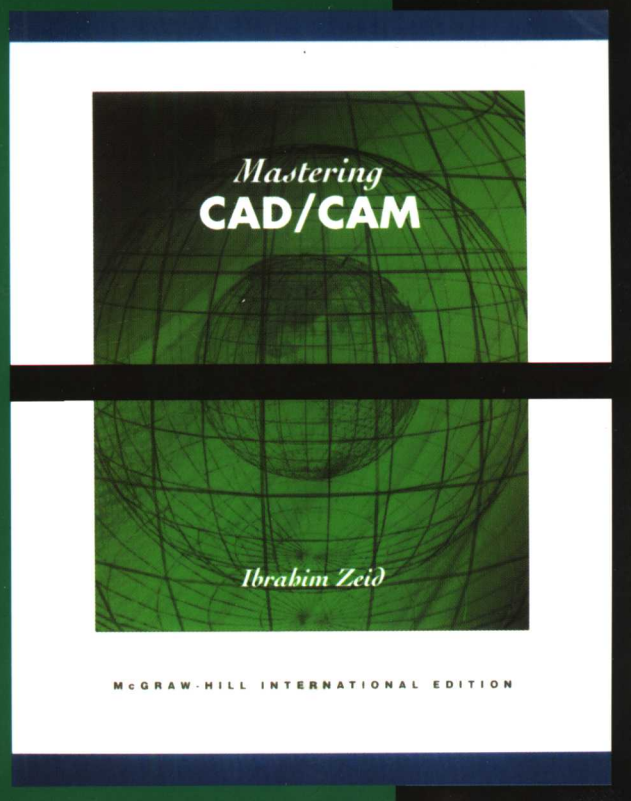


中国工程图学学会图学教育专业委员会推荐

国外大学优秀教材 —— 工程图学系列 (影印版)

Ibrahim Zeid 著 童秉枢 改编

# 通晓CAD/CAM



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国外大学优秀教材 —— 工程图学系列 (影印版)

# 通晓CAD/CAM

**Mastering CAD/CAM**

Ibrahim Zeid 著  
童秉枢 改编

清华大学出版社  
北京

Ibrahim Zeid  
**Mastering CAD/CAM**  
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## 丛书序言

本套丛书是由清华大学出版社和中国工程图学学会图学教育专业委员会共同策划的。

双语教学是近年来国内高校的教学改革热点之一，目前在数十所高校中已经开展了制图课程的双语教学。

从目前国内开展双语教学的高校使用的教材来看，大体上有以下几种情况：①直接选用欧美原版教材；②中国的制图教师根据我国的教学基本要求改编的原版教材，并以附录的形式讲解投影法和标准方面的差异；③中国的制图教师编写的英文教材；④中国的制图教师编写的中英文对照的双语教材等。

为了给我国高校的制图教师开展双语教学时提供更多的教材选择，也为了使我国高校的广大师生对美国制图课程的现状有更多的了解，清华大学出版社和中国工程图学学会图学教育专业委员会决定出版这套丛书。经过编委会一年多的分析与研究，我们从数十本美国原版教材中选择了 6 本构成了本套丛书，分别为机械类的制图教材两本，近机械类与非机械类的制图教材两本，CAD 与计算机图形学方面的教材两本。需要说明的是美国的制图教材并未按照上述方式分类，所谓不同的类别是由本套丛书的编委会根据其内容来确定的。

由于美国原版教材的内容远远多于我国同类教材的内容，编委会根据我国的实际情况，以“教学基本要求”为依据，对其内容进行了删减，在这一过程中，未对原版教材作任何改写，以保证其“原汁原味”的风格。我们希望通过这种方法，给开展制图课双语教学的院校提供一套既能保持原版教材风貌，又符合我国实际情况的英语教材。

最后，清华大学出版社及本套丛书的编委会对积极提供样书供编委会选择的美国麦格劳-希尔公司和培生公司表示衷心的感谢，是他们的积极配合使得这套丛书得以顺利出版。

限于改编者的水平，书中不当之处在所难免，欢迎广大读者批评指正。

国外大学优秀教材——工程图学系列编委会

2007 年 3 月

## 影印版序言

全书原有 5 部分 23 章,还有 3 个附录和 1 个索引,共计 962 页。全面地覆盖了 CAD/CAM 技术的主要内容,较好地处理了技术的基础性与先进性的关系。

考虑到我国课程设置、教学学时以及教材市场的实际情况,在本书影印时作了必要的删节。删节以章为单位,具体如下:

(1) 删去第 6、7、8 章,大约 210 页。这部分内容为曲线曲面,在我国的计算机图形学、计算机辅助几何设计等相关教材及著作中可以找到相同深度的内容。如果保留在本书中,由于内容太多,难以在有限的教学时间内讲授。

(2) 删去第 11 章,大约 17 页。这章内容为图形显示器的硬件,从 CAD/CAM 的应用角度看,学生可以不作深入的了解。

(3) 删去第 15 章,大约 38 页。这章内容为物理特性计算,例如面积、体积、重心、惯性矩等计算,在我国的力学教材中有此内容的叙述。

(4) 删去第 20 章及相应的附录 C,大约 83 页。这章内容为公差配合和表面粗糙度,在我国的工程制图和机械设计等教材中都有深入的论述,并且符合我国的国家标准。

以上共删去 348 页,约占全书的 1/3。

经过删节处理后,页眉保留原版书的页码,页脚是连续的新书页码。文中提到的页码均为原版书页码。本书目录保留原版书目录,目录中的页码为原版书页码,使用时请用页眉处页码。有的内容或页码有可能已被删除从而无法找到,由此给读者带来不便,请读者谅解。

清华大学 童秉枢

2006 年 8 月

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# Preface

**OVERVIEW.** This new book follows in the footsteps of my *CAD/CAM Theory and Practice* (McGraw-Hill, 1991), which has been widely adopted and used throughout the world. This new book, *Mastering CAD/CAM*, has been written to respond to many suggestions made since the first book was published. It is also written to include the new concepts that have been developed since 1991. Designed to meet the demands of both practice-oriented and theoretically based courses, the book meets these conflicting demands by making CAD/CAM systems its focus. It explains the functionalities of these systems in a generic and syntax-independent fashion so that students can use their system of choice, and it relates the mathematical developments and concepts to these systems to unravel their secrets.

The book achieves a mastery level in CAD/CAM by carefully balancing the breadth and depth of topic coverage with the syntax-independent use of CAD/CAM systems. The book has 23 chapters, over 904 equations, over 328 figures, 562 screenshots from using different CAD/CAM systems, 97 examples, 36 tutorials done on different CAD/CAM systems, 75 geometric models of parts and assemblies, 31 real-life objects modeled (including a golf ball, razor, slipper, household fan, AC duct, universal joint, a telephone, a glass of wine, a spiral, a spring, and a candy dish), 383 end-of-chapter problems, a comprehensive index, and three appendices.

The book covers CAD/CAM systems and related software in a syntax-independent fashion by focusing on their semantics, and not their syntax. The semantics of these systems are the same although their syntax differs. The book uses and discusses three sets of software: (1) CAD/CAM systems: SOLIDWORKS<sup>®</sup>, Pro/ENGINEER<sup>®</sup>, CATIA<sup>®</sup>, Unigraphics, I-DEAS<sup>®</sup>, CADKEY<sup>®</sup>, and AutoCAD<sup>®</sup>; (2) Programming and graphics: Java<sup>™</sup>, Java 3D<sup>™</sup>, C, C++, OpenGL<sup>®</sup>, DirectX<sup>®</sup>, VRML, FTP, Telnet, and Web browsers; (3) Symbolic equation solvers: MATLAB<sup>®</sup>, Maple<sup>®</sup>, Mathcad<sup>®</sup>, and Mathematica<sup>®</sup>.

The rationale behind this book is simple but effective. Students need a comprehensive and complete source of CAD/CAM knowledge in order to become proficient in using any CAD/CAM system. This knowledge includes understanding 3D modeling and viewing, geometric modeling, computer graphics, and product design and manufacturing. Both students and instructors should find this book useful, as it provides “one-stop shopping” for all their learning and teaching needs.

The purpose and goal of this book is to present the fundamental concepts of CAD/CAM and its tools in a generic framework. These concepts and tools are supplemented with examples, tutorials, and problems to provide students with hands-on experience so that they can master the concepts. The book strikes a delicate balance between subject depth and breadth, and between generic and practical aspects of CAD/CAM. Regarding depth and breadth, the book covers the basic topics about CAD/CAM. Regarding generic and practical aspects, the book relates the generic concepts to their use in technology, software, and practical applications.

**FEATURES.** This book has many pedagogical and content features:

- Eye-catching page design, and graphics design for section and example headings.
- Abundant figures and screen captures to illustrate concepts.
- Goal, objectives, and headlines at the start of each chapter.
- Tutorials and problems at the end of each chapter.
- Each example and tutorial has three pedagogical elements to allow interactivity and deep understanding. *Solution strategy* describes the thinking behind the solution. *Discussion* provides insight into the solution. *Hands-on* exercises ask the reader to extend or modify the solution. This is a confidence builder during the learning process.
- Each example focuses on one chapter concept only, while each tutorial combines a few chapter concepts together to provide a more practical application. Many tutorials use real-life objects to stimulate and motivate students.
- All topics are covered with depth and breadth.

**AUDIENCE.** This book fills an important need in the market. **Students** in Mechanical and Industrial Engineering need a book that explains the subject matter in a simple, yet comprehensive and coherent way with enough examples and hands-on tutorials. This book offers concentrated knowledge to its readers so that they can find what they need very quickly.

**Instructors** need a book that provides them with enough topics, examples, tutorials, problems, and pedagogy. For example, the instructor may use the examples and tutorials in a lab setting. The instructor can also access the book’s companion website, located at <http://www.mhhe.com/zeid1>. A solutions manual accompanies the book as well.

**Professionals**, usually pressed for time, need a book that they can use for self-teaching purposes. They also need a book that provides them with answers to specific questions they may have while using a CAD/CAM system. With this book, professionals can tap into its many examples, tutorials, and concepts for answers.

**ORGANIZATION.** This book can be used in a series of semester courses—for example, in a two undergraduate course sequence, or an undergraduate course followed by a graduate course. The undergraduate course(s) can use Chapters 1 to 10, 16, 18, and 20. The course can use two or three additional chapters, depending on the course's focus and philosophy. For example, CAD courses can use Chapters 15, 17, and 19. CAM courses can use Chapters 21, 22, and 23. The coverage of Chapters 6 to 9 may exclude the mathematical rigor of these chapters and focus more on the practice-oriented concepts. The graduate course can use chapters 1 to 14 with the mathematical rigor. In addition, courses with a CAD focus can use three more chapters from Part IV, and CAM courses can use three more chapters from Part V.

The book is organized into five related parts. Part I covers the effective use of CAD/CAM systems. This part develops the basic skills required for using any commercial system. Part II discusses, in detail, geometric modeling. Part III covers computer graphics concepts. Part IV focuses on product design and development. Part V covers the manufacturing and management concepts of products. This organization is beneficial in accommodating different course requirements and readers' backgrounds.

The problems section is divided into three parts: theory, lab, and programming. The theory and lab parts are ideal for practice-oriented courses. The theory and programming parts are ideal for theoretically based courses.

The book is written in such a way that some chapters stand on their own; that is, the chapters need not be taught sequentially. Such an approach accommodates different teaching styles. For example, Chapter 12 may be covered before the chapters in Part II. Chapter 20 may be covered following Chapter 4. Chapter 16 may be covered following Chapter 6, 7, 8, 9, or 10. Similarly, the chapters in Parts IV and V can be covered in different order than that of the book.

**ACKNOWLEDGEMENTS.** I am indebted to all of the people who helped directly or indirectly to write this book. I would like to thank the following reviewers for their valuable comments, suggestions, and advice throughout the project. There is no doubt that their suggestions have influenced and enhanced this book.

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Ibrahim Zeid  
zeid@coe.neu.edu  
*Northeastern University*  
Boston, Massachusetts

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# Contents

## Preface

xxv

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## Part I: Using CAD/CAM Systems

<b>Chapter 1</b>	<b>Introduction</b>	<b>3</b>
1.1	Introduction	5
1.2	Product Life Cycle	5
1.3	Scope of CAD/CAM	7
1.4	CAD/CAM Systems	8
1.5	CAD/CAM Applications	9
1.6	Acquiring a CAD/CAM System	10
1.7	Getting Started	12
1.8	Tutorials	13
1.8.1	Getting Started	13
1.8.2	Use FTP and Telnet Sessions Together	23
PROBLEMS		25
<b>Chapter 2</b>	<b>3D Modeling and Viewing</b>	<b>27</b>
2.1	Introduction	29
2.2	The Three Modeling Approaches	30
2.3	Types of Geometric Models	33
2.4	Coordinate Systems	35

2.4.1	Model Coordinate System	35
2.4.2	Working Coordinate System	37
2.4.3	Screen Coordinate System	40
2.5	Sketching and Sketch Planes	41
2.6	Parameters and Dimensions	43
2.7	Basic Features	45
2.8	Datum Features	51
2.9	Geometric Constraints	52
2.10	Modeling Operations	52
2.11	Heterogeneous Modeling	53
2.12	Modeling Strategies	53
2.13	Master Model	54
2.14	System Modes	55
2.15	Model Viewing	56
2.16	VRML Web-Based Viewing	57
2.17	Tutorials	58
2.17.1	Create a Rectangular Plate	58
2.17.2	Create a Base Plate	59
2.17.3	Create a Support Bracket	60
2.17.4	Create a Golf Ball	61
PROBLEMS		62
<b>Chapter 3 Modeling Aids and Tools</b>		<b>67</b>
3.1	Introduction	69
3.2	Geometric Modifiers	69
3.3	Layers	71
3.4	Colors	74
3.5	Grids	74
3.6	Groups	77
3.7	Dragging and Rubber Banding	77
3.8	Clipping	77
3.9	Entity Selection Methods	78
3.9.1	Individual Entity	78
3.9.2	All Displayed Entities	78
3.9.3	Groups	79
3.9.4	Enclosing Polygon or Window	79
3.9.5	Chaining Contiguous Entities	80
3.10	Entity Verification and Copying	80

3.11	Geometric Arrays	81
3.12	Transformations	83
3.13	Geometric Measurements	83
3.14	Offsetting	85
3.15	Editing	87
3.15.1	Entity Trimming	87
3.15.2	Entity Division	89
3.15.3	Entity Stretching	90
3.15.4	Entity Editing	91
3.16	Tutorials	91
3.16.1	Create a Spur Gear	91
3.16.2	Create a Telephone	94
PROBLEMS		97
<b>Chapter 4 Engineering Drawings</b>		<b>101</b>
4.1	Introduction	103
4.2	Drawing Structure	104
4.3	Model and Drawing Associativity	105
4.4	Drawing Content	105
4.5	Methods of Angle of Projection	106
4.6	Types of Views	108
4.7	Types of Dimensions	110
4.8	Annotations	111
4.9	Tolerances	112
4.10	Dimensioning Rules	112
4.11	Editing Drawings	113
4.12	Tutorials	113
4.12.1	Create a Drawing	113
4.12.2	Use Drawing and Model Associativity	115
PROBLEMS		116
<b>Chapter 5 CAD/CAM Programming</b>		<b>121</b>
5.1	Introduction	123
5.2	Relational and Object Databases	123
5.3	Object Definition	127
5.4	Object Concepts	128
5.4.1	Classes	129
5.4.2	Instantiation	129

5.4.3 Membership Access	129
5.5 Inheritance	130
5.6 Parametric Design and Objects	131
5.7 Programming Levels	132
5.8 Macros	135
5.9 Programming the CAD and CAM Interface	137
5.10 Java 3D	138
5.11 Tutorials	142
5.11.1 Create Primitives Using Java 3D	142
PROBLEMS	144

## Part II: Geometric Modeling

<b>Chapter 6 Curves</b>	<b>149</b>
6.1 Introduction	151
6.2 Curve Entities	151
6.3 Curve Representation	157
6.4 Analytic Curves	162
6.5 Lines	162
6.6 Circles	172
6.7 Ellipses	181
6.8 Parabolas	188
6.9 Hyperbolas	192
6.10 Conics	193
6.11 Synthetic Curves	196
6.12 Hermite Cubic Spline	198
6.13 Bezier Curve	201
6.14 B-Spline Curve	207
6.15 Curve Manipulations	216
6.15.1 Evaluating Points on Curves	216
6.15.2 Blending	217
6.15.3 Segmentation	218
6.15.4 Trimming	219
6.15.5 Intersection	220
6.15.6 Transformation	220
6.16 Tutorials	221
6.16.1 Create a Guide Bracket	221

6.16.2    Create a Stop Block	224
PROBLEMS	226
<b>Chapter 7    Surfaces</b>	<b>239</b>
7.1    Introduction	241
7.2    Surface Entities	241
7.3    Surface Representation	247
7.4    Surface Analysis	250
7.4.1    Tangent Vectors	251
7.4.2    Twist Vectors	252
7.4.3    Normal Vectors	253
7.4.4    Distance Calculations	253
7.4.5    Curvatures	254
7.4.6    Tangent Planes	255
7.5    Analytic Surfaces	257
7.6    Plane Surface	257
7.7    Ruled Surface	260
7.8    Surface of Revolution	262
7.9    Tabulated Cylinder	263
7.10    Synthetic Surfaces	265
7.11    Hermite Bicubic Surface	265
7.12    Bezier Surface	268
7.13    B-Spline Surface	272
7.14    Coons Surface	275
7.15    Blending Surface	282
7.16    Offset Surface	283
7.17    Triangular Patches	283
7.18    Surface Manipulations	284
7.18.1    Displaying	284
7.18.2    Evaluating Points and Curves on Surfaces	286
7.18.3    Segmentation	286
7.18.4    Trimming	287
7.18.5    Intersection	287
7.18.6    Projection	288
7.18.7    Transformation	290
7.19    Tutorials	291
7.19.1    Create a B-Spline Surface and Solid	291
7.19.2    Create a Surface and Solid of Revolution	293

7.19.3	Design a Pipe Elbow	294
7.19.4	Create a Magician Hat	294
7.19.5	Edit and Control Surfaces	295
7.19.6	Create a Slipper	297
7.19.7	Create an Air Conditioning Duct	302
7.19.8	Create a Household Fan	304
7.19.9	Create a Hair Dryer	306
7.19.10	Create Free-Form Springs	312
PROBLEMS		315
<b>Chapter 8 NURBS</b>		<b>323</b>
8.1	Introduction	325
8.2	Basics	325
8.2.1	The Knot Vector	327
8.2.2	The Weights	328
8.3	Curves	330
8.4	Lines	331
8.5	Arcs	332
8.6	Circles	335
8.7	Bilinear Surface	342
8.8	Ruled Surface	343
PROBLEMS		343
<b>Chapter 9 Solids</b>		<b>345</b>
9.1	Introduction	347
9.2	Geometry and Topology	348
9.3	Solid Entities	349
9.4	Solid Representation	353
9.5	Fundamentals of Solid Modeling	355
9.5.1	Set Theory	355
9.5.2	Regularized Set Operations	361
9.5.3	Set Membership Classification	367
9.6	Half-Spaces	370
9.6.1	Basic Elements	370
9.6.2	Building Operations	371
9.6.3	Remarks	374
9.7	Boundary Representation (B-rep)	374
9.7.1	Basic Elements	375

9.7.2	Euler Equations	378
9.7.3	Curved and Faceted B-rep Models	381
9.7.4	Building Operations	382
9.7.5	Remarks	382
9.8	Constructive Solid Geometry (CSG)	383
9.8.1	CSG Trees	383
9.8.2	Basic Elements	387
9.8.3	Surface/Surface Intersection	389
9.8.4	Building Operations	392
9.8.5	The Neighborhood Concept	393
9.8.6	Remarks	395
9.9	Sweeps	395
9.9.1	Basic Elements	396
9.9.2	Building Operations	396
9.9.3	Remarks	397
9.10	Solid Manipulations	397
9.10.1	Displaying	397
9.10.2	Evaluating Points, Curves, and Surfaces on Solids	397
9.10.3	Segmentation	398
9.10.4	Trimming and Intersection	398
9.10.5	Transformation	398
9.10.6	Editing	398
9.11	Tutorials	398
9.11.1	Use Solid Trees	398
9.11.2	Create a Candy Dish	401
PROBLEMS		404
<b>Chapter 10 Features</b>		<b>409</b>
10.1	Introduction	411
10.2	Feature Entities	412
10.3	Feature Representation	423
10.4	Three-Dimensional Sketching	423
10.5	Parametrics	424
10.6	Relations	425
10.7	Constraints	428
10.8	Feature Manipulations	431
10.9	Tutorials	432
10.9.1	Create a Sweep Feature	432



10.9.2	Create a Loft Feature	433
10.9.3	Create a Spiral Feature	435
10.9.4	Create a Helical Spring	436
10.9.5	Create a Rib Feature	438
PROBLEMS		439

### **Part III: Computer Graphics**

<b>Chapter 11</b>	<b>Graphics Display</b>	<b>443</b>
11.1	Introduction	445
11.2	CRT	446
11.3	Flat Screen CRT	448
11.4	Analog Flat Panel Displays	448
11.5	Digital Flat Panel Displays	450
11.6	Raster Displays	451
11.7	Specifications	452
PROBLEMS		457
<b>Chapter 12</b>	<b>Transformations</b>	<b>461</b>
12.1	Introduction	463
12.2	Formulation	463
12.3	Translation	464
12.4	Rotation	465
12.4.1	Rotation About Coordinate System Axes	465
12.4.2	Two-Dimensional Rotation About an Arbitrary Axis	467
12.4.3	Three-Dimensional Rotation About an Arbitrary Axis	468
12.5	Scaling	473
12.6	Reflection	475
12.7	Homogeneous Representation	478
12.8	Concatenated Transformations	481
12.9	Mapping of Geometric Models	485
12.9.1	Translational Mapping	485
12.9.2	Rotational Mapping	486
12.9.3	General Mapping	487
12.10	Inverse Transformations	490
12.11	Projections	492
12.11.1	View Definition	493
12.11.2	Orthographic Projections	494