

Syllabus
CE 597 Adjustment of Geospatial Observations
CRN=53229 Fall 2016 MWF 11:30 HAMP 1113

Week	Session	Date	Subject
1	1	Mon 22-Aug	Introduction, course mechanics, references, computer resources, matlab, functional and stochastic models, redundancy, weights, condition equations, residuals
	2	Wed 24-Aug	objective functions, least squares, L1, L2 norm minimization indirect observations, hand solution
	3	Fri 26-Aug	linear examples, leveling, angle figures, regression
2	4	Mon 29-Aug	constrained minimization, lagrange multipliers, observations only, longhand solution
	5	Wed 31-Aug	independence/dependence, condition number, matrix rank, solution of linear system, matrix inverse
	6	Fri 02-Sep	matrix derivation indirect observations, matrix derivation observations only, matrix naming conventions
3		Mon 05-Sep	No Class (Labor Day)
	7	Wed 07-Sep	more linear models, curve fitting, surface fitting, spline, ANOVA
	8	Fri 09-Sep	derive 2D, rotation matrix, linear coordinate transformations, 2D conformal,
4	9	Mon 12-Sep	2D affine transformation, 3D conformal
	10	Wed 14-Sep	nonlinear equations/models, newton iteration 1D, nD, jacobian matrix,
	11	Fri 16-Sep	partial derivatives: analytical, approximation, symbolic; convergence and iteration
5	12	Mon 19-Sep	nonlinear examples, 2D/3D ranging
	13	Wed 21-Sep	probability, random variables, probability density function, discrete, continuous, cumulative distribution function, normal distribution,
	14	Fri 23-Sep	multivariate normal distribution, mean, variance, standard deviation
6	15	Mon 26-Sep	distributions that we need: F,chi-square, t,normal, mvn, critical values, tables, calculator, matlab functions, random vectors
	16	Wed 28-Sep	Covariance, covariance matrix, derive general error propagation law, error propagation,

			covariance propagation
	17	Fri 30-Sep	examples of E.P., one step, two step, n-step
7	18	Mon 03-Oct	indirect observations Q_{ll} , Q_{xx} , Q_{vv} , Q_{lh} , observations only Q_{ll} , Q_{vv} , Q_{lh}
	19	Wed 05-Oct	confidence interval, eigenvalues, eigenvectors
	20	Fri 07-Oct	hypothesis test, global test, (= Chi-square test or F test), correlation coefficient
8		Mon 10-Oct	No Class (October Break 10&11th)
	21	Wed 12-Oct	confidence region, error ellipse, CE/LE, numerical integration
	22	Fri 14-Oct	plane surveying techniques, triangulation, angle observation
9	23	Mon 17-Oct	MIDTERM EXAM
	24	Wed 19-Oct	plane surveying techniques trilateration, traverse, azimuth, direction measurement
	25	Fri 21-Oct	projective transformation (8 parameter transformation), pseudo LS, RPC's
10	26	Mon 24-Oct	derive 3D rotation matrix, rotation parameters, euler angles, seq. rotations, quaternions, algebraic rotation parameters
	27	Wed 26-Oct	direction cosines, axis-angle parameterization, critical geometry
	28	Fri 28-Oct	general LS, mixed model, matrix derivation, error prop Q_{vv} , Q_{xx} , Q_{lh}
11	29	Mon 31-Oct	curve fit (all coordinates observed), model element counting, 3D conformal coordinate transformation
	30	Wed 02-Nov	LIDAR (point cloud) data processing, seven parameter transformation, registration, merging
	31	Fri 04-Nov	GPS pseudorange and adjustment
12	32	Mon 07-Nov	GPS pseudorange and adjustment, RINEX, error propagation
	33	Wed 09-Nov	GPS troposphere delay, sat. pos. adj.
	34	Fri 11-Nov	parameter constraints
13	35	Mon 14-Nov	Parameter constraints
	36	Wed 16-Nov	unified LS
	37	Fri 18-Nov	Unified LS
14	38	Mon 21-Nov	sequential estimation
		Wed 23-Nov	No Class (Thanksgiving)
		Fri 25-Nov	No Class (Thanksgiving)
15	39	Mon 28-Nov	Sequential estimation
	40	Wed 30-Nov	kalman filter
	41	Fri 02-Dec	kalman filter
16	42	Mon 05-Dec	robust estimation, IRLS, data snooping,

			redundancy number, reliability
	43	Wed 07-Dec	robust estimation, L1-norm minimization, linear programming
	44	Fri 09-Dec	commercial adjustment programs
17	45	M-F, 12-16	Final Exam date & place TBD