile factory caused uproar of the workers)*
  - *Replacement of conscious activity by reflexes (e.g. drill of the sailors allows the automatisisation of ship handling)*
- **Automation:**
  - *The use of computers and machines instead of people to do a job*