OFFICIAL UNDERGRADUATE COURSE OUTLINE (page 1)

COURSE IMPLEMENTATION DATE:	June 1994
COURSE REVISED IMPLEMENTATION DATE:	May 2014
COURSE TO BE REVIEWED:	May 2020
(six years after UEC approval)	*(month, year)*

OFFICIAL UNDERGRADUATE COURSE OUTLINE INFORMATION

Students are advised to keep course outlines in personal files for future use.

Shaded headings are subject to change at the discretion of the department – see course syllabus available from instructor

BIO 202	Biology	4
COURSE NAME/NUMBER	FACULTY/DEPARTMENT	UFV CREDITS

Cellular Signaling and Regulation of Gene Expression
COURSE DESCRIPTIVE TITLE

CALENDAR DESCRIPTION:

This course focuses on signal transduction in cells. Topics covered include electrical and chemical signalling in cells, DNA structure and organization of the eukaryotic genome, DNA replication, the cell cycle and cancer, biotechnology and genetic engineering, gene expression, transcription and translation mechanisms, and control of gene expression.

PREREQUISITES: BIO 201. Note: As of May 2015, prerequisites will change to the following: BIO 112 and CHEM 114.

COREQUISITES:

PRE or COREQUISITES:

SYNONYMOUS COURSE(S):

(a) Replaces:

(b) Cross-listed with:

(c) Cannot take: for further credit.

SERVICE COURSE TO: *(department/program)*

TOTAL HOURS PER TERM: **90**

STRUCTURE OF HOURS:

Lectures:	**45**	Hrs
Seminar:	**25**	Hrs
Laboratory:	**20**	Hrs
Field experience:		Hrs
Student directed learning:		Hrs
Other (specify):		Hrs

TRAINING DAY-BASED INSTRUCTION:

Length of course:

Hours per day:

OTHER:

Maximum enrolment: **24**

Expected frequency of course offerings: Yearly

(every semester, annually, every other year, etc.)

WILL TRANSFER CREDIT BE REQUESTED? (lower-level courses only)	☒ Yes	☐ No
WILL TRANSFER CREDIT BE REQUESTED? (upper-level requested by department)	☐ Yes	☐ No
TRANSFER CREDIT EXISTS IN BCCAT TRANSFER GUIDE:	☒ Yes	☐ No

Course designer(s):	**Tony Stea**		
Department Head:	**Allan Arndt**	Date approved:	**June 4, 2013**
Campus-Wide Consultation (CWC)		Date of meeting:	**June 14, 2013**
Curriculum Committee chair:	**David Fenske**	Date approved:	**September 20, 2013**
Dean/Associate VP:	**Lucy Lee**	Date approved:	**September 20, 2013**
Undergraduate Education Committee (UEC) approval		Date of meeting:	**October 25, 2013**

LEARNING OUTCOMES:

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

1. Describe the main steps in signal transduction in cells.
2. Explain how electrical and chemical signals are essential for nervous system signalling.
3. Discuss the organization of the genome of cells.
4. Describe how DNA replication works in prokaryotic and eukaryotic cells.
5. Explain the cell cycle and the role of mitosis.
6. Describe the role of biotechnology and genetic engineering in society.
7. Describe how transcription and translation processes work in eukaryotic cells.
8. Discuss the mechanisms of control of gene expression.

METHODS: *(Guest lecturers, presentations, online instruction, field trips, etc.)*

Lecture, demonstration, small group practice, discussion, A/V materials, use of models, charts, and lab exercises.

METHODS OF OBTAINING PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):

☒ Examination(s) ☒ Portfolio assessment ☒ Interview(s)

☒ Other (specify): Additional assignments

☐ PLAR cannot be awarded for this course for the following reason(s):

TEXTBOOKS, REFERENCES, MATERIALS:

[Textbook selection varies by instructor. An example of texts for this course might be:]

Becker, W.M., L. J. Kleinsmith, J. Hardin, and G.P. Bertoni. The World of the Cell. 7th ed. San Francisco: Benjamin Cummings, 2009.

SUPPLIES / MATERIALS:

STUDENT EVALUATION:

[An example of student evaluation for this course might be:]

Midterm lecture exam:	25%
Final lecture exam:	45%
Quizzes:	5%
Lab reports:	10%
Oral presentation:	15%

COURSE CONTENT:

[Course content varies by instructor. An example of course content might be:]

1) Cell Signaling and Signal Transduction:
- electrical properties of cells and nervous system signaling
- chemical signals, cellular receptors, novel messenger molecules
- signal transduction pathways stimulating gene expression

2) Structural Basis of Cellular Information:
- DNA structure, genome organization, DNA packaging.

Course Content continued:

3) DNA Replication and Cell Division:
- DNA replication, DNA damage and repair, cell cycle, cancer.

4) Biotechnology and Genetic engineering:
- Gene cloning, genetic engineering, gene therapy.

5) Gene Expression:
- genetic code, transcription, RNA processing, translation, protein targeting.

6) Control of Gene Expression:
- prokaryotes *vs.* eukaryotes, transcriptional *vs.* posttranscriptional control.

LABORATORY EXPERIMENTS:
In the lab/seminar component of the course students work on complex lab exercises for five to six weeks. The remaining time is used for student presentation of research projects. For the research projects, students work in pairs or individually and must choose a research paper dealing with any topic related to cell biology. The majority choose papers from Science, Nature or Cell due to our current library holdings. The choice of paper must be approved by the instructor. Students must acquire a good basic understanding of the paper including the techniques described in the paper. The students then present the paper to the class. They are graded on the level of understanding demonstrated during the presentation as well as during a brief discussion with the instructor and class immediately following their presentation. The primary objective of this activity is to teach the students how to read the literature. A secondary objective is to expose students to the application of experimental techniques which cannot actually be performed or demonstrated in our teaching labs.

Lab exercises include:
Lab 1: PCR analysis and sequence comparisons of human mitochondrial DNA.
Students will isolate their own mitochondrial DNA from cheek cells and amplify a specific region using the Polymerase Chain Reaction (PCR). Samples will be run on a DNA electrophoresis gel and then later sequenced. Sequences will be compared to a number of other sequences in a human mtDNA database.

Lab 2: Control of gene expression in Eukaryotes.
Insects (meal worms) are exposed to heat shock conditions. Blood and tissue samples are assayed using Western blotting with an hsp70 antibody to observe aspects of the expression of hsp70 gene.

Lab 3: Gene regulation in transgenic bacteria.
Students create transgenic bacteria by inserting a jellyfish gene which glows when active. The students then determine the presence or absence of the gene and the environmental factors which can influence activity of this transgene.

SUPPORTING LAB EQUIPMENT AVAILABLE:
In-house manual presently in use as is all necessary equipment.