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1. Review of protein and peptide structure (1.5 hours)
 - Secondary structures as a structural biologist looks at them. STRUCTURE = FUNCTION, peptide bonds & Ramachandran plots, complementarity and the α -helix: 4-helix bundle, globin fold, β -sheets, β -bulges, β -turns, antibody fold, Rossmann fold, jellyroll, TIM barrels, etc.
2. Structure determination by protein crystallography (9 hours)
 - Crystal symmetry: What are crystals? Why use crystals?
 - X-ray scattering of a crystal: Bragg's law.
 - Crystal quality & data resolution.
 - What information can be obtained from each determination?
 - The phase problem: Heavy atoms, MAD & molecular replacement.
 - Electron density maps.
 - Data collection & structure fitting.
 - Refinement of protein structures & indicators of 'correctness'.
3. Structure determination by NMR (1.5 hours)
 - Larmor frequency & proton coupling.
 - Comparison of NMR of small molecules and proteins.
 - Fourier Transform methods for data collection.
 - NOE and multi-dimensional NMR.
 - Comparison of X-ray and NMR methods.
4. Concepts of protein folding (3.0 hours)
 - Levinthal paradox & the protein folding problem.
 - Methods to characterize protein folding: UV-Vis; NMR; X-ray scattering, enzyme activity.
 - Isomerization of peptide bonds as a rate-limiting step in protein folding.
 - Disulfide bond formation as a rate-limiting step in protein folding.
 - Cellular strategies: enzymes, chaperones & chaperonins.
 - Simple concepts of proteins folding, including the 'molten globule', nuclear condensation, hydrophobic collapse, etc.
 - Introduction to ΔG -value analysis.
5. Real-world examples (3.0 hours)
 - Literature examples of structure determination and examples of how macromolecular structure determines function.

(1)

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- Grading of multiple choice, short answer and/or essay examination questions.

(2)

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- Midterm – 40%
- Class assignment 10%
- Final examination (2 hours): 50%

Both examinations must be written and the assignment completed in order to avoid receiving an “N” grade.

(3) UVic Grading Scheme

90 -100
85 -

77 - 79

65 - 69

< 50

