MCB6937 Syllabus Outline for spring 2023

**Please do not use the Canvas** **Grade Book** to determine your final grade in the course. Use the **Syllabus** or the **Final Grade Calculator** to see how you are doing.

**Exam dates**: All exams will be open for multiple days. This course is "information-dense," as they say, so you must spend some time each day keeping up. A survey of students in this course last semester indicated that the average time spent studying per week was from 4-6 hr.

**1-Exams** (92.0% of grade)

Spring 2023 Exam Calendar:

**Exam 1 Jan 28-Feb 1**  (7 hr of material)       (17.3% of final grade)

**Exam 2 Feb 25-Mar 1** (11 hr of material)  (24.9% of final grade)

**Exam 3 Apr 1-5**  (13 hr of material)    (24.9% of final grade)

**Exam 4 Apr 29-May 2** (12 hr of material) (24.9% of final grade)

**Optional re-take Final: May 3-5**(a chance to re-take your lowest exam. Only your highest score will be used.)

(Total from Exams + 92.0%)

**2-Homework Quizzes** (3.5% of grade)

**3-Gene Structure/Bioinformatics** Parts [1](https://ufl.instructure.com/courses/383298/assignments/3974406), [2](https://ufl.instructure.com/courses/383298/assignments/3974407), & [3](https://ufl.instructure.com/courses/383298/assignments/3974408) (4.0% of grade)

Due dates:

**Part-1**& (Part 1B optional)**Mar 9**

**Part-2   Mar 29**

**Part-3   Apr 6**

**4-Graduate Presentation: PowerPoint slides: Apr 27**(2.0%)

**5-Genome Engineering 2022 all parts:** **Apr 27**(2.0%; optional extra credit)

**6-COVID-19 extra credit** **Apr 27**(1% optional extra credit)

**MCB6937 Spring 2023 Calendar of Events**



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| **Grading Scale Numerical Equivalents** |
| **A** = 91 or above | **C**= 68-73.99(minimum needed for major) |
| **A-** = 89-90.99 | **C-**= 65-67.99 |
| **B+** = 85-88.99 | **D+** = 62-64.99 |
| **B** = 81-84.99 | **D** = 58-61.99 |
| B- = 79-80.99 | **D-** = 54-57.99 |
| **C+** = 74-78.99 | **E**= 0-53.99 |

Course Topic Outline

**Module 1**

**Early man:** genetic limits to cultural development, basic assumptions of biology challenged (organism, species, multicellular life, genomic endosymbiosis).

**DNA replication:** Bacterial: chromosomal, plasmids, conjugation, rolling circle, linear DNAs, Adenovirus, PhiX174 phage, bacterial cell cycle, ColE1 origin, oriC, plasmid incompatibility groups, Agrobacterium pTi system and vectors.

**Bacterial Cell Cycle**

**Module 2**

**Mitochondrial DNA replication:** heavy and light strand replication, D-loop formation and priming, and transcription

**Enzymes involved in DNA replication:**

Bacterial DNA polymerases III, I, IV, and V, Eukaryotic DNA polymerases delta, epsilon, alpha & gamma. Leading & lagging strand synthesis, clamp, clamp loaders.

**Recombination**: five types of recombination in bacterial and eukaryotes, allelic conversion, RecA, activation of RecA, SOS repair system, LexA, RecABC, and RuvABC, Chi sites, synaptonemal complexes, Holliday structures, SP11

**Transposons:**

**DNA transposons-**replicative and Nonreplicative transposition mechanisms, eukaryotic-Ac/DS (maize), and P-elements (Drosophila)

**Retrotransposons-**LTR retrotransposons, Non-LTR, retrovirus replication, SINES, and MITES

**Module 3**

**DNA Repair:**

**Bacterial\_**nucleotide excision,UvrABCD, base excision, glycosylases, lyases, mismatch repair, MutL, MutS, MutH, error prone systems, long & short patch repair, 8-oxy-G, Mfd.

**Eukaryotic**\_global systems, transcription linked, TFIIH, XPB, XPD, XPC, Msh2, Msh3, Msh6, APE1, short & long patch.

**Bacterial Transcription:** RNA polymerase subunits and mechanisms, promoter recognition, Sigma70, Sigma-S, Sigma54, details of sigma domain functions (1.1, 2.3, 2.4, 3.2, 4.2), alpha subunit CTD, hairpin-helix-hairpin & helix-turn-helix DNA binding domains, abortive cycling. Termination: intrinsic and Rho-dependent terminators.

**Operons**: Lac, Ara, GalP1, Tryptophan, attenuation, negative regulation, positive regulation, catabolite repression, CAP dependent operons, Lac repressor and CAP structure and function, Rho terminators and polarity mutants

**Module 4**

**Chromatin:** Histones (H3, 4, 2A, 2B, H3.3) archaeal origins, nucleosome structure, nucleosome assembly\_Caf1, Asf1, FACT, N1, Nucleoplasmin, models for chromatin organization, +1 nucleosome, histone tails, centromeres, kinetochore, puffs, beads on a string, TRF2, Lampbrush, polytene, euchromatin, heterochromatin, bacterial packaging proteins, Telomeres\_Telomerase, G=quartet, SIR3/Sir4, T-loops.

**Eukaryotic Transcription**: promoters, basal factors, TBP, TAFs, SAGA, PCAF, CpG islands, TFIIB (details of structural domains), TFIIH, TFIIF, TFIIE, Mediator, TFIID & SAGA (details of function), transactivators, enhancers, steroid receptors-mechanism, estrogen receptor, thyroid receptor, glucocorticoid receptor, repressors (plant and animal), leu zippers, amphipathic helices, DNA binding domains, building the preinitiation complex, brief epigenetics, chromatin remodelers.