uc3m | Universidad Carlos III de Madrid

COURSE: CALCULUS II		
DEGREE: Bachelor in Data Science and Engineering and Telecommunication Technologies Engineering	**ACADEMIC YEAR: 2024-2025**	**TERM: 2**

28 sessions along 14 weeks

WEEKLY PLANNING

WEEK	SESSION	DESCRIPTION	GROUPS (mark X)		WEEKLY PROGRAMMING FOR STUDENT		
			LECTURES	SEMINARS	DESCRIPTION	CLASS HOURS	HOMEWORK HOURS (Max. 7h week)
1	1	**CHAPTER 1: DIFFERENTIAL CALCULUS IN SEVERAL VARIABLES** 1.1 R^n as an Euclidean space; topology 1.2 Functions of n variables - Functions, graphs, and level sets	X		Sections 1.5, 2.1, 2.2 [MT]	1,67	6,3
1	2	(*) Discussion of selected exercises		X	(**) Problem solving for selected exercises	1,67	
2	3	1.3 Limits and Continuity	X		Section 2.2 [MT]	1,67	6,3
2	4	(*) Discussion of selected exercises		X	(**) Problem solving for selected exercises	1,67	
3	5	1.4 Differentiability - Partial derivatives - Derivative; Jacobian matrix	X		Section 2.3 [MT]	1,67	6,3
3	6	(*) Discussion of selected exercises		X	(**) Problem solving for selected exercises	1,67	
4	7	- Properties of the derivative - Chain rule - Directional derivatives; gradient vector	X		Sections 2.5, 2.6 [MT]	1,67	6,3
4	8	(*) Discussion of selected exercises		X	(**) Problem solving for selected	1,67	

					exercises		
5	9	**CHAPTER 2: LOCAL PROPERTIES OF FUNCTIONS** 2.1 Higher order derivatives - Iterated derivatives; equality of mixed partials - Differential operators: divergence, curl, Laplacian	X		Sections 3.1, 3.2 [MT]	1,67	6,3
5	10	(*) Discussion of selected exercises		X	(**) Problem solving for selected exercises	1,67	
6	11	- Taylor polynomial; Hessian matrix 2.2 Optimization - Local extrema - Absolute/global extrema	X		Sections 3.2, 3.3 [MT]	1,67	6,3
6	12	(*) Discussion of selected exercises		X	(**) Problem solving for selected exercises	1,67	
7	13	- Free optimization problems - Constrained optimization: Lagrange multipliers	X		Section 3.3, 3.4 [MT]	1,67	6,3
7	14	(*) Discussion of selected exercises		X	(**) Problem solving for selected exercises	1,67	
8	15	**CHAPTER 3: INTEGRAL CALCULUS ON R^n** 3.1 Double and triple integrals - Iterated integrals - Cavalieri's principle - Integrals over rectangular regions; Fubini's theorem	X		Sections 5.1-5.2 [MT]	1,67	6,3
8	16	**First partial exam** (*) Discussion of selected exercises		X	(**) Problem solving for selected exercises	1,67	
9	17	- Arbitrary 2- and 3-dimensional regions - Change in the order of integration 3.2 n-dimensional integrals	X		Sections 5.3-5.5 [MT]	1,67	6,3

9	18	(*) Discussion of selected exercises		X	(**) Problem solving for selected exercises	1,67	
10	19	3.3 Changes of variables and applications - Changes of variables; Jacobian - Polar, cylindrical, and spherical coordinates - Average; center of mass; moments of inertia	X		Sections 6.1-6.3 [MT]	1,67	6,3
10	20	(*) Discussion of selected exercises		X	(**) Problem solving for selected exercises	1,67	
11	21	**CHAPTER 4: INTEGRALS OVER CURVES AND SURFACES** 4.1 Line integrals - Parametrized curves - Line integral - Conservative fields	X		Sections 7.1, 7.2 [MT]	1,67	6,3
11	22	(*) Discussion of selected exercises		X	(**) Problem solving for selected exercises	1,67	
12	23	4.2 Surface integrals - Parametrized surfaces - Area of a Surface - Integrals of scalar functions and vector fields	X		Sections 7.3-7.6 [MT]	1,67	6,3
12	24	**Second partial exam** (*) Discussion of selected exercises		X	(**) Problem solving for selected exercises	1,67	
13	25	4.3 Integral theorems of vector analysis - Planar case: Green's and divergence theorems - Stokes' theorem	X		Sections 8.1, 8.2 [MT]	1,67	6,3
13	26	(*) Discussion of selected exercises		X	(**) Problem solving for selected exercises	1,67	
14	27	- Conservative fields	X		Sections 8.3, 8.4 [MT]	1,67	6,3

		- Gauss' theorem						
14	28	(*) Discussion of selected exercises		X	(**) Problem solving for selected exercises	1,67	6,3	
						Subtotal 1	**47**	**88**
					Total 1 *(Hours of class plus student homework hours between weeks 1-14)*		135	

15		Tutorials, handing-in, etc.				2		
16		Assessment, final exam preparation				3	10	
17								
18								
						Subtotal 2	**3**	**12**
					Total 2 *(Hours of class plus student homework hours between weeks 15-18)*		15	
TOTAL *(Total 1 + Total 2. Maximum 180 hours)*							**150**	

Notes:

[MT] Marsden and Tromba, "Vector Calculus", W. H. Freeman (6th edition, 2012)

(*) Discussion of selected exercises from the course collection that correspond to the previous lecture

(**) Problem solving for selected exercises from the course collection and sections of [MT] that correspond to the previous lecture

(+) Lecture hours are always 1.67 (1.67 hours*28 sessions = 46.76 hours)