Universidad Carlos III de Madrid
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COURSE: NUMERICAL METHODS		
DEGREE: APPLIED MATHEMATICS AND COMPUTATION	**YEAR: 2**	**TERM: 1**

WEEKLY PLANNING

WEEK	SESSON	DESCRIPTION	GROUPS (mark X)		Special room for session ?	WEEKLY PROGRAM FOR STUDENT		
			LECTURES	SEMINARS		DETAILED DESCRIPTION	CLASS HOURS	HOMEWORK HOURS (Max. 7h week)
1	1	Chap. I: Introduction: errors, algorithms and estimates	X			Introduction: sources of error, roundoff, truncation, propagation. Machine numbers, floating-point arithmetics. Taylor polynomials and error. Estimating and bounding errors. Interval arithmetics. References: Basic: [WS] 1.1-1.5. Additional: [TB] 3.13. [QSS] 2.1, 2.4-2.5. [ABD] 1.1-1.3. [MF] 1. [KA] 1-2.	1,66	
1	2	Practice 1		X	Computers	Practice 1: finding optimal step to minimize sum of roundoff plus truncation errors in a Taylor estimate. Hand in Week 5.	1,66	6,5
2	3	Chap. II: Interpolation, 1	X			Newton/Lagrange Interpolation, errors. Equispaced (or not) nodes. Refs: Bas: [WS] 2.1-2.4. Add: [QSS] 8.1-8.2. [MF] 4.1-4.4. [KA] 4.1-4.2, App. E. [ABD] 3.1.1-3.1.3.	1,66	
2	4	Problems		X		Problems chapter 1.	1,66	6,5
3	5	Chap. II: Interpolation, 2	X			Runge's phenomenon. Hermite interpolation. Richardson's extrapolation. Refs: Bas: [MF] 7.3. [KA] 4.2.2, 8.3.2. Add: [QSS] 8.4, 9.6. [ABD] 3.1.5, 4.4.	1,66	
3	6	Problems		X		Problems chapter 2.	1,66	6,5

4	7	Chap. II: Interpolation, 3	X			Splines. Natural cubic splines. Refs: Bas: [WS] 3.4. Add: [QSS] 8.6.1. [MF] 5.3. [KA] 4.3.	1,66	
4	8	Problems		X		Problems chapter 2.	1,66	6,5
5	9	Chap. III: Numerical Differentiation and Integration, 1	X			Numerical differentiation: back/forward, central, general, higher order. Errors. Refs: Bas: [WS] 1.6. Add: [MF] 6. [KA] 5.4. [ABD] 4.1.	1,66	
5	10	Practice 2		X	Computers	Practice 2: splines, differentiation and graphical questions on interpolation. Hand in Week 9.	1,66	6,5
6	11	Chap. III: Numerical Differentiation and Integration, 2	X			Numerical Integration: Newton-Côtes formulae. Errors. R: B: [WS] 4.2-4.3. A:[MF] 7.1-7.2. [KA] 5.1-5.2. [QSS] 9.1-9.4. [ABD] 4.2.2-4.2.3.	1,66	
6	12	Problems		X		Problems chapter 3.	1,66	6,5
7	13	Chap. IV: Direct methods for linear systems, 1	X			Linear systems, stability: condition number. Triangular systems. Gaussian elimination. Pivoting. Refs: Bas: [WS] 6.2-6.3, 6.5. Add: [MF] 3.1-3.4. [TB] 4.20-4.22. [KA] 6.1-6.3, 6.5. [QSS] 3.1-3.3,3.5. [ABD] 2.1, 2.2.1-2.2.3.	1,66	
7	14	Problems		X		Problems chapter 3.	1,66	6,5
8	15	Chap. IV: Direct methods for linear systems, 2	X			Computing determinants and matrix inverses. Conditioning. Refs: Bas: [TB] 3.12. Add: [QSS] 3.6. [ABD] 2.2.5-2.2.6.	1,66	
8	16	Problems		X		Problems chapter 4.	1,66	6,5
9	17	Chap. IV: Direct methods for linear systems, 3	X			Orthogonalization methods and improved methods. Refs: Bas: [CM] 5.5. Add: [QSS] 3.10-3.12. [ABD] 2.2.4.	1,66	
9	18	Problems		X		Problems chapter 4.	1,66	6,5
10	19	Chap. V: Nonlinear systems, 1	X			Nonlinear equations: Mean-value theorem, number of roots in an interval. Bisection, Secant, Newton-Raphson. Refs: B: [WS] 5.2, 5.4-5.5. A: [MF] 2.1-2.4. [KA] 3.1-3.3. [QSS] 6.2. [ABD] 5.1.2.	1,66	
10	20	TEST		X		Partial exam, covering chapters I-IV (weeks 1-9)	1,66	6,5
11	21	Chap. V: Nonlinear systems, 2	X			Fixed-point methods. Convergence order. Error analysis. Nonlinear systems.	1,66	6,5

						Refs: B: [WS] 5.3, 5.6. A: [KA] 3.4. [QSS] 6.3, 6.5, 7.1. [ABD] 5.1.2-5.1.3, 5.3.		
11	22	Practice 3		X	Computers	Practice 3: adaptive integration methods, combined with MATLAB tools for Newton, Secant, etc. Hand in Week 15.	1,66	
12	23	Chap. V: Nonlinear systems, 3	X			Accelerated, Taylor, interpolation methods. Refs: Bas: [MF] 2.5. Add: [QSS] 6.6-6.7. [ABD] 5.1.4-5.1.5.	1,66	
12	24	Problems		X		Problems chapter 5.	1,66	6,5
13	25	Chap. VI: Least Squares, 1	X			Least-squares, normal equations. Regression. Refs: Bas: [WS] 8.1-8.4. [TB] 2.6-2.7, 2.9. Add: [QSS] 10.7.	1,66	
13	26	Problems		X		Problems chapters 5 and 6.	1,66	6,5
14	27	Chap. VI: Least Squares, 2	X			Normal equations and QR method. Overdetermined systems. Refs: Bas: [WS] 8.5-8.8. Add: [QSS] 3.4.3, 3.13. [ABD] 2.3.7.	1,66	
14	28	Practice 4 and problems		X	Computers	Problems chapter 6. Practice 4: use of scientific software based on least-squares. No assignment (not part of evaluation).	1,66	6,5
						Subtotal 1	**46,5**	**91**
						Total 1 *(Hours of class plus student homework hours between weeks 1-14)*		**137,5**
15						Tutorials, handing in, etc	2	
16								
17							3	7,5
18						Assessment		
						Subtotal 2	**5**	**7,5**
						Total 2 *(Hours of class plus student homework hours between weeks 15-18)*		**12,5**
TOTAL *(T1 + T2)*	**150**							