Automation (21-541)

Advanced Manufacturing Laboratory

Department of Industrial Engineering

Sharif University of Technology

Session # 3

Session Schedule

- *CIM hardware and software considerations*

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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 automatisation of the textile factory caused uproar of the workers)*
  - *replacement of conscious activity by reflexes (e.g. drill of the sailors allows the automatisation of ship handling)*
- *Automation:*
  - *The use of computers and machines instead of people to do a job*

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CIM history *(Continued…)*

- *CIM scope within the enterprises:*
  - *Marketing*
  - *Product Design*
  - *Planning*
  - *Purchase*
  - *Manufacturing Engineering*
  - *Factory Automation Hardware*
  - *Warehousing*
  - *Logistics and Supply Chain Management*
  - *Finance*
  - *Information Management*

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CIM hardware and software considerations

- *CIM equipment:*
  - *CNC machines*
  - *Computerized work centers*
  - *Robotic work cells*
  - *DNC/FMS systems*
  - *Work handling and tool handling devices*
  - *Storage devices*
  - *Sensors, shop floor data collection devices*
  - *Inspection machines*
  - *Computers, controllers*
  - *CAD/CAM systems, workstations / terminals, data entry terminals, bar code readers, RFID tags*
  - *Printers, plotters and other peripheral devices, modems, cables, connectors*

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CIM hardware and software considerations

- *CIM software comprises computer programs like:*
  - *Management Information System; Database Management*
  - *Sales, Order Entry*
  - *Marketing*
  - *Finance*
  - *Analysis; Modeling and Design*
  - *Simulation*
  - *Inventory Control; Materials Handling*
  - *Monitoring; Shop Floor Data Collection*
  - *Process Planning*
  - *Manufacturing Facilities Planning; Production Control*
  - *Work Flow Automation*
  - *Quality Management*

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Homework # 1

- *Provide at least three software solutions for each of the following scopes:*
  - *Database Management*
  - *Marketing*
  - *Simulation*
  - *Work Flow Automation*
  - *Quality Management*

- *The HW should be sent to omidf@ie.sharif.edu till Saturday, 6th of Mehr(Sep, 28th ,2013)*
- *Email subject: "HW1:studentnumber"*

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

- *Computer Integrated Manufacturing (CIM) encompasses*
  - *The entire range of product development and manufacturing activities with all the functions being carried out*
  - *With the help of dedicated software packages.*
  - *The data required for various functions are passed from one application software to another in a seamless manner*
- *CIM considers*
  - *All activities from the design of the product to customer support in an integrated way,*

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CIM Database management

- *The information required for manufacturing cover a wide range of disciplines and serving a multitude of inter-related yet vastly differing needs.*

- *A database can be defined as a collection of data in a single location designed to be used by different programmers for a variety of applications.*

- *A database is a collection of logically related data stored together in a set of files intended to serve one or more applications in an optimal fashion.*

- *Database must also have a predetermined structure and organization suitable for access, interpretation, or processing either manually or automatically*

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CIM Database management

- *The CIM database comprises basically four classes of data:*
  - *Product Data: Data about parts to be manufactured. It includes text and geometry data.*

  - *Manufacturing Data: The information as to how the parts are to be manufactured is available in production data.*

  - *Operational Data: Closely related to manufacturing data but describes the things specific to production, such as lot size, schedule, assembly sequence, qualification scheme.*

  - *Resource Data: This is closely related to operational data but describes the resources involved in operations, such as materials, machines, human resources and money*

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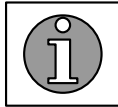
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CIM Database management

- *Varied tasks one might expect to accomplish in a CIM environment:*
  - *Designing assemblies and performing tolerance analysis on those assemblies.*
  - *Preparing production drawings of assemblies, individual parts, tooling, fixtures and other manufacturing facilities.*
  - *Preparing part lists and bill of materials (BOM).*
  - *Preparing process plans for individual part manufacture and assembly.*
  - *Programming CNC machines for processing complete parts (CAM).*
  - *Designing work cells and programming the movement of components in those cells using work handling devices like robots, conveyors, AGV's/ RGV's.*
  - *Preparing inspection programs including programs for CNC machines.*

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Make your own CIM database !!

- *To understand the necessities of a CIM data base:*
  - *Groups with 5-6 students will be established*

  - *Each group starts the essential activities for forming a CIM database in the class theoretically*

  - *The implementation of theoretical activities will be conducted during the weeks in manufacturing laboratory*

  - *The implementation results will form the groups CIM databases during the course*

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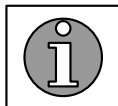
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Make your own CIM database !!

- *First step:*
  - *Definition of the groups*
    - *You can introduce your group members :*

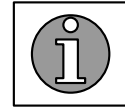   - *You will be assigned to random defined groups.*

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Make your own CIM database !!

- *Second step:*
  - *Choose a programming language e.g.*
    - *Microsoft SQL server*
    - *Oracle*
    - *Microsoft Access*
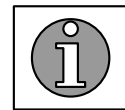   - *Visual studio*
    - *C++*
    - *C*
    - *Pascal*

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Make your own CIM database !!

- *Third step:*
  - *Theoretically plan the procedures which enable:*
    - *The storage of object related data (attributes)*

    - *The sort of data related to an array of objects (Tables, Primary keys)*

    - *The storage of relation among related objects (relational database, Foreign keys)*

    - *The retrieve operation of a definite object by means of its attributes (Select)*

    - *The modification/delete operation of a definite object by means of its attributes (Update/Delete)*

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Make your own CIM database !!

- *Third step: (Continued ...)*
  - *Theoretically plan the procedures which enable:*
    - *The transfer of your data base from one computer to another (Back up operation)*

    - *The extract of information from an array objects (Information)*

    - *The extract of knowledge from a series of information (knowledge)*

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Homework # 2

- *Provide a simple implementation regards to your theoretical activities in steps one to three:*
  - *Define a simple discourse*
  - *Use a programming language*
  - *Define some simple objects in the selected discourse*
  - *Define some simple attributes for selected objects*
  - *Implement your theoretical procedures in step 3*

- *The HW should be sent to omidf@ie.sharif.edu till Saturday, 15th of Mehr(Oct, 7th,2013)*
- *Email subject: "HW2:GroupCode"*