

Subject: 200 – Biochemistry

Course: 625 - Coenzymes and Cofactors in Enzymology

Proposed course title:

Reactions of vitamins and minerals (cofactors and coenzymes) in enzymology

Time devoted to individual topics together with the hours of instructor-student instruction and/or discussion:

The course includes 32 lectures of 50 min. Format of the lectures includes Powerpoint presentations by the instructor, white-board drawing sessions led by student groups, in-class collaborative problem sets, and out-of-class problem sets. Two written exams are given. The questions on the exam are queries to propose detailed mechanisms for different classes of cofactors and coenzymes under study, identifications of structure, and short answer descriptions of chemical rationale for various proposals of reaction mechanisms from the published literature.

Learning outcomes:

Learning goals for the undergraduate and graduate levels are included.

Undergraduate-level learning goals: Develop an appreciation of the stereochemical, electronic, and spatial constraints on enzyme reactions; integrate principles from general chemistry, organic chemistry, basic biology and biochemistry into a more detailed understanding of how vitamins and minerals (cofactors and coenzymes) function in living systems; become more fluent in use of the correct terminology when speaking and writing about specific examples from biochemical and organic chemistry background principles.

Graduate-level learning goals: All undergraduate-level learning goals and: obtain an ability to read published literature and evaluate the validity of proposed enzyme mechanisms; obtain an ability to propose experiments that can be used to test specific aspects of a proposed mechanism; prepare concise written descriptions of enzyme active sites and reaction mechanisms.

Representative list of readings:

Each lecture includes a topical review article or primary literature paper that provides context and additional background or specific details. These citations change over time as new publications become available or current state of knowledge advances.

Any other requirements for the course:

Students will learn to use PyMOL (<https://www.pymol.org>) to visualize protein structures, learn about stereochemical and spatial arrangement of enzyme active sites, and as a guide to drawing more accurate representations of enzyme mechanisms. Assistance in software installation (or access to university resources) and instructor-generated instructional scripts will be provided.

How students will be evaluated:

Exams (60%), written outside-of-class homework (25%); in-class collaborative problem sets (10%); preparation for and ability to participate in class discussion (5%).

Letter grades of A, AB, B, BC, C, D and F are assigned as follows:

Letter grades are assigned based on rank-ordering of points achieved in the tasks assigned in the student evaluation rubric. The individual ranking is then correlated and adjusted with achievement of undergraduate- and graduate-specific learning goals as demonstrated by exam performance, out-of-class problem sets, and the combination of in-class collaborative problem solving and overall class participation.