Modern measurement methods in physics

(PhD entrance exam topics)

1. Instrument components, analogue and digital instruments, properties and types of instruments
2. Processing and evaluation of measurement data. Deterministic and statistical errors, confidence interval, error propagation, regression
3. A/D and D/A conversion, basic analogue signal processing
4. Sampling measurements, sampling theorem. Anti-alias filtering
5. Statistical and spectral analysis of sampled data, DFT, FFT and application of window functions
6. Correlation functions, power density specrtum. Measurement of correlation and spectral density
7. Synchronous modulation-demodulation, chooper technique. Lock-in amplifiers
8. Sensors. Type of sensors, operation principles. Properties and application of sensors

Suggested readings:

W. Bolton:Newnes Instrumentation and Measurement Pocket Book, Newnes; 2001

S.W. Smith, The Scientist & Engineer's Guide to Digital Signal Processing, California Technical Pub.; 1st edition, 1997, http://www.dspguide.com/

W. Kester, The Data Conversion Handbook, Newnes, 2005

Analog Devices: The Data Conversion Handbook
http://www.analog.com/library/analogdialogue/archives/39-06/data_conversion_handbook.html

Measurement Computing, Data Acquisition Handbook
http://www.mccdaq.com/support/data-acquisition-handbook.aspx