Course Description

- Instructor
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- Class time
  - Saturday- Monday 10:30-12:00

- Course evaluation
  - Mid-term (25%)
  - Final exam (40%)
  - Quiz (5%)
  - Exercise (30%)
Course Description (Continued ...)

- **Mid-term session:**
  - Monday: 8th Ordibehesht 1393, 10:30 ~ 12:30

- **Final Exam:**
  - Saturday: 24th Khordad 1393, 15:00 ~ 17:30

- **Reference:**
  - Benhabib, Beno; “Manufacturing: Design, Production, CAD/CAM, and Integration”, 2003, Marcel Dekker Inc, New York

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**Course Description (Continued..)**

- **Contents:**
  - Introduction to CAD/CAM/CAE systems (5 sessions)
  - Components of CAD/CAM/CAE systems (2 sessions)
  - Geometric modeling systems (3 sessions)
  - Optimization in CAD (5 sessions)
  - Rapid prototyping and manufacturing (3 sessions)
  - Virtual engineering (2 sessions)
  - Product Life Cycle Cost Model (2 sessions)
  - Computer-Based Design and Features/Methodologies of Feature Representations (5 sessions)
  - Feature-Based Process Planning and Techniques (3 sessions)
  - Collaborative Engineering (2 sessions)
Course Description (Continued..)

* Contents:
  * Rapid prototyping and manufacturing (3 sessions)
  * RP primitives
  * Application of RP

Introduction to CAD/CAM/CAE systems
Rapid prototyping and manufacturing

- **RP primitives**
  - Rapid prototyping is a group of techniques used to quickly fabricate a scale model of a physical part or assembly using three-dimensional computer aided design (CAD) data.
  - Construction of the part or assembly is usually done using 3D printing or "additive layer manufacturing" technology.
  - Alternatively, it is also called:
    - Layered manufacturing
    - 3D printing
    - Desktop manufacturing
    - Solid free form manufacturing

- **The process of RP consists of three steps:**
  - Form the cross sections of the part to be manufactured
  - Lay the cross section layer by layer
  - Combine the layers
Rapid prototyping and manufacturing

- **RP**
  - **Selective laser sintering:**

  Selective laser sintering (SLS) is an additive manufacturing technique used for the low volume production of prototype models and functional components.

  Selective laser sintering uses lasers as its power source to sinter powdered material, binding it together to create a solid structure.

  Compared with other methods of additive manufacturing, SLS can produce parts from a relatively wide range of commercially available powder materials.
  
  These include polymers such as nylon (neat, glass-filled, or with other fillers) or polystyrene, metals including steel, titanium, alloy mixtures, and composites and green sand.
  
  SLS technology is in wide use around the world due to its ability to easily make very complex geometries directly from digital CAD data.
Rapid prototyping and manufacturing

* RP
  * Selective laser sintering:
    * A support structure is not needed because the voids are filled by the unprocessed powder at each layer
    * The integration with the CAD model is achieved well in this method.

Rapid prototyping and manufacturing

* RP
  * 3D printing:
    * Spread powder
    * Print layer
    * Drop position
    * Repeat cycle
    * Intermediate stage
    * Last layer printed
    * Finished part
Rapid prototyping and manufacturing

- RP
  - 3D printing:
    - In 3D printing a liquid binder instead of ink in common printers is ejected.
    - The layer of ceramic powder is selectively raster-scanned with a print head that delivers a liquid binder causing the particles to adhere to each other.

Rapid prototyping and manufacturing

- RP
  - Laminated-Object manufacturing
Rapid prototyping and manufacturing

- RP
- Fused Deposition modeling
Rapid prototyping and manufacturing

Rapid prototyping and manufacturing