COURSE OUTLINE – subject to changes :

L-1	Mon 22 Aug	0.1,0.2	welcome to MCS 471, evaluating polynomials, binary numbers
L-2	Wed 24 Aug	0.3,0.4	floating-point numbers and floating-point arithmetic
L-3	Fri 26 Aug	1.1,1.2	bisection, fixed-point iterations, cobweb diagrams
L-4	Mon 29 Aug	1.3	forward and backward error, multiple roots, condition number
L-5	Wed 31 Aug	1.4	Newton's method, its convergence to single and multiple roots
L-6	Fri 2 Sep	1.5	the secant method, superlinear convergence, regula falsi
	Mon 5 Sep		Labor Day holiday. No classes.
L-7	Wed 7 Sep	13.1	optimization without derivatives, golden section search
L-8	Fri 9 Sep	2.1,2.2	linear algebra, Gaussian elimination, LU factorization
L-9	Mon 12 Sep	2.3	norms, the condition number of a linear system
L-10	Wed 14 Sep	2.4	row pivoting for numerical stability, PA=LU factorization

Project one is due on Friday 16 September, at 10am.

L-11	Fri 16 Sep	2.5	iterative methods for linear systems
L-12	Mon 19 Sep	2.6	positive definite matrices, the Cholesky factorization and its cost
L-13	Wed 21 Sep	2.6,2.7	the conjugate gradient method and the multivariate Newton method
L-14	Fri 23 Sep	3.1	polynomial interpolation with Lagrange and Neville
L-15	Mon 26 Sep	3.2	divided differences, the condition of interpolation
L-16	Wed 28 Sep	3.3	Chebyshev interpolation; Padé approximation
L-17	Fri 30 Sep	3.4	cubic splines; Bezier curves
L-18	Mon 3 Oct	4.1,4.2	fitting data; conditioning of the least squares problem

Project two is due on Wednesday 5 October, at 10am

L-19	Wed 5 Oct	4.3	the QR factorization, modified Gram-Schmidt, Householder reflectors
L-20	Fri 7 Oct	4.4	iterative methods for least squares, Krylov, preconditioned GMRES
L-21	Mon 10 Oct	4.5	nonlinear least squares, Gauss-Newton, Levenberg-Marquardt
L-22	Wed 12 Oct		review for the first midterm exam
L-23	Fri 14 Oct		**the first midterm exam**
L-24	Mon 17 Oct	5.1	finite difference formulas; Richardson extrapolation
L-25	Wed 19 Oct	5.2	Newton-Cotes formulas for numerical integration
L-26	Fri 21 Oct	5.3,5.4	adaptive integration; Romberg integration
L-27	Mon 24 Oct	5.5	Gaussian quadrature; orthogonal polynomials
L-28	Wed 26 Oct	6.1,6.2	Euler's method to solve initial problems; Lipschitz continuity

Project three is due on Friday 28 October, at 10am

L-29	Fri 28 Oct	6.2,6.3	higher order equations; linear systems, spectral decomposition
L-30	Mon 31 Oct	6.4	local and global errors; Runge-Kutta methods
L-31	Wed 2 Nov	6.5,6.6	stability of solutions; stiff equations
L-32	Fri 4 Nov	6.7	predictor-corrector methods; variable step methods
L-33	Mon 7 Nov	7.1	solving boundary value problems with shooting methods
L-34	Wed 9 Nov	7.2	linear, characteristic-value, and nonlinear problems
L-35	Fri 11 Nov	7.3	collocation and the finite element method

Project four is due on Monday 14 November, at 10am

L-36	Mon 14 Nov		review for the second midterm exam
L-37	Wed 16 Nov		**the second midterm exam**
L-38	Fri 18 Nov	8.1	parabolic PDEs, finite differences for the heat equation
L-39	Mon 21 Nov	8.2	hyperbolic PDEs, finite differences for the wave equation
L-40	Wed 23 Nov	8.3	elliptic PDEs, finite differences for steady state equations
	Fri 25 Nov		Thanksgiving holiday. No classes.
L-41	Mon 28 Nov		review of the materials before the first midterm exam

Project five is due on Wednesday 30 November, at 10am

L-42	Wed 30 Nov		review of the materials between the two midterm exams
L-43	Fri 2 Dec		comprehensive review

Final exam: in the week from Monday 5 to Friday 9 December, TBA.