

Syllabus
CE 597 Adjustment of Geospatial Observations
On Campus CRN=53229, Distance CRN=62652
Fall 2013

Session	Date	Subject
1	Tue 20-Aug	Introduction, course mechanics, references, computer resources, matlab, functional and stochastic models, redundancy, weights, condition equations, residuals, objective functions, least squares, L1, L2 norm minimization
2	Thu 22-Aug	indirect observations, hand solution, linear examples, leveling, angle figures
3	Tue 27-Aug	constrained minimization, lagrange multipliers, observations only, longhand solution
4	Thu 29-Aug	matlab tutorial, matlab programming, graphics, linear independence/dependence, condition number, matrix rank, solution of linear system, matrix inverse
5	Tue 3-Sep	matrix derivation indirect observations, matrix derivation observations only, matrix naming conventions
6	Thu 5-Sep	more linear models, regression, curve fitting, surface fitting, spline, ANOVA
7	Tue 10-Sep	derive 2D, rotation matrix, linear coordinate transformations, 2D conformal, affine transformation, 3D conformal
8	Thu 12-Sep	nonlinear equations/models, newton iteration 1D, nD, jacobian matrix, partial derivative & approximation, convergence
9	Tue 17-Sep	nonlinear examples, 2D/3D ranging, matlab symbolic processing
10	Thu 19-Sep	probability, random variables, probability density function, discrete, continuous, cumulative distribution function, normal distribution, multivariate normal distribution, mean, variance, standard deviation
11	Tue 24-Sep	distributions that we need: F, chi-square, t, normal, mvn, critical values, tables, calculator, matlab functions, random vectors
12	Thu 26-Sep	Covariance, covariance matrix, derive

		general error propagation law, error propagation, covariance propagation
13	Tue 1-Oct	indirect observations Q_{ll} , Q_{xx} , Q_{vv} , Q_{llh} , observations only Q_{ll} , Q_{vv} , Q_{llh}
14	Thu 3-Oct	confidence interval, eigenvalue, eigenvector, hypothesis test, global test, (χ^2 = Chi-square test or F test), correlation coefficient
	Tue 8-Oct	No Class (October Break 7&8th)
15	Thu 10-Oct	confidence region, error ellipse, CE/LE, numerical integration
16	Tue 15-Oct	plane surveying techniques, traverse triangulation, trilateration, azimuth, angle, direction measurement
17	Thu 17-Oct	MIDTERM EXAM
18	Tue 22-Oct	projective transformation (8 parameter transformation), pseudo LS, RPC's
19	Thu 24-Oct	derive 3D rotation matrix, rotation parameters, euler angles, seq. rotations, quaternions, algebraic rotation parameters, direction cosines, axis-angle parameterization, critical geometry
20	Tue 29-Oct	general LS, mixed model, matrix derivation, error prop Q_{vv} , Q_{xx} , Q_{llh}
21	Thu 31-Oct	curve fit (all coordinates observed), model element counting, 3D conformal coordinate transformation
22	Tue 5-Nov	LIDAR (point cloud) data processing, registration, merging
23	Thu 7-Nov	GPS pseudorange and adjustment, RINEX, error propagation, PDOP, HDOP, VDOP, GDOP
24	Tue 12-Nov	parameter constraints
25	Thu 14-Nov	unified LS
26	Tue 19-Nov	unified LS
27	Thu 21-Nov	sequential estimation
28	Tue 26-Nov	kalman filter
	Thu 28-Nov	No Class (Thanksgiving)
29	Tue 3-Dec	robust estimation, IRLS, data snooping, redundancy number, reliability
30	Thu 5-Dec	robust estimation, L1-norm minimization, linear programming
31	Mon 9-Dec	Final Exam 10:30-12:30, HAMP 1113