CAD/CAM (21-342)
Advanced Manufacturing Laboratory
Department of Industrial Engineering
Sharif University of Technology

Session # 11

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

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

Rapid prototyping and manufacturing

- **RP primitives**
  - 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**
  - **Stereo Lithography:**
  - In late 1970s and 1980s:
    - A photosensitive polymer that solidifies when exposed to a lightening source is maintained in liquid state
  - A platform as an elevator
  - The UV laser scans the polymer layer above the platform to solidify the polymer and give it the shape of the corresponding cross section
  - The platform is lowered in the polymer bath based on the layer thickness
Rapid prototyping and manufacturing

- **RP**
  - **Solid Ground Curing (SGC):**
    - The cross section of each layer is calculated from the geometric model of the pal and the desired thickness.
    - The optical mask is generated comforting to each section.
    - After leveling the platform is covered with a thin layer of the liquid photopolymer.
    - The mask is positioned over the surface of the liquid resin, the resin is exposed to high power UV lamp.
    - The residual liquid is removed from the work piece.
    - A layer of melted wax is spread over the work piece to full the voids.
    - The wax is solidified.
    - The layer surface is trimmed to the desire thickness.
    - At the end the wax is melted.