MSE 6130 Surface Analysis
**Fall 2018**
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Topics:

1. Introduction to the course, course syllabus, online resources, facilities access proposal writing
2. Fundamentals of characteristic absorption and emission processes
    - Photon and electron general properties
    - Electron scattering and mean-free path
    - Photons transmission in solids
        - Absorption coefficients
    - Electrons and photons in solids
    - Electron band structures
    - Electron transitions and core-hole processes
    - Transitions and transition probabilities
    - Relaxation processes
        - Direct photoemission
        - Auger emission
        - Fluorescence emission
3. Diffraction fundamentals
    - Elastic scattering of radiation
    - Structural coherence related to scattering phase shifts
    - Bragg condition (specific case of scattering)
    - General form of phase shift (cubic materials)
    - Structure factor
        - SC-, BCC-, and FCC- lattices
        - Rock salt, diamond and zincblende structure factors as examples
    - Other intensity factors in diffraction
    - Surface Structures
        - Surface diffraction
        - Low Energy Electron Diffraction
4. Techniques using tunable energy X-ray sources
    - X-ray absorption
    - Tunable mean-free path XPS
5. Surface Analysis in practice
    - Sources
    - Detectors
    - Sample preparations
    - Vacuum science