00: Introduction

COMP5821M: Geometry Processing

UNIVERSITY OF LEEDS

Content

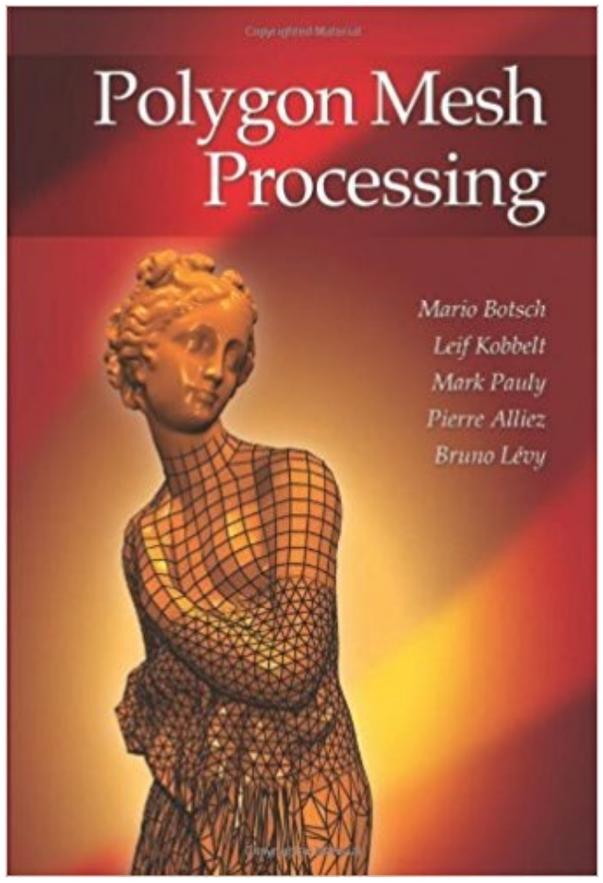
- Mesh Representation & Data Structures
- Differential Geometry of Curves & Surfaces
- Higher-Order Curves & Surfaces
- Simplification & Smoothing
- Texture Parameterisation & Synthesis
- Mesh Repair & Improvement
- Mesh Processing Pipeline

Assessment

- 4 Assignments @ 25% each
  - I: Mesh Data Structures
  - II: Higher Order Surfaces
  - III: Texture Parameterisation
  - IV: Simplification & Smoothing
- No exam

Textbooks

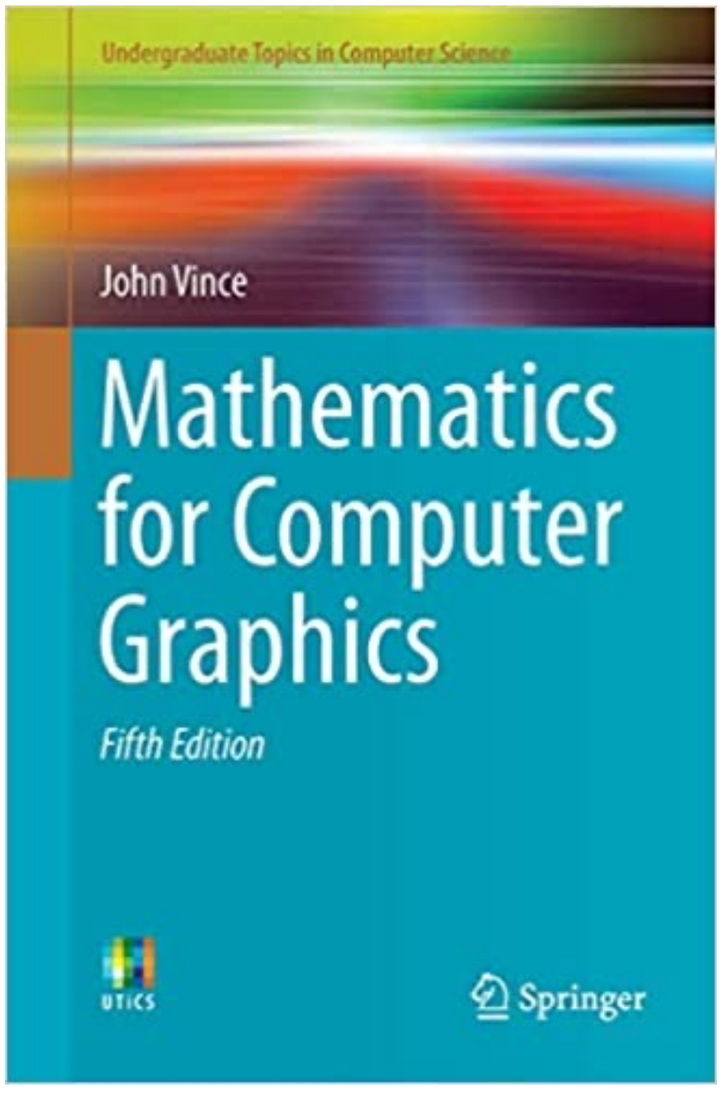
- There is no single textbook we can use
- But all of the core material is in this one:



Hardback: £18.99
Kindle: £48.44

Maths Refresher

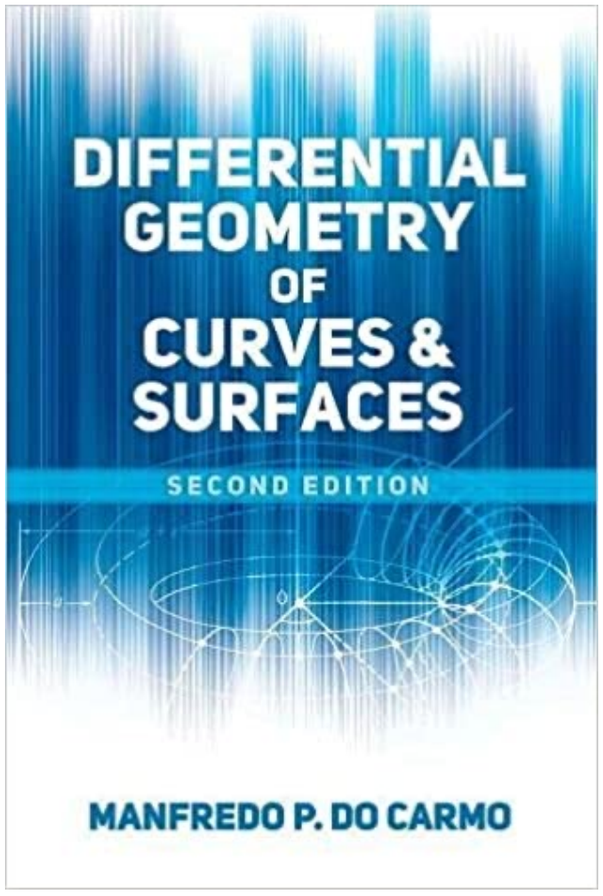
- Basic linear algebra / geometry / calculus:



Hardback: £40.54
Kindle: £12.34

Differential Geometry

- Botsch & Kobbelt *assume* you know it
- So we will supplement from these two



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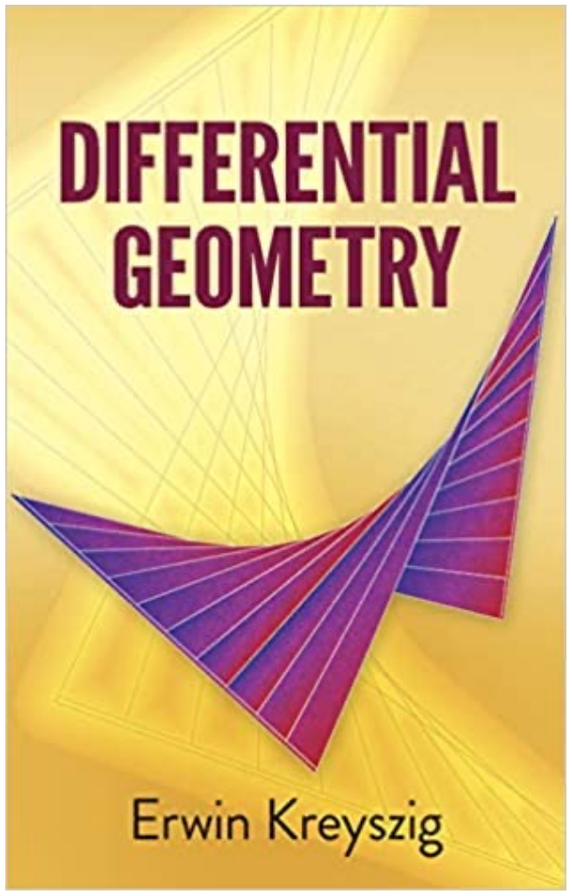
Kindle: £14.92



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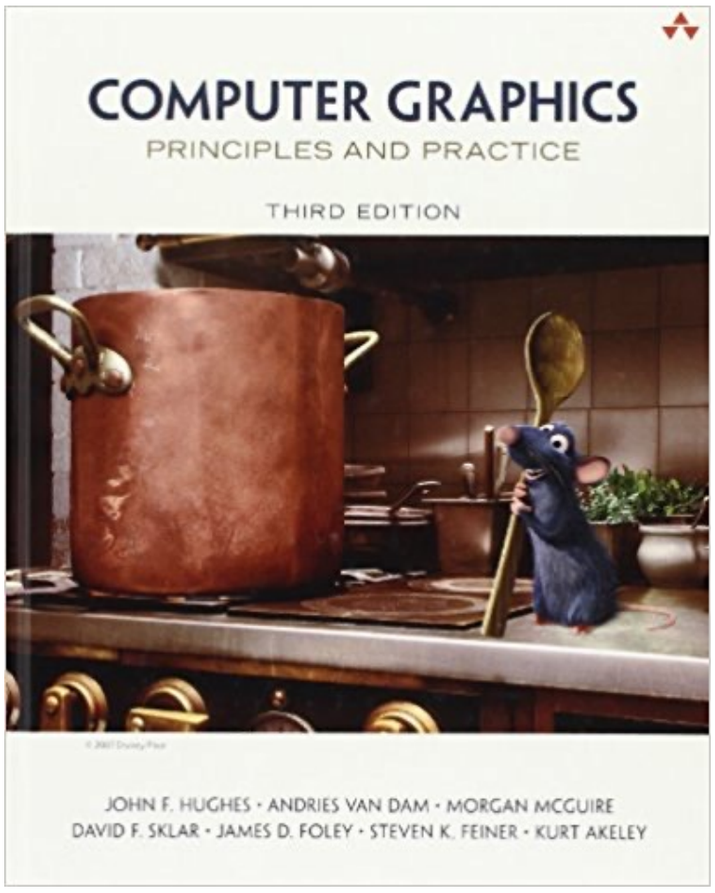
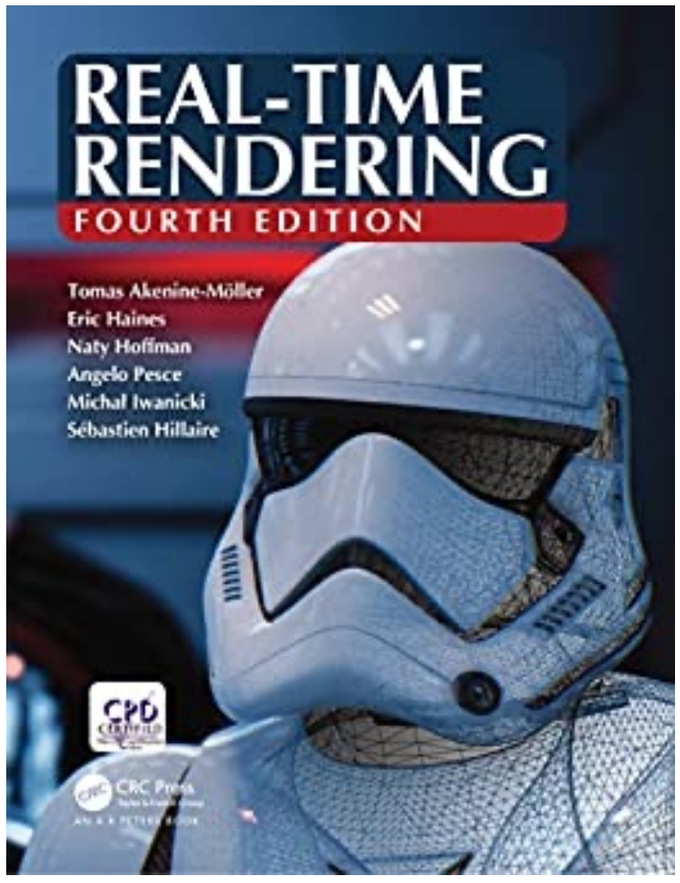
Kindle: £8.96

Texts From 5812/5822

- Both of these have *some* of this material
- And you'll need them anyway



Hardback: £78.66
ACM: $20.00



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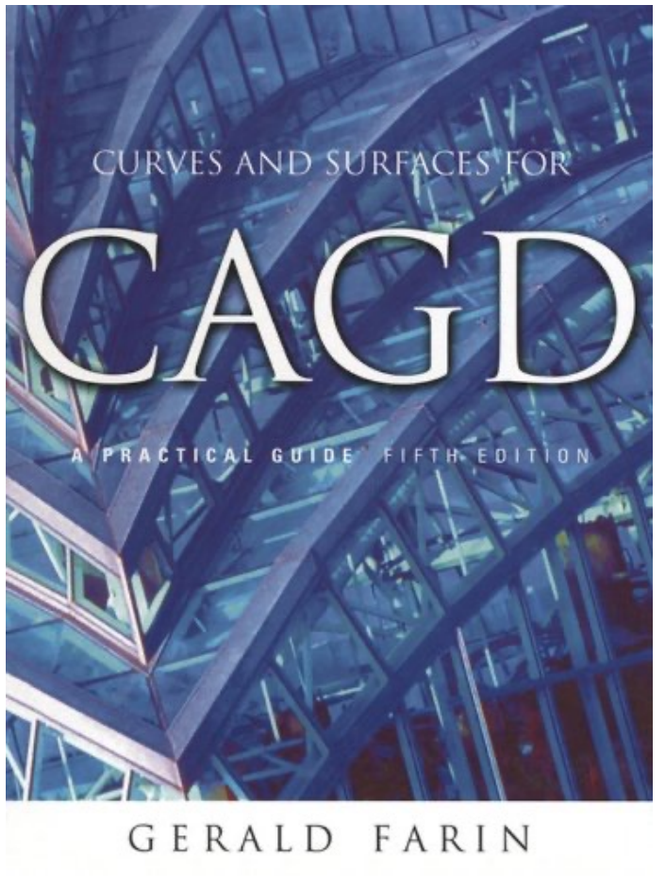
Secondary References

- None of these is necessary
- All of them are useful



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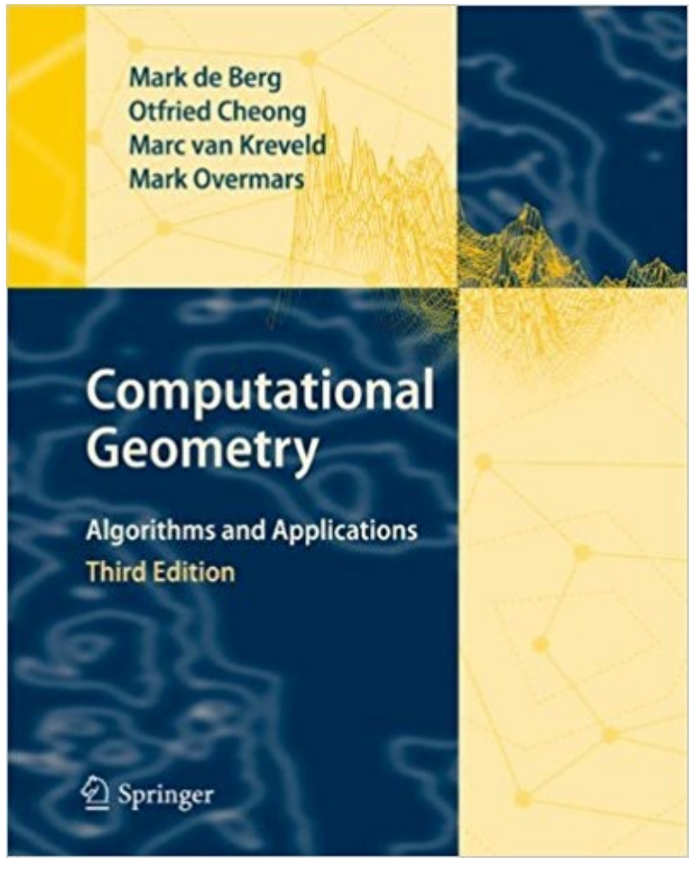

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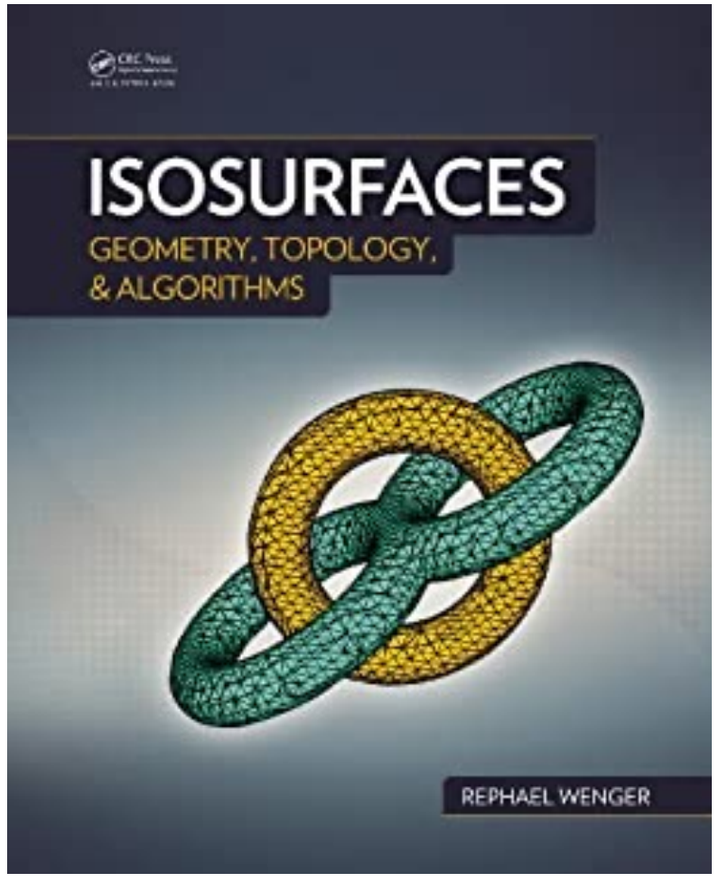

Hardback: £85.00
Kindle: £34.99

Detailed Plan

1	27/09-01/10	Multi-dimensional Calculus	Meshes & the Euler Formula			
2	04/10-08/10	Mesh Data Structures	Mesh Operations	Mesh Data Structures		A1
3	11/10-15/10	Differential Geometry of Curves	Modelling with Curves			
4	18/10-22/10	Differential Geometry of Surfaces	Higher Order Surfaces			A2
5	25/10-29/10		READING WEEK / VIS CONFERENCE			
6	01/11-05/11	Texture Parameterisation & Morphing	Surface Anisotropy		A1	A3
7	08/11-12/11	Surface Curvature	Laplace Operators			
8	15/11-19/11	Discrete Neighbourhoods	Discrete Laplace-Beltrami Operators			
9	22/11-26/11	Simplification	Smoothing		A2	A4
10	29/11-02/12	The Mesh Repair Pipeline	Volumetric Modelling & Isosurfaces			
11	05/12-09/12	Voronoi, Delaunay & Medial Axes	Mesh Quality			
12	12/12-16/12				A4	
	03/01-07/01					
13	10/01-14/01					
14	17/01-21/01				A4	

Mesh Representations & Operations
Differential Geometry
Mesh Parameterisation
Simplification & Smoothing
Mesh Quality & Repair
No Lecture

Chapter Equivalence

1	28/09/2020	Multi-dimensional Calculus	
	01/10/2020	Meshes & the Euler Formula	Botsch 1
2	05/10/2020	Mesh Data Structures	Botsch 2
	08/10/2020	Mesh Operations	Botsch 2, 7.2.1
3	12/10/2020	Differential Geometry of Curves	Botsch 3.1, do Carmo 1, Kreyszig 2
	15/10/2020	Modelling with Curves	Farin 1-9, 13, Hughes 22
4	19/10/2020	Differential Geometry of Surfaces	Botsch 3.2.1-3.2.2, do Carmo 2.1-2.4, Kreyszig 3.24-3.26
	22/10/2020	Higher Order Surfaces	Farin 14-22, Hughes 23
5	26/10/2020	READING WEEK / VIS CONFERENCE	
	29/10/2020	READING WEEK / VIS CONFERENCE	
6	02/11/2020	Texture Parameterisation & Morphing	Botsch 5, 9
	05/11/2020	Surface Anisotropy	Botsch 3.2.2, do Carmo 2.5, Kreyszig 3.27-3.28
7	09/11/2020	Surface Curvature	Botsch 3.2.3, do Carmo 3.1-3.3, Kreyszig 4.38-4.42
	12/11/2020	Laplace Operators	Botsch 3.2.3
8	16/11/2020	Discrete Neighbourhoods	Botsch 3.3
	19/11/2020	Discrete Laplace-Beltrami Operators	Botsch 3.3
9	23/11/2020	Simplification	Botsch 4
	26/11/2020	Smoothing	Botsch 7
10	30/11/2020	The Mesh Repair Pipeline	Botsch 8
	03/12/2020	Volumetric Modelling & Isosurfaces	Botsch 1.4, Hughes 24.3, Wenger
11	07/12/2020	Voronoi, Delaunay & Medial Axes	Botsch 6.4, de Berg 7, 9
	10/12/2020	Mesh Quality	Botsch 6

Lab Sessions

- 2 hour lab shared with Rafael in COMP 5812M
- This week, it will be online
- We will break it into 4 groups:
- Group A will meet me at 1500, Rafael at 1530
- Group B will meet Rafael at 1500, me at 1530
- Group C will meet me at 1600, Rafael at 1630
- Group D will meet Rafael at 1600, me at 1630

Group A - 1500 HC, 1530 RK

M. Eng.

Matthew Cumber

Siyuan Fan

Isaiah Fergile-Leybourne

Alexander Goose

Jason (Zecheng) Hu

M. Sci.

Sharo Hama Karim

Niall Horn

Chaoshan Huang

Jason Kharmawphlang

Yichen Xiao

Group B - 1500 RK, 1530 HC

M. Eng.

John Barbone

Sven Buckland

Vincent (Chan) Lou

Natasha Newland

M. Sci.

Nikhil Bharadwaj

Jiaxing Cai

Zekun Cai

Yiu Ho

Eleanor Mills

Shihua Wu

Group C - 1600 HC, 1630 RK

M. Eng.

Ciaran Brennan

Lewis Hadley

Parmvir Grewal

Tomas Martinek

M. Sci.

Yizhou Hu

Huayang Jiang

Wei Pan

Tianyi Yan

Jingyuan Zhang

Zhiyang Zhang

Group D - 1600 RK, 1630 HC

M. Eng.	M. Sci.
Domantas Dilys	Jacob Bennett
Mario Ivanov	Zechen Geng
Ramal Cooray	Sharjeel Qaiser
Usama Usman	Yuxuan Wen
	Xiaoyuan Yang
	Jinyun Zhu