NANO 703/703L
Final - Study Guide

The final exam content is cumulative over the semester.
Topics not convered on previous exams are listed below.

Chap. 22: Ampitude Contrast

-Contrast definition

-Mass-thickness contrast

Chap. 23: Phase Contrast

-Weak-phase object approximation; positive/negative phase contrast

-Origin of lattice fringes

-Signatures of phase contrast

Chap. 24: Thickness and Bending Effects

-Column approximation

-Thickness and bending contours

-Absorption in dynamical theory

Chap. 25: Planar Defects

-Twins, stacking faults, antiphase boundaries

-Scattering matrix

-Boundary conditions on electron wave across planar defect

Chap. 28: High-Resolution TEM

-The TEM as a linear system; impulse response (transfer) function $h(u)$

-Contributions to $h(u)$: Aperture function $A(u)$ and phase function $\chi(u)$

-Influence of defocus and spherical aberration on phase

-Contrast transfer function $T(u)$; importance for weak-phase objects

-Scherzer defocus and resolution

-Attenuation (envelope, damping) terms

Chap. 30 & 31: Image Simulation, Processing, Quantification

-Influence and measurement of C_s and Δf

-Multislice method, propagator

Notes: X-Ray Diffraction

-Angles: 2θ, ω

-Sources: characteristic lines

-Powder patterns: Intensity vs. 2θ

-Line shapes: Gaussian, Lorentzian, Pearson-7, Voigt

-Peak doublets: Kα1 and Kα2

-Powder standards: JCPDS, PDF

-Integrated Intensity: structure factor squared, multiplicity, Lorentz-polarization factor

-Broadening: Scherrer equation

Lab 11: TEM Dark-Field Imaging

Lab 12: Scanning TEM and EDX