



## Thiagarajar College of Engineering, Madurai - 625 015

(A Govt. Aided ISO 9001:2008 Certified Autonomous Institution Affiliated to Anna University)



Course Code	14ME360	Course Name	Geometric Modeling		
Degree	B.E	Programme	Mechanical Engineering	Semester	III
Faculty In-Charge		Mr. T. Prakash			

Innovating Teaching Method: Padlet used

Padlet URL: <https://padlet.com/tprakashtce/geometricmodelling>

### Syllabus

#### Coordinate systems:

Geometric co-ordinate systems - Cartesian, Cylindrical and Spherical coordinate systems. Display co-ordinate systems - Global, Local, View and Screen coordinate systems.

#### Mathematical modelling of Curves:

Definition - Parametric and non- parametric forms of analytical and synthetic curves. Analytical Curve modelling - Line Segment, Circle, Ellipse. Synthetic Curve modelling - Hermite Cubic Spline, Bezier, B-spline and Rational Curves. Curve manipulation techniques.

#### Mathematical modelling of Surfaces:

Definition - Parametric and non- parametric forms of analytical and synthetic surfaces. Analytical surface modelling - Parametric form of plane, loft, Cylindrical, Surface of revolution. Synthetic Surface modelling - Hermite Bicubic Spline, Bezier, B-spline, Coon's, triangular, blending Surfaces. Surface Manipulation techniques.

**Mathematical modelling of Solids:** Properties of solid model, Solid modelling Techniques - Boundary representation, Constructive Solid Geometry, Analytical Solid Modelling, Sweep representation schemes. Solid Manipulation Techniques.

#### Transformation and Projection techniques:

Introduction to computer graphics, Non-interactive Vs interactive computer graphics, applications, graphics system configuration.

2D and 3D transformation techniques - Translation, Rotation, Scaling and Reflection principles. Principle of concatenated transformation. Orthographic and Perspective Projections of Geometric Models.

Introduction to computer aided animation system.

**Graphic Standards and mode of data transfer:**

Definition of graphics standard, geometrical data, direct and indirect data transfer. Neutral file formats - Data Exchange Format (DXF) and Initial Graphics Exchange Specification (IGES).

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Thiagarajar College of Engineering

14ME360

Geometric Modeling

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# 1.0 Introduction to Course

By

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# Contents

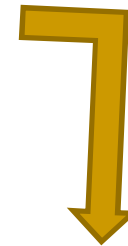
<b>1.0 Introduction to Course</b>	
1	Introduction
2	Definition of Geometric Modeling
3	Objectives of Course
4	Assessment of Course
5	Concept Map
6	Books

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# Introduction

Geometric Modeling = Geometry + Modeling

Geometric form with mathematical  
representation of particular shapes



Called

Geometric Modeling

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## Course Outcomes

At the end of the course students should be able

CO1	Define the coordinate system for the development of geometric models	Remember
CO2	Develop and manipulate the curves and surfaces using parametric equations	Apply
CO3	Develop and manipulate the solid models using different modeling approaches	Apply
CO4	Implement the transformation and projection over the geometric model	Apply
CO5	Implement the neutral file formats over 2D wireframe models	Apply

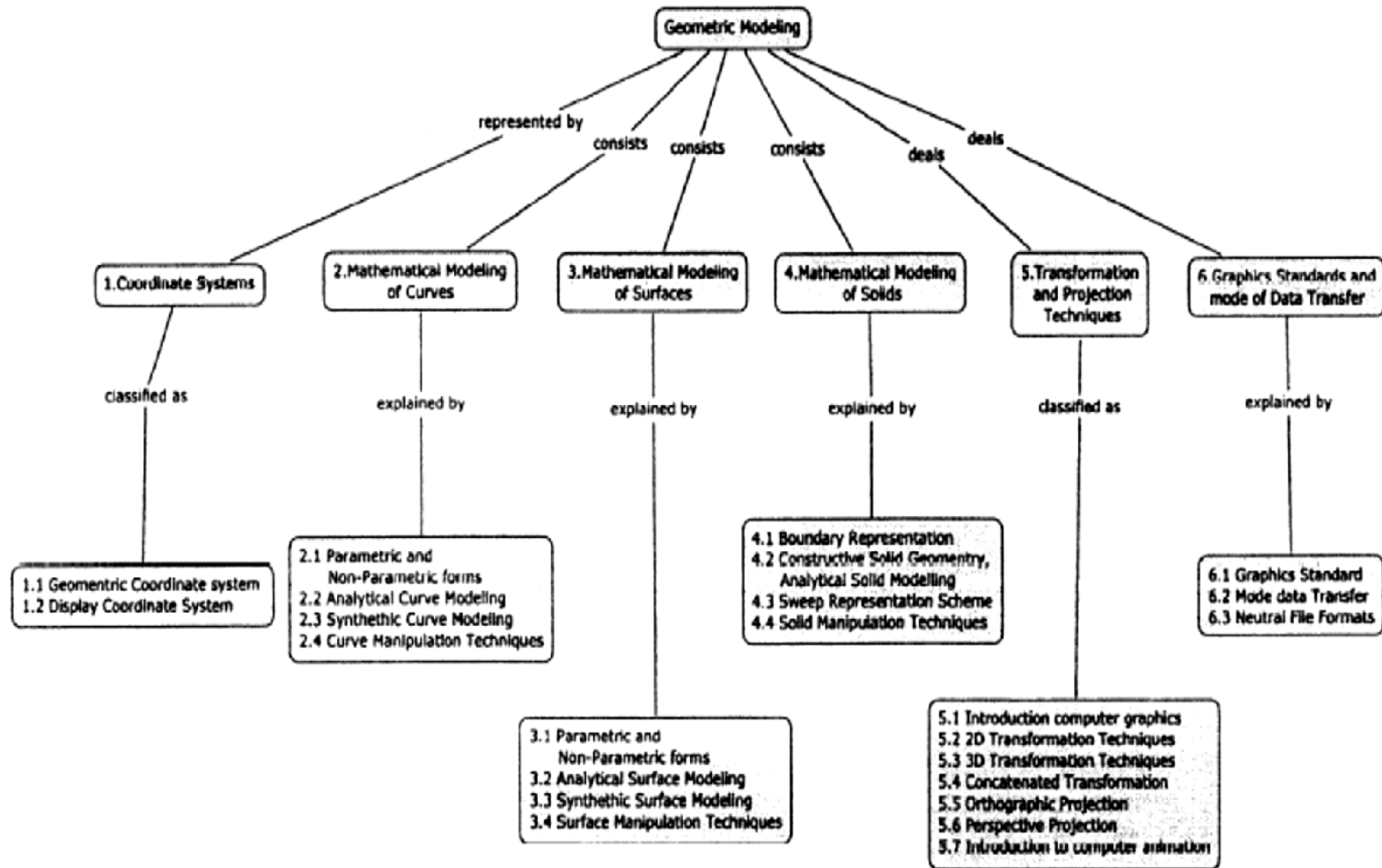
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## Assessment Pattern

Bloom's Category	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	30	20	20	20
Understand	40	40	40	40
Apply	30	40	40	40



# Concept Map



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# Books

## Text Books

1. Ibrahim Zeid, "**Mastering CAD/CAM**", Tata McGraw Hill Education (P) Ltd., Special Indian Edition, 2008.
2. Amarendra N Sinha and Arun D Udai, "**Computer Graphics**", Second reprint, Tata McGraw Hill Education (P) Ltd., 2009.

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# Books

## Reference Books

1. Michael E. Mortenson, "**Geometric Modeling**", Third edition, Industrial Press, 2006.
2. Rogers, "**Mathematical Elements for computer Graphics**", Tata Mcgraw Hill Education Private Limited, 2009.
3. Rajiv Chopra, "**Computer Graphics: A Practical Approach, Concepts, Principles, Case Studies**", First Edition, S.Chand and Company Ltd., 2011.

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## Definition of Geometric Modeling

- Geometric modeling is a branch of **applied mathematics** and **computational geometry** that studies methods and **algorithms** for the mathematical description of shapes.
- Geometric modeling can be defined as **computer compatible** and **mathematical representation** of the geometry

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# Need of Geometric Modeling

- Computer Aided Manufacturing
- Computer Integrated manufacturing
- Computer Aided design
- Robotics path planning
- Aircraft Application
- Computer Graphics

etc.,

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# Computer Aided Manufacturing (CAM)

- CAM is concerned with use of computer to assist with manufacturing process

## Examples

- ❑ Design For Manufacture (DFM)
- ❑ Computer Aided Process Planning (CAPP)
- ❑ Computer based Predictive Models
- ❑ Computer aided assembly planning
- ❑ Computer Aided inspection
- ❑ Computer controlled Machines such as CNC Machines
- ❑ Rapid Prototyping

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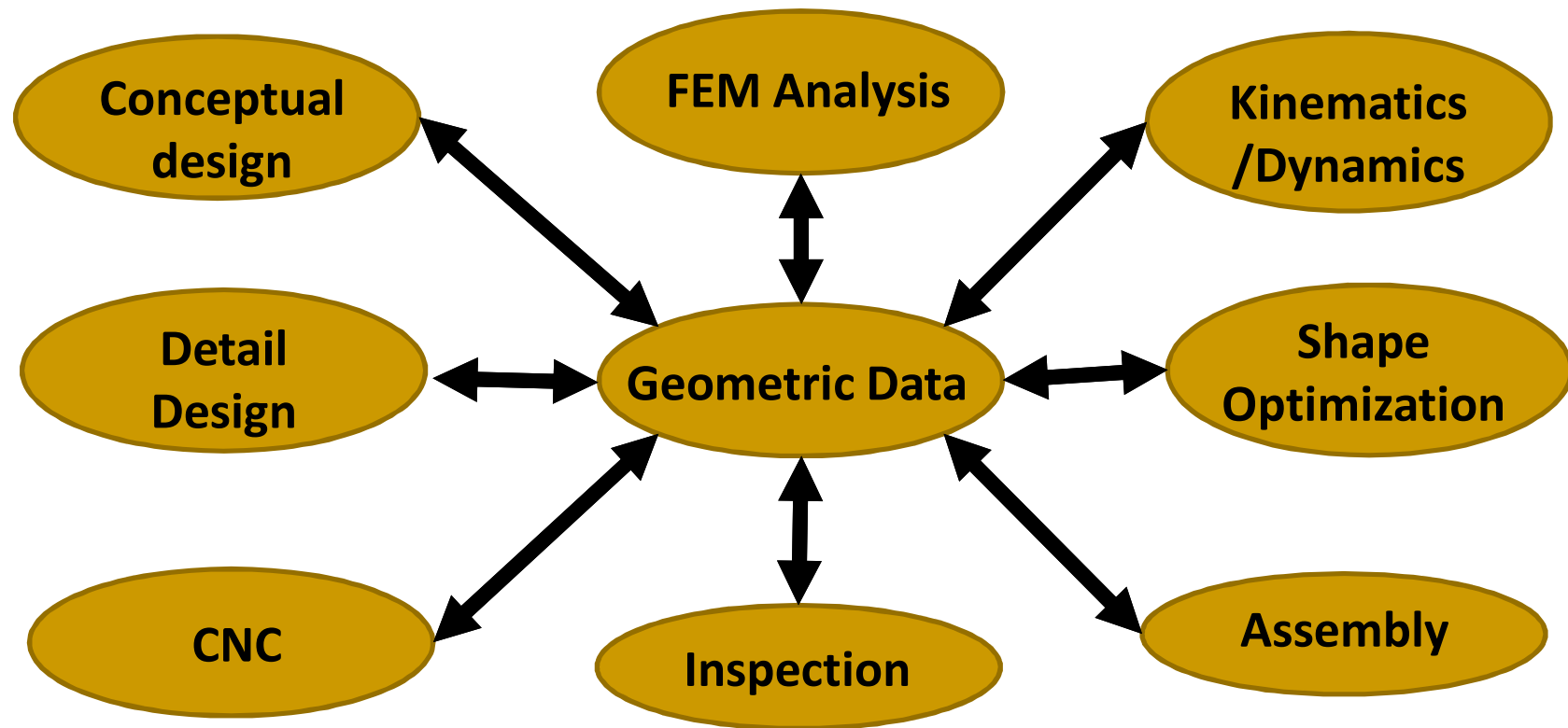
## Computer Integrated Manufacturing (CIM)

- CIM refers to integration of all activities of manufacturing enterprise including business function

## Computer Aided Design (CAD)

- Its defined as tool which is used to develop a model and analyze the particular model in order to achieve desired output

# Integration of Design and Manufacturing





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# Summary

- Geometric Modeling –
  - Definition
  - Introduction
  - Need
- Integration of the Design and Manufacturing
- About Course
- Objective
- Assessment Pattern
- Books

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**END**