Oregon State University - Department of Mathematics
Qualifying Exam Syllabus
Revised: Spring 2000

Real Analysis:

- Metric spaces, Normed spaces, l_p spaces
- Weierstrass approximation theorem
- Completeness, Fixed point (contraction mapping) theorem
- Baire Category theorem
- Compactness, Arzela-Ascoli theorem
- Measure and integration in $\mathbb{R}^n$
- Lebesgue convergence theorems
- L_p spaces, completeness
- Fubini-Tonelli theorem
- Hilbert basis, orthogonal projection

References:

H.L. Royden: *Real Analysis* (Prentice Hall)
Rudin: *Real and Complex Analysis* (McGraw-Hill)
K.T. Smith: *Primer of Modern Analysis* (Springer-Verlag)
Kolmogorov and Fomin: *Introductory Real Analysis* (Dover)

Complex Analysis:

- Analytic functions, Cauchy-Riemann equations
- Conformal maps, Linear fractional (Möbius) transformations
- Contour integrals (piecewise C^1)
- Cauchy theorems (homotopy versions)
- Maximum principle, open mapping theorem
- Fundamental theorem of algebra, argument principle (Rouche)
- Power series
- Singularities, Laurent series
- Residues, residue theorem

References:

Alfhors: *Complex Analysis* (McGraw-Hill)
Hille: *Analytic Function Theory* (Blaisdell Publishing Company)
Conway: *Functions of One Complex Variable* (Springer-Verlag)

Linear Algebra:

- Matrices, matrix operations, determinants
- Systems of linear equations
- Abstract vector spaces, bases and dimension
- Inner product spaces
- Linear transformations, eigenvalues, diagonalization
- Minimal and characteristic polynomials
- Jordan canonical form
- Spectral theorem (finite dimensional version)

References:

Hoffman and Kunze: *Linear Algebra* (Prentice-Hall)
Friedberg, Insel , Spense: *Linear Algebra* (Prentice-Hall)