

CBM003 ADD/CHANGE FORM

Undergraduate Council
 New Course Course Change
 Core Category: NONE Effective Fall 2008

or

Graduate/Professional Studies Council
 New Course Course Change
 Effective Fall

1. Department: Biology and Biochemistry College: NSM

2. Person Submitting Form: L. Rapp Telephone: x3-8398

3. Course Information on New/Revised course:

- Instructional Area / Course Number / Long Course Title:
BIOL / 4366 / Molecular Evolution
- Instructional Area / Course Number / Short Course Title (30 characters max.)
BIOL / 4366 / MOLECULAR EVOLUTION
- SCH: 3.00 Level: SR CIP Code: 26.1303.0002 Lect Hrs: 3 Lab Hrs: 0

4. Justification for adding/changing course: Successfully taught as a selected topics course

5. Was the proposed/revised course previously offered as a special topics course? Yes No

If Yes, please complete:

- Instructional Area / Course Number / Long Course Title:
BIOL / 4397 / Molecular Evolution
- Content ID: 295596 Start Date (yyyy3): 20051

6. Authorized Degree Program(s): B.A., B.S. Biology

- Does this course affect major/minor requirements in the College/Department? Yes No
- Does this course affect major/minor requirements in other Colleges/Departments? Yes No
- Are special fees attached to this course? Yes No
- Can the course be repeated for credit? Yes No

7. Grade Option: Letter (A, B, C ...) Instruction Type: lecture ONLY (Note: Lect/Lab info. must match item 3, above.)

8. If this form involves a change to an existing course, please obtain the following information from the course inventory: Instructional Area / Course Number / Long Course Title

 / /

• Start Date (yyyy3): Content I.D.:

9. Proposed Catalog Description: (If there are no prerequisites, type in "none".)

Cr: 3. (3-0). Prerequisites: BIOL/3301. Description (30 words max.): Evolution of molecular entities and the use of molecular data in the reconstruction of evolutionary events at and above the species level.

10. Dean's Signature:  Date: 25 Sept 07

Print/Type Name:



COURSE TITLE/SECTION: BIOL 4366, Molecular Evolution

FACULTY: Dan Graur
E-mail: dgraur@uh.edu

OFFICE HOURS: 4 hours every week, TBA
Phone: 3-7236 FAX: 3-2636

I. Course

A. Catalog Description

Reconstruction of the evolution of taxa through molecular data. The evolution of genomic constituents (e.g., genes, transposable elements, junk DNA). Methodology of molecular evolutionary analysis. Identification of the evolutionary forces operating at the molecular level.

B. Purpose

The main purpose of the course is to acquaint the student with the main areas of molecular evolutionary research, i.e., phylogenetic reconstruction of biological entities, historical reconstruction of evolutionary events, the methodology of molecular evolution, and molecular genomics.

II. Course Objectives

Upon completion of this course, students will be able to:

1. calculate genetic distances
2. calculate degrees of genetic variation
3. reconstruct phylogenetic trees
4. test reliability of phylogenetic trees
5. distinguish among orthology, paralogy, and xenology
6. test molecular clocks
7. compute GC content
8. compute GC skews
9. understand molecular evolutionary concepts
10. understand population genetics

III. Course Content

This course will include the following topical (content) areas:

1. Introduction to Evolutionary Biology
2. What is Molecular Evolution?
3. A Short History of DNA
4. DNA and RNA
5. Proteins and Translation
6. Mutation
7. Dynamics of Genes in Populations
8. Weak Forces of Evolution (Mating, Mutation, Migration)
9. Selection
10. Random Genetic Drift
11. Gene Substitution
12. Genetic Variability
13. Mutationism, Neutralism, Selectionism
14. Evolutionary Change in Nucleotide Sequences
15. Number of Substitutions between two Protein-Coding Genes
16. Alignment of amino-acid and nucleotide sequences
17. CLUSTAL - multiple sequence alignments
18. Rates of nucleotide substitutions
19. Positive Darwinian Selection
20. Male Driven Evolution
21. Patterns of Nucleotide Substitution
22. Codon Usage
23. Iconography of Evolution
24. Clocks
25. Introduction to Phylogenetics
26. Phylogenetic Terminology
27. Methods of Phylogenetic Reconstruction
28. Processing and Testing of Phylogenetic Trees
29. Human Phylogeny
30. Cetacean Phylogeny
31. Molecular Archeology
32. Early Divergence Events
33. Segmental & Contextual Changes
34. Post-duplication Evolutionary Processes
35. Exon Shuffling
36. Concerted Evolution
37. Transposable Elements
38. SINEs and LINEs
39. Horizontal Gene Transfer
40. Genome Size
41. Prokaryotic Genomes

42. The C-Value Paradox
43. Gene Geography
44. GC Content
45. Evolution of genetic codes

IV. Course Structure

Frontal lectures, discussions, obligatory reading, optional reading

V. Textbooks

Required:

Fundamentals of Molecular Evolution by Dan Graur and Wen-Hsiung Li (Paperback, Jan 15, 2000)

Recommended:

Molecular Evolution and Phylogenetics by Masatoshi Nei and Sudhir Kumar (Paperback - Aug 15, 2000)

Molecular Evolution: A Phylogenic Approach by Roderic D. Page and Edward C. Holmes (Paperback - Nov 1, 1998)

VI Course Requirements

A. Reading Assignments

Textbook, 1 or 2 new articles from general journals such as Nature, Science, PNAS,

B. Written Assignments

Bonus points for literature survey on diverse subjects determined in consultation between student and lecturer

C. Projects (as needed)

D. Exams (as needed)

A final exam + 2 midterm exams

VII Grading Policies

Point Structure

2 Midterm Exams (100 pts. Each)	200 pts.
Final Exam	<u>100 pts.</u>
Maximum Totals (Undergraduate Students)	300 pts.

The total points earned at the end of the semester will be converted to a percentage and letter grades assigned according to the following grading scale:

A: 92 - 100%	A-: 90 - 91.9%	B+: 88-89.9%	B: 82 - 87.9%	B-: 80 - 81.9%
C+: 78-79.9%	C: 72 - 77.9%	C-: 70 - 71.9%	D+: 68-69.9%	D: 62 - 67.9%
D-: 60 - 61.9%	F: <60%			

Policy on grades of I (Incomplete): A temporary grade of "I" can be assigned by the instructor when a student is currently (a) passing a course or (b) still has a reasonable chance of passing in the judgment of the instructor, but for *non-academic* reasons beyond their control have not completed a *relatively small* part of all requirements. After the student and instructor agree that the student shall receive an "I" grade, an "Incomplete Grade Agreement" form *must* be completed and filed with the Office of Undergraduate Affairs (124f Science Building). It is the student's responsibility to see to it that this form is filled out and delivered. Further information on "I" grades can be found at <http://www.uh.edu/dos/hdbk>.

Students with Disabilities: Whenever possible, and in accordance with 504/ADA guidelines, the University of Houston will attempt to provide reasonable academic accommodations to students who request and require them. Please call 713-743-5400 for more assistance.

VIII. Bibliography

Articles in specialized journals: Molecular Biology and Evolution, Journal of Molecular Evolution, Molecular Phylogenetics and Evolution,

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