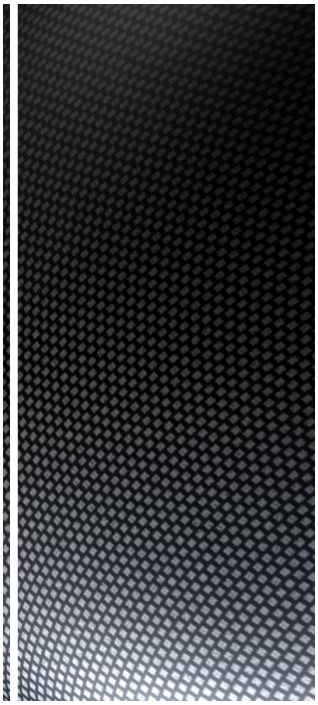


CAD/CAM (21-342)

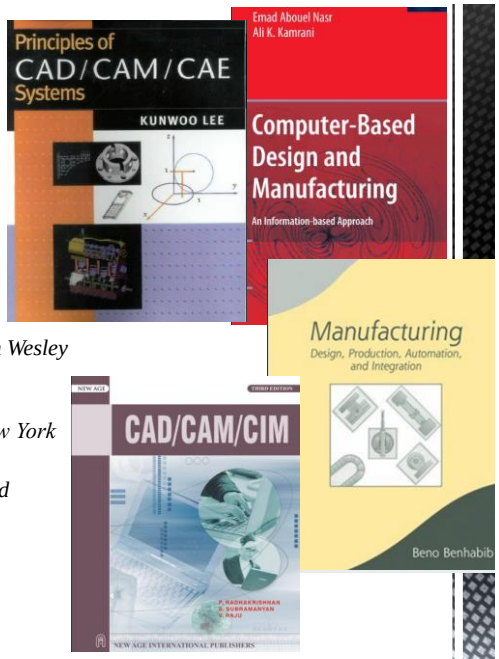
Advanced Manufacturing Laboratory
Department of Industrial Engineering
Sharif University of Technology

Session # 17

Course Description

- *Instructor*
  - *Omid Fatahi Valilai, Ph.D. Industrial Engineering Department, Sharif University of Technology*
  - *Email: FValilai@sharif.edu , Tel: 6616-5706*
  - *Website: Sharif.edu/~fvalilai*
- *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:*
  - *Lee, Kunwoo; "Principles of CAD/CAM/CAE systems", 1999, Addsion Wesley*
  - *Abouel Nasr, Emad; Kamrani, Ali K.; "Computer-Based Design and Manufacturing: An Information-Based Approach", 2007, Springer, New York*
  - *Benhabib, Beno; "Manufacturing: Design, Production, CAD/CAM, 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*

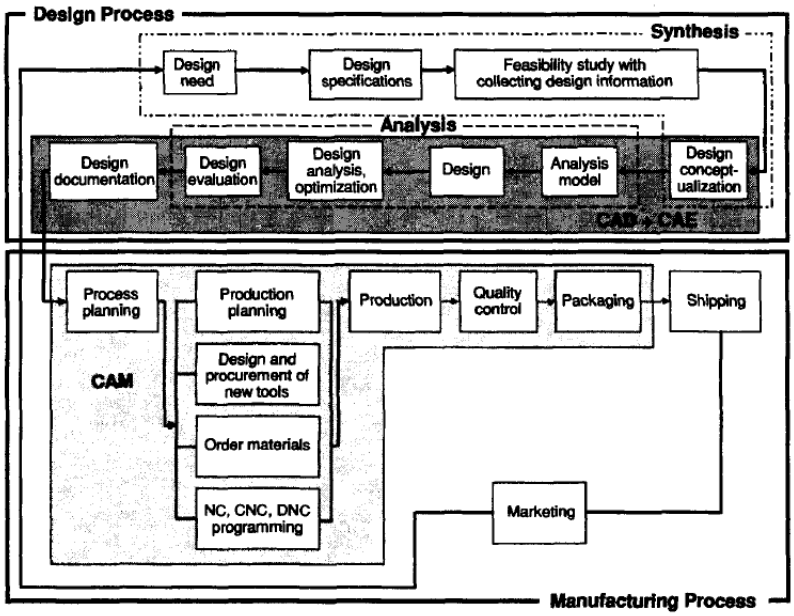
Course Description *(Continued..)*

- *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:*
  - *Computer-Based Design and Features/Methodologies of Feature Representations* *(5 sessions)*
    - *Feature-Based Technologies*
    - *The New Methodology Objectives*
    - *Variant Process Planning (VPP)*
    - *Generative Process Planning (GPP)*
    - *Assembly Planning*

Introduction to CAD/CAM/CAE systems

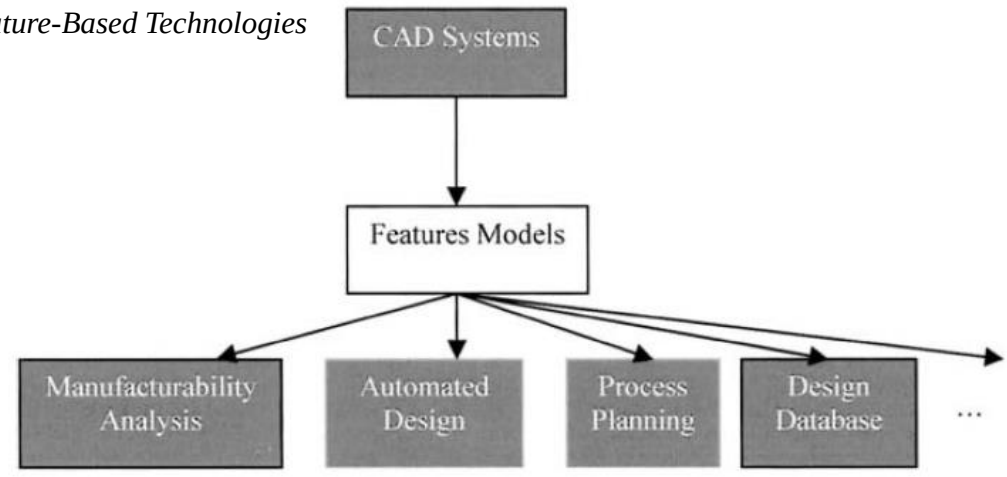


Computer-Based Design and Features Methodologies of Feature Representations

- *Feature-Based Technologies*
  - *Traditionally, design and manufacturing are treated as two separate stages and usually managed by two different groups of people.*
  - *This sequential approach is a slow and a costly process.*
    - *To reduce the time and cost, it is important to achieve a good integration of design and manufacturing that provides a common language to interact and to anticipate design changes and coordinates them with the manufacturing processes.*

Computer-Based Design and Features Methodologies of Feature Representations

- *Feature-Based Technologies*



Computer-Based Design and Features Methodologies of Feature Representations

- *Feature-Based Technologies*
  - *Using the feature-based approach, the agent that provides the interpretation, or more explicitly the "feature interpreter,"*

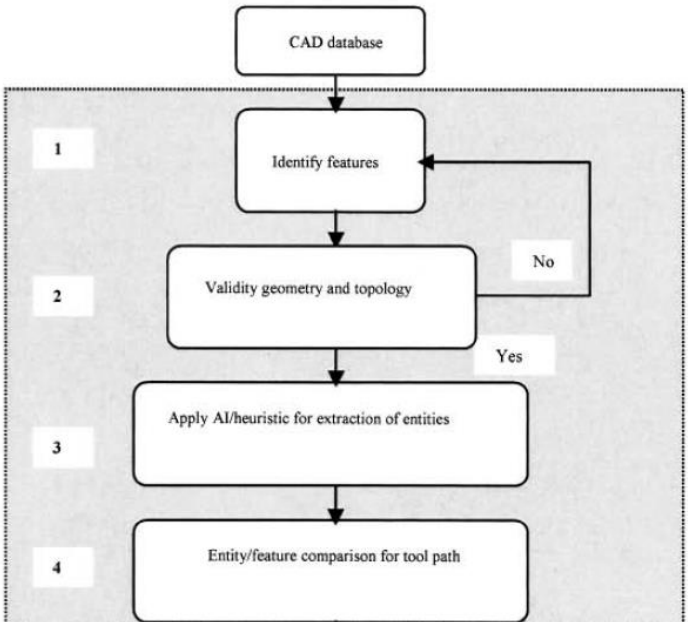
    decomposes the part into a group of manufacturing standard features that are suitable for machining operations.

  - *After a product's geometric model is constructed, the geometric data need to be transferred into a format that can be used to generate the required manufacturing processes.*

  - *This conversion of the geometric data is called feature recognition or feature extraction.*
    - *Several approaches, such as graph matching, syntactic recognition, volume decomposition, and rule-based algorithms, have been developed for feature recognition*

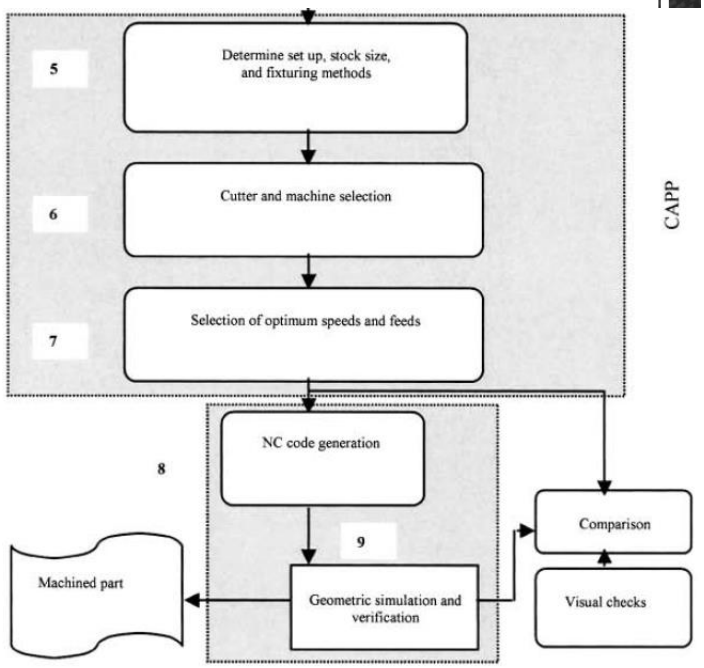
Computer-Based Desig... Methodologies of Featu...

- *Feature-Based Technologies*



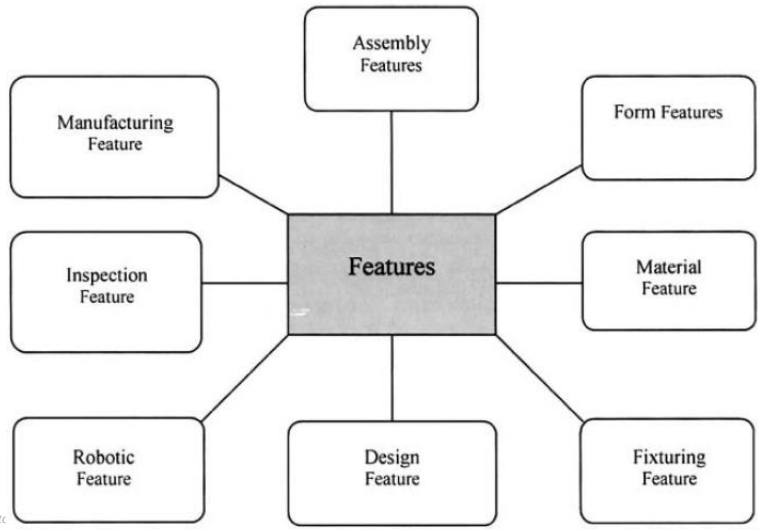
Computer-Based Design ar Methodologies of Feature I

- *Feature-Based Technologies*



Computer-Based Design and Features Methodologies of Feature Representations

- *Feature-Based Technologies*



Computer-Based Design and Features Methodologies of Feature Representations

- *Feature-Based Technologies*
  - *The feature-based approach to the application of CAD is an intelligent form of design representation in which the design is expressed in terms of*

  some high level definition that has direct relevance in various downstream manufacturing activities such as process planning.

  - *Feature information permits the process planner to determine the machining tools and manufacturing processes required to machine the designed objects.*

Computer-Based Design and Features Methodologies of Feature Representations

- *Feature-Based Technologies*

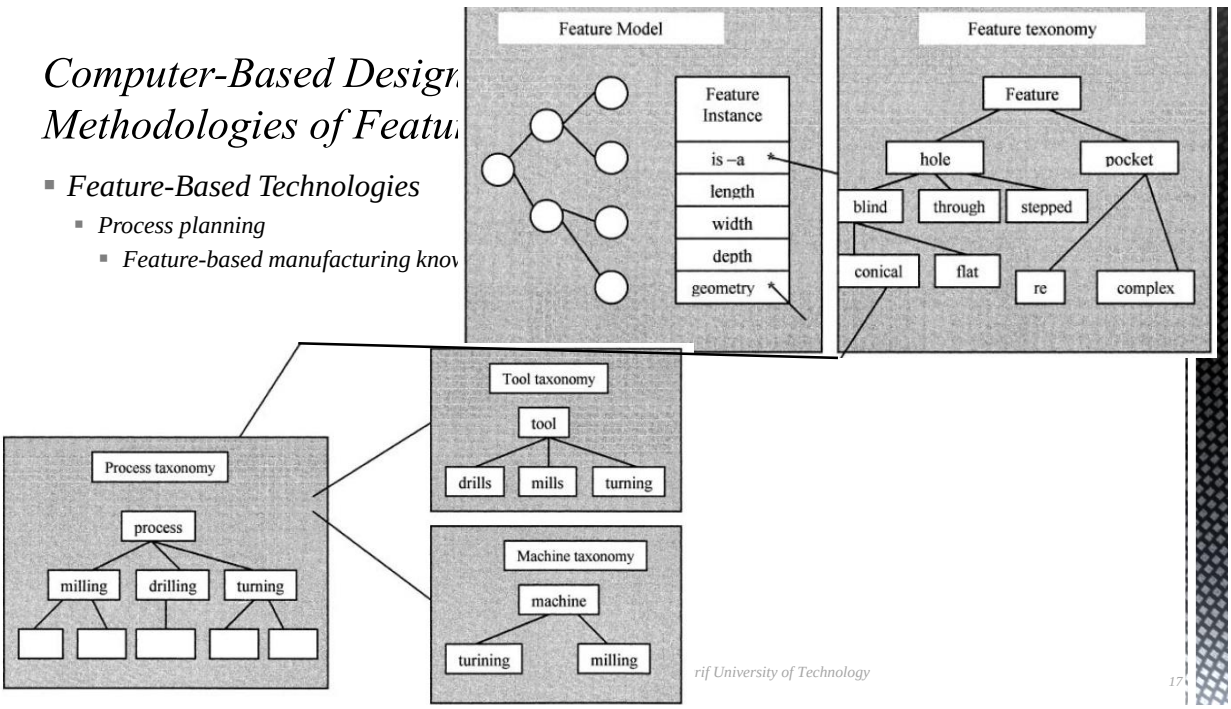
Aspect	Type of Features	Characteristics
1. Information support requirement	Form features Precision features Material features	Size, shape Tolerance, surface finish Material type, material grades, heat treatment, etc.
2. Applicability of the features in different phasess of manufacturing	Design features Process planning features Assembly features	Center line, radius, function of the features Starting surface, manufacturing method Line, radius, tolerance
3. Configuration of the feature	Elementary features Compound features Functional features	Hole, step, etc. Stepped hole screw thread
4. Profile of the features	Prismatic features Cylindrical features	Slot, pocket, etc. Hole, fillet, arch, etc.

Computer-Based Design and Features Methodologies of Feature Representations

- *Feature-Based Technologies*
  - *Process planning*
  - *Process planning involves determining the information required for manufacturing a part. Most research on process planning includes machining operations*
  - *The two primary approaches for automated process planning*
    - *Variant Process Planning*
    - *Generative Process Planning*

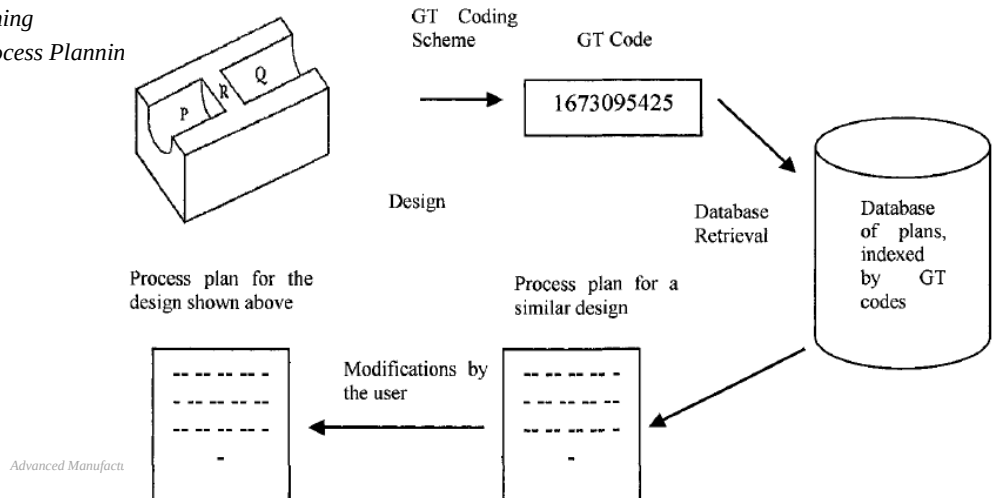
Computer-Based Desig
Methodologies of Featu

- *Feature-Based Technologies*
  - *Process planning*
    - *Feature-based manufacturing knov*



Computer-Based Design and Features Methodologies of Feature Representations

- *Feature-Based Technologies*
  - *Process planning*
    - *Variant Process Plannin*



Computer-Based Design and Features Methodologies of Feature Representations

- *Feature-Based Technologies*
  - *Process planning*
    - *Generative Process Planning*
      - *In the generative process planning (GPP) approach, the planning system seeks to synthesize the process plan directly*
      - *For machine-designed objects, the distinctive approach is to perform the planning on the basis of a feature by feature methodology by retrieving candidate processes from*

the manufacturing knowledge repository,

selecting the practical processes on the basis of geometric and manufacturing information of the designed objects,

and merging the selected processes in a proper sequence.