

## Group Technology (Part-2)


6ME4-02: Computer Integrated Manufacturing Systems

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1

## Outcomes




PART CLASSIFICATION



PART CODING

2

## Why: Part Classification



**Design Retrieval**

- A designer faced with the task of developing a new part can use a design retrieval system to determine if a similar part already exists.
- A simple change in an existing part would take much less time than designing a whole new part from scratch.

**Automated Process Planning**

- The part code for a new part can be used to search for process plans for existing parts with identical or similar codes.


**Machine Cell Design**

- The part codes can be used to design machine cells capable of producing all members of a particular part family, using the composite part concept.


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3


## Part Classification




**DESIGN ATTRIBUTES/PARAMETERS**



**MANUFACTURING ATTRIBUTES**



**CREATE PART FAMILIES WITH "SIMILAR CODES"**



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4

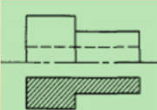
### Part Classification and Coding

Part Design Attributes	
Basic external shape	Major dimensions
Basic internal shape	Minor dimensions
Length/diameter ratio	Tolerances
Material type	Surface finish
Part function	
Part Manufacturing Attributes	
Major process	Operation sequence
Minor operations	Production time
Major dimensions	Batch size
Length/diameter ratio	Annual production
Surface finish	Fixtures needed
Machine tool	Cutting tools

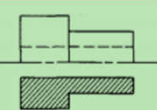
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5

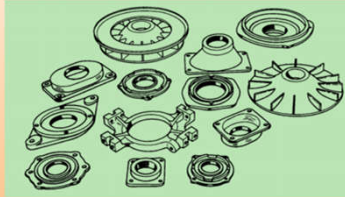
### Part Classification: Example



Part 1  
100,000/yr  
Tolerance  $\pm 0.015$   
1020 CRS  
nickel plate



Part 2  
100/yr  
Tolerance  $\pm 0.001$   
18-8 stainless



Identical shape and size but different manufacturing requirement

Similar manufacturing process requirement but different design attributes

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6

### Design System vs Manufacturing System

Part classification and coding system divide into

1. System based on part design attributes
  - Useful for design retrieval and to promote design standardization.
2. System based on part manufacturing attributes
  - Used for computer-aided process planning, tool design and other production-related functions.
3. System based on both design and manufacturing attributes
  - To combine the functions and advantages of the other two systems into a single classification scheme.
  - The types of design and manufacturing parts attributes typically discussed earlier.
  - A certain amount of overlap between the design and manufacturing attributes of a part.

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7

### Part Coding

A part coding scheme consists of a sequence of symbols that identify the part's design and/or manufacturing attributes

Code: All NUMERIC, All ALPHABETIC or a COMBINATION of both

Most common classification and coding systems is

NUMBER DIGITS

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8

Part coding: Example of daily routine life

9

## Part Classification and Coding System

- A part coding system consist of a sequence of symbols that identify the part's design and/or manufacturing attributes.
- The symbols in the code can be all numeric, all alphabetic, or a combination of both types.
- However, most of the common classification and coding systems use number digits only.
- The three basic coding structures are:
  1. Hierarchical structure
  2. Chain-type structure
  3. Hybrid structure

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10

### Coding Structure: Hierarchical structure

• The structure of Hierarchical (also refers as Monocode) is like a tree in which each symbol amplifies the information provided in the previous digit.

**A-1-1-B-2**

11

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**A-1-1-B-2**

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12

### Hierarchical structure: Key Features

- A monocode (hierarchical code) provides a large amount of information in a relatively small number of digits.
- Useful for storage and retrieval of design related information such as part geometry, material, size, etc.
- It is difficult to capture information on manufacturing sequences in hierarchical manner, so applicability of this code in manufacturing is rather limited.

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13

### Chain-type Structure

Chain-type structure, (also known as polycode), in which the interpretation of each symbol in the sequence is always the same

It does not depend on the value of preceding symbols, so symbols are independent of each other.

Each digit in specific location of the code describes a unique property of the workpiece.

It is easy to learn and useful in manufacturing situations where the manufacturing process have to be described.

The length of a Polycode may become excessive because of its unlimited combinational features.

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14

### Chain-type Structure

Code Value

1	2	3	4	5	6	7	8
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Material

Material form

Material property

Bending method

Specific requirement

Test method

Surface finish

Tolerance

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15

### Chain-type Structure

Digit	Class of feature	Possible value of digits			
		1	2	3	4
1	External shape	Cylindrical without deviations	Cylindrical with deviations	Boxlike	• • •
2	Internal shape	None	Center hole	Brind center hole	• • •
3	Number of holes	0	1-2	3-5	• • •
4	Type of holes	Axial	Cross	Axial cross	• • •
5	Gear teeth	Worm	Internal spur	External spur	• • •
•	•	•	•	•	•
•	•	•	•	•	•
•	•	•	•	•	•

2	3	2	1	2
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16

## Hybrid Structure



- It is the mixture of both Hierarchical (monocode) and Chain-type (polycode) systems.
- Mixed code retains the advantages of both systems.
- Most coding systems use this code structure.

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17

## Summary



Part classification based on design and manufacturing attributes,  
Part coding and three types: Hierarchical, Chain and Hybrid

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18

Thank you for  
your kind  
attention



19

19