Syllabus
CE 597 Adjustment of Geospatial Observations
CRN=53229 Fall 2015 MWF 11:30 HAMP 1266

Session	Date	Subject
1	Mon 24-Aug	Introduction, course mechanics, references, computer resources, matlab, functional and stochastic models, redundancy, weights, condition equations, residuals
2	Wed 26-Aug	objective functions, least squares, L1, L2 norm minimization indirect observations, hand solution
3	Fri 28-Aug	linear examples, leveling, angle figures, regression
4	Mon 31-Aug	constrained minimization, lagrange multipliers, observations only, longhand solution
5	Wed 02-Sep	independence/dependence, condition number, matrix rank, solution of linear system, matrix inverse
6	Fri 04-Sep	matrix derivation indirect observations, matrix derivation observations only, matrix naming conventions
	Mon 07-Sep	**No Class (Labor Day)**
7	Wed 09-Sep	more linear models, curve fitting, surface fitting, spline, ANOVA
8	Fri 11-Sep	derive 2D, rotation matrix, linear coordinate transformations, 2D conformal,
9	Mon 14-Sep	2D affine transformation, 3D conformal
10	Wed 16-Sep	nonlinear equations/models, newton iteration 1D, nD, jacobian matrix,
11	Fri 18-Sep	partial derivatives: analytical, approximation, symbolic; convergence and iteration
12	Mon 21-Sep	nonlinear examples, 2D/3D ranging
13	Wed 23-Sep	probability, random variables, probability density function, discrete, continuous, cumulative distribution function, normal distribution,
14	Fri 25-Sep	multivariate normal distribution, mean, variance, standard deviation
15	Mon 28-Sep	distributions that we need: F,chi-square, t,normal, mvn, critical values, tables, calculator, matlab functions,

		random vectors
16	Wed 30-Sep	Covariance, covariance matrix, derive general error propagation law, error propagation, covariance propagation
17	Fri 02-Oct	examples of E.P., one step, two step, n-step
18	Mon 05-Oct	indirect observations Qll, Qxx, Qvv, Qlhlh, observations only Qll, Qvv, Qlhlh
19	Wed 07-Oct	confidence interval, eigenvalues, eigenvectors
20	Fri 09-Oct	hypothesis test, global test, (= Chi-square test or F test), correlation coefficient
	Mon 12-Oct	**No Class (October Break 12&13th)**
21	Wed 14-Oct	confidence region, error ellipse, CE/LE, numerical integration
22	Fri 16-Oct	plane surveying techniques, triangulation, angle observation
23	Mon 19-Oct	**MIDTERM EXAM**
24	Wed 21-Oct	plane surveying techniques trilateration, traverse, azimuth, direction measurement
25	Fri 23-Oct	projective transformation (8 parameter transformation), pseudo LS, RPC's
26	Mon 26-Oct	derive 3D rotation matrix, rotation parameters, euler angles, seq. rotations, quaternions, algebraic rotation parameters
27	Wed 28-Oct	direction cosines, axis-angle parameterization, critical geometry
28	Fri 30-Oct	general LS, mixed model, matrix derivation, error prop Qvv, Qxx, Qlhlh
29	Mon 02-Nov	curve fit (all coordinates observed), model element counting, 3D conformal coordinate transformation
30	Wed 04-Nov	LIDAR (point cloud) data processing, seven parameter transformation, registration, merging
31	Fri 06-Nov	GPS pseudorange and adjustment
32	Mon 09-Nov	GPS pseudorange and adjustment, RINEX, error propagation, PDOP, HDOP, VDOP, GDOP
33	Wed 11-Nov	parameter constraints
34	Fri 13-Nov	parameter constraints
35	Mon 16-Nov	unified LS
36	Wed 18-Nov	unified LS
37	Fri 20-Nov	sequential estimation

38	Mon 23-Nov	sequential estimation
	Wed 25-Nov	**No Class (Thanksgiving)**
	Fri 27-Nov	**No Class (Thanksgiving)**
39	Mon 30-Nov	kalman filter
40	Wed 02-Dec	kalman filter
41	Fri 04-Dec	kalman filter
42	Mon 07-Dec	robust estimation, IRLS, data snooping, redundancy number, reliability
43	Wed 09-Dec	robust estimation, L1-norm minimization, linear programming
44	Fri 11-Dec	commercial adjustment programs
45	M-F, 14-18	**Final Exam** date & place TBD