CM30070: material covered

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Date/format	Book	Topic
3/10/11: L	—	Basic tour of Maple's features and structure
6/10/11: L	1.2	Representations. Normal and canonical representations.
6/10/11: L	2.1.1–3	Polynomials in one variable: sparse or dense storage? Karatsuba's method. Factored representations
10/10/11: L	2.1.4–5	Polynomials in several variables: recursive, distributed. Admissible orderings. Alternative representations like DAGs. Rational functions: GCDs.
13/10/11: L	2.3.1–2	Euclid's algorithm. Gauss' Lemma. Pseudo-remainder. Subresultant Algorithm.
13/10/11: C	—	How to manipulate polynomials with Maple.
17/10/11: L	2.3.4–5	Complexity of polynomial GCD. GCD and Square-free decomposition.
20/10/11: L	3.2.1–3	Linear equations in several variables. Why we don't calculate matrix inverses. Dodgson-Bareiss algorithm/theorem.
20/10/11: C		Discussion about coursework. For Q2 students can use prem in Maple
24/10/11: L	3.2.4; 3.1	Sylvester matrix. Over and underdetermined systems of equations. Equations in one variable.
27/10/11: C		General Maple queries about loops, procedures, sets vs lists.
31/10/11: L	3.1.4–6; 3.1.9	Algebraic Numbers. Capelli's Theorem. How many real roots? Sturm's Theorem.
3/11/11: L	3.3	Introduction to nonlinear equations and reduction
3/11/11: C		Coursework questions.
7/11/11: L	3.3.1–2	Gröbner Bases. Buchberger's Algorithm. Zeroes and Varieties.
7/11/11: L	3.3.3	Orderings: plex, grlex, tdeg, matrix.
10/11/11: C		Discussion about the definitions of polynomial ideals and varieties.
14/11/11: L	3.3.6–8	Gianni-Kalkbrener Theorem. Complexity of calculating plex vs tdeg Gröbner Bases. FGLM. Shape Lemma

15/11/11: C	Using Maple to calculate Gröbner Bases. How Maple acts 'cleverly' when calculating them.
17/11/11: L 4–4.1.3	Modular Methods. Landau-Mignotte Inequality.
17/11/11: C	Examples of modular calculations.
21/11/11: L 4.1	Rest of 4.1; also introduction to the bivariate problem.
22/11/11: C	More Maple
24/11/11: L 4.2–3	The bivariate problem (which is very largely *déjà vu* from the modular problem. Start of 4.3, state theorem 26, and that the main challenge is sparsity, which is the rest of 4.3 (not covered this year).
24/11/11: C	Explain why A_{y-v} in the multivariate case is analogous to A_p in the univariate case, and how this unifies 4.1 and 4.2.
28/11/11: L 4.4;5	Overview of Modular methods for Gröbner bases. Note that a prime is bad with respect to a calculation, rather than an abstract problem, here. "Sledgehammer" proof that there are only finitely many bad primes. Hilbert-badness. The factorisation problem. All primes *can* be bad. The 'matching up' problem: why Chinese Remainder doesn't work.
28/11/11: L 7.1	Introduction to integration. Hermite's algorithm.
5/12/11: L 7.2	Integration of rational functions. Ostrogradski-Horowitz algorithm. Trager-Rothstein algorithm.
6/12/11: C	More Maple.
8/12/11: L 7.3,7.7	How the algebra underpins the calculus. Liouville's Principle. Risch Differential Equation Problem.
8/12/11: C	Discussion of Coursework Q4. Sample solution
12/12/11: L 7.4–5	Integration of logarithmic functions. Integration of exponential functions.
15/12/11: L 7;8.1	Summary of methods to solve integration and Risch Differential Equation problems. Algebra versus Analysis. Difference between formulae, functions, rules. Branch cuts.

'L'= lecture 'C'= class.