INTER AMERICAN UNIVERSITY OF PUERTO RICO
RECINTO METRO CAMPUS
SCIENCE AND TECHNOLOGY FACULTY
Department of Natural Sciences

SYLLABUS

I. GENERAL INFORMATION

Course Title	: **Skills Laboratory II**
Code and number	: BIOL 2013
Credits	: One (1)
Academic Term	:
Professor	:
Office Hours	:
Office Telephone	:
Email	:

II. DESCRIPTION:

Application of laboratory techniques used for the qualitative and quantitative analysis of living organisms with emphasis on cells and biological macro-molecules. Use of statistical methods for the analysis and interpretation of generated data. Students are required to submit laboratory reports following established scientific formats. Requires 45 hours of lab. Prerequisites: BIOL 1103, CHEM 1111

III. OBJECTIVES:

At the end of the course it is expected that the student can:

1. Manipulate prokaryotic cells.
2. Apply the conversion factors between units of volume, especially between milliliters and microliters.
3. Apply conversion factors between units of mass such as milligrams and micrograms or nanograms.
4. Use basic concepts of statistics, such as average, standard deviation and standard error of the mean, as they are applied to the management of volume data.
5. Isolate genomic DNA (gDNA), DNA plasmid and proteins.
6. Distinguish between genomic DNA, plasmid DNA and complementary DNA (cDNA).
7. Use the genebank to identify sequences of unknown diagnostics, plants, parasites and bacteria.
8. Define the concepts enzyme active site, activity and specificity. Explain the characteristics and function of the active site of enzymes in relation to its activity and specificity.

9. Explain the characteristics and function of the active site of enzymes in relation to its activity and specificity. Graphically describe the effect of temperature, concentration of reagents and pH on enzyme activity.
10. Determine experimentally the effects of various factors, such as temperature, concentration of reagents and pH on enzyme activity.
11. Distinguish between the concepts of concentration and quantity.
12. Explain the importance of the determination of the concentration of protein in a solution.
13. Compare methods of quantification of proteins based on their specificity and sensitivity.
14. Explain the chemical basis of five (5) methods used in the quantification of proteins.
15. Select cells suitable for spectrophotometric studies depending on the type of light used.
16. Explain the relationship between absorbance and concentration.
17. Properly use a spectrophotometer to determine the concentration of a series of unknown protein concentrations.
18. Define the terms plasmid, phage, vector, cloning, genomic DNA, plasmid DNA and other terms related to the techniques of DNA recombinant.
19. Compare between different cloning vectors.
20. Determine the effect of pH on the efficiency of isolation of plasmids.
21. Calculate the concentration and amount of DNA isolated in a given experiment.
22. Explain the physical principle of electrophoresis.
23. Distinguish between electrophoresis of proteins and nucleic acids.
24. Explain the usefulness of the following components in a system of electrophoresis: gel buffer, running buffer, casting gel, ethidium bromide, *gel loading buffer*, *casting tray*, *DNA ladders*, gel loading dyes.
25. Predict the number and size of bands of DNA that will be generated from the treatment with restriction enzymes.

IV. COMPETENCIES OF THE PROFILE OF GRADUATES THAT ARE ADDRESSED IN THIS COURSE

1. Students will communicate effectively in writing.
2. Students will develop the skills of handling equipment and materials for application of laboratory techniques for analysis and interpretation of data generated.
3. Students will explain fundamental concepts of biology

V. CONTENT

A. Use of micropipettes and solutions preparation
B. Extraction and spectroscopy of gDNA
C. DNA plasmid mini prep and DNA electrophoresis in agarose
D. chromatograph: protein purification
E. Spectrophotometry: protein quantification
F. Determination of enzyme activity
G. Bioinformatics: the use of BLAST

VI. COURSE RULES AND REGULATIONS

A. Lab attendance is mandatory. If the student is absent to a laboratory session, you can not make it up, because of the complexity in the preparation thereof.
B. **The use of cell phones or beepers will not be allowed during the lab**.
C. Safety rules that appear in the Laboratory Manual in the section safety rules be observed.
D. To carry out the notes of laboratory exercises, you will use a laboratory notebook that you will always bring. The notebook should have a table of content where I will sign. In every laboratory exercise, you should write the title of the laboratory, the objectives and procedure as a flow chart. DO NOT WRITE quantities in the flow chart, just the minimal amount of words in such a way that you will remember it always. It should be done before each exercise laboratory. It will be written only in ink. Laboratory reports must be delivered the following week of having carried out the laboratory exercise. Reports from laboratories will be in groups. Individual reports, will not be accepted unless it is established by the professor in charge of the course.
E. Laboratory reports must be delivered following the format that appears in the section "How to Prepare and Submit a Laboratory Report". All papers and lab reports must be drafted according to the header that appears in Appendix I of the Laboratory Manual. They must written be using a word (on computer) processor, using uppercase and lowercase, letter 11 or 12 and correcting grammar. Written works are not accepted in pencil. All delivered work must be legible, be clean and organized.

VII. EVALUATION

A. Assessment instruments

	Points	Weight (value)
Laboratory Reports (5)	600	60%
Attendance/notebook	100	20%
Test 1 Ej 1-Ej 4	100	10%
Test 2 Ej 5- 9	100	10%
Total	1000	100%

Lab reports using the model how to prepare and submit a laboratory report (long report)

	(weight)
1. Ej. 1 Micropipettes and biochemical calculations	0
2. Ej. 2 Micropropagation	100 (8.57)
3. Ej.2 Genomic DNA isolation (gDNA) from Eucariotic cells	100 (8.57%)
4. Ej 3. DNA plasmid mini prep (comercial) and DNA electrophoresis	200 (17.14%)
5. Protein purification and cuantification	200 (17.14%)
6. Bioinformatics	100 (8.57%)
7. Enzyme Kinetics (no reports, but it is in the test)	
Total	700

B. Curve:

90-100%	A
80-89	B
70-79	C
60-69	D
Less than 60	F

VIII. SPECIAL NOTES

1. *Ancillary Services or Special Needs*

Students who require special assistance or ancillary services shall request them at the beginning of the term or as soon as s/he acquires knowledge of the need, through the corresponding record in the Office of the professional counselor, Mr. José Rodríguez, located in the University orientation (Office 111) program.

2. Dishonesty, fraud and plagiarism

Dishonesty, fraud, plagiarism and any other inappropriate behavior with regard to academic work constitute breaches older sanctioned by the General rules of students. Violations as dictated in the General Regulation of students may result in suspension from the University for one defined time of one year or permanent expulsion from the University, among other sanctions.

3. Use of electronic devices

You should turn off cell phones and other electronic devices that could disrupt the processes of teaching and learning or alter the environment conducive to academic excellence. Pressing situations will be addressed, as appropriate. The University prohibits handling electronic devices that allow access, store or send data during evaluations or tests.

IX. RECURSOS EDUCATIVOS

Texto

Medina FR, González LI, Oquendo CA, Tosado R, and Miranda MT. 2016. Activitites for Skill Laboratory II. Inter American University of Puerto Rico. San Juan, PR.

Additional Readings

Alberts B, Johnson A, Lewis J, Raff M, Roberts K and Walter P. 2014. *Molecular Biology of the Cell.* 6th edition. Garland Science. New York & London.

Ausubel FM et al. 1988. *Current Protocols in Molecular Biology*. 5th ed. Vols I & II. John Wiley & Sons. New York, NY.

Ausubel FM, Brent R, Kingston R, Moore DD, Seidman JG, Smith JA, Struhl K. 2002. *Short Protocols in Molecular Biology*. 5th Ed. John Wiley & Sons, New York, NY.

DNA Learning Center. Cycle sequencing. http://www.dnalc.org/ddnalc/resources/cycseq.html

Elgin SCR. 2005. Genomics in Education. www.nslc.wustl.edu/elgin/genomics/

Kranz R, Weston-Hafer K, Richards E, Bednarski A, Cruz W & Elgin S. C.R.2006. Identifying unknown bacteria using biochemical and molecular methods. http://www.nslc.wustl.edu/elgin/genomics/bio3055/idunknbacteria06.pdf

Micklos DA and Fryer G. 1990. *DNA Science: A First Course in Recombinant DNA Technology.* Carolina Biological Supply & Cold Spring Harbor Laboratory Press. Cold Spring Harbor, NY

Mullis K. 1993. Nobel Lecture - *Nobelprize*.org http://www.nobelprize.org/nobel_prizes/chemistry/laureates/1993/mullis-lecture.html

Neumann KH, Kumar A. 2009. *Plant Cell and Tissue Culture- A tool in Biotechnology*. Springer Verlag, Berlin.

Razdan KM. 2002. *Introduction to Plant Tissue Culture*. 2nd Edition. Science Publishers, Inc. Enfield, New Hampshire.

Sambrook J. & Russell DW. 2001. *Molecular Cloning: A Laboratory Manual.* Third Edition. Cold Spring Harbor Laboratory Press. Cold Spring Harbor, NY.

Sabu P. 2011. *Clinical sequencing's first steps*. http://www.biotechniques.com/news/Clinical-sequencings-first-steps/biotechniques-312982.html

Seidman LA y Moore CJ. 1999. *Basic Laboratory Methods for Biotechnology: Textbook and Laboratory Reference*. Prentice Hall. Upper Saddle River, Nueva Jersey.

The Innocence Project. www.innocenceproject.org

Resources in Internet

1. DNA lab part II. UTUBE. http://www.youtube.com/watch?v=iyb7fwduuGM&feature=fvw accedido 6 de noviembre 2009.
2. Micropipetting https://www.youtube.com/watch?v=FE676kkvH-g
3. Micropipetting - https://www.youtube.com/watch?v=uEy_NGDfo_8

4. Micropropagación https://www.youtube.com/watch?v=_Fl_WBRr7Xc
5. Micropropagación – cultivo de semillas de campo. https://www.youtube.com/watch?v=AbSXUPF8Dcs
6. Preparación de medios de cultivo para micropropagación vegetalhttps://www.youtube.com/watch?v=pdSrwfWfPCw
7. https://www.youtube.com/watch?v=aDt42aF5PkE Técniicas de Fertilizacion y Reproduccion Vegetal In Vitro https://www.youtube.com/watch?v=aDt42aF5PkE
8. . Cultivo de células vegetales – en UTUBE http://www.bing.com/videos/search?q=plant+tissue+culture+youtube&FORM=VDRE
9. You can find several videos on the Internet about how to make gelatin to run the DNA, DNA plasmid mini prep, etc.

10. Amrita University. 2010. Agarose Gel Electrophoresis. http://www.youtube.com/watch?v=6mQGNDnOyH8
11. Benchfly. How to perform Colony PCR. http://www.youtube.com/watch?v=h0yRrDWtdA4
12. GE Healthcare Lifesciences. Principles of Hydrophobic interaction chromatography http://www.youtube.com/watch?v=v6SPK6ZovgA

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