

1. Module identification code.	
Name of the institution:	Universidad Autónoma de Nuevo León
Name of the school:	School of Medicine
Name of the degree program:	Clinical Chemistry
Name of the course (learning unit):	Biostatistics
Total number of class hours-theory and practice:	40
Class hours per week:	2 hours
Independent study:	20
Course modality:	Face-to-face instruction
Module level:	Second semester
Core/elective module:	Core
Curriculum area:	ACFB
UANL credit points:	2
Create date:	September 18 th , 2017
Date of last amendment made:	January 19 th , 2022
Person(s) responsible for the design and amendment of the module:	M. A. Engineer Angel Enrique Alcorta Garza

2. Presentation:

This learning unit is developed in two phases:

The first contemplates describing the main descriptive statistical techniques, to present the grouped data and identify the possible advanced methods in the solution of problems in the biochemical field.

In the second phase, the techniques of inferential statistics, database analysis, are described to contrast the results that support the solution of problems in the biochemical field, until concluding the integrating product of learning which consists of developing a proposal to the solution of a case posed, where information and statistical technologies are applied.

3. Purpose:

The purpose of the learning unit is to train the student in the use of statistical techniques, which will serve them to solve problems applied in the validation of analytical methods in the biochemical field.

During the learning unit, the student will develop skills in the management of descriptive and inferential statistics, through logical, critical and creative thinking to analyze natural and social phenomena, which will allow them to form pertinent decisions in their field of influenza and social responsibility by generating reports, written evidence in electronic format and solving problems. They will practice the values promoted by the University before their classmates and professors, with truth, honesty and respect for life, when developing their activities, when working in a team with a positive attitude, even in the professional field.

Regarding specific competencies, the student makes use of statistical techniques, which allow him to incorporate new methodologies for the laboratory, guaranteeing reliability of analytical results, applying quality control guidelines.

The learning unit facilitates the solution of statistical problems, applying descriptive and inferential methods; is located in the second semester of the Clinical Chemist curriculum, it is related to most of the learning is of the curriculum, for example, Analytical Chemistry and Instrumental Analysis, applying statistical techniques to perform data analysis around problems in the biochemical field.

4. Competences of the graduate profile

General competences to which this module (learning unit) contributes:

Instrumental skills:

3. To manage Digital Information, Communication, Knowledge and Learning Technologies (TICCAD), in academic, personal and professional environments with cutting-edge techniques that allow their constructive and collaborative participation in society.

Personal and social interaction skills:

11. To practice the values promoted by the UANL: truth, equity, honesty, freedom, solidarity, respect for life and others, peace, respect for nature, integrity, ethical behavior and justice, in their personal and professional environment to contribute to building a sustainable society

Integrative skills:

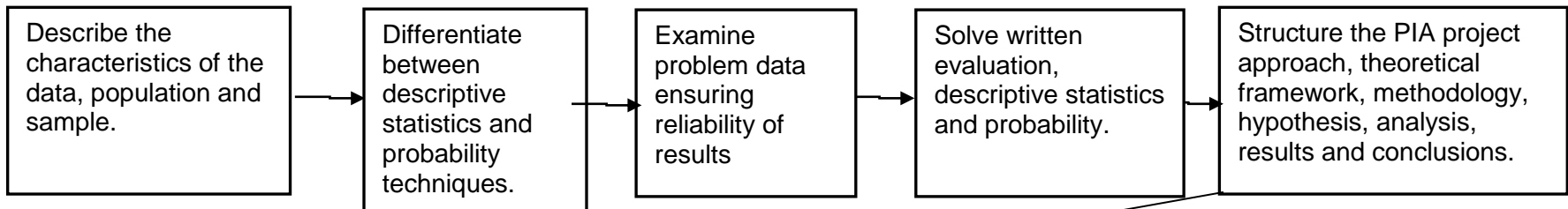
15. To achieve the adaptability required by the uncertain social and professional environments of our time to create better living conditions.

Specific competences of the graduate profile to which this module (learning unit) contributes:

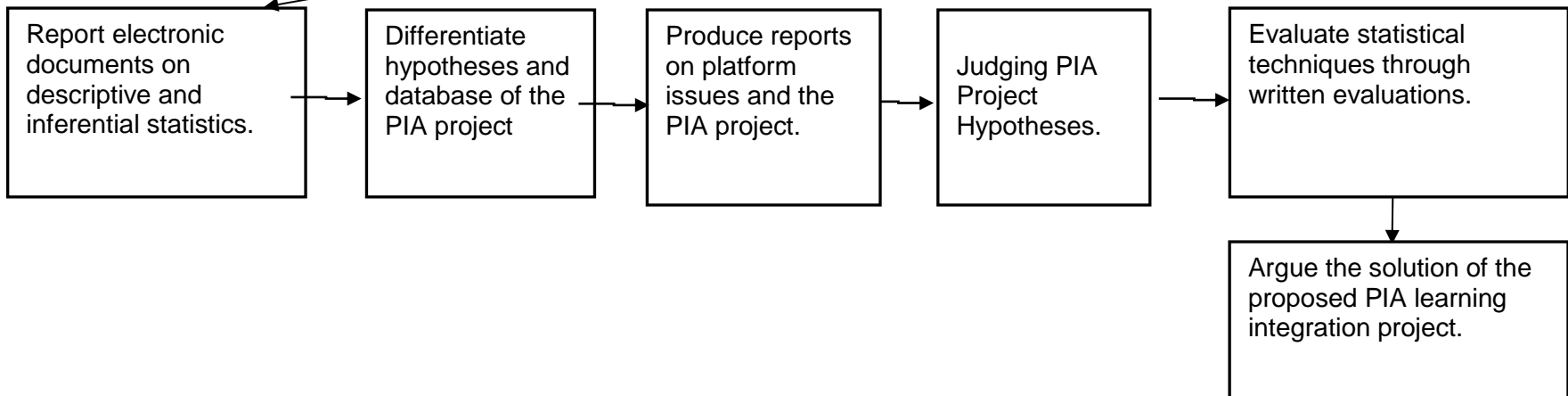
4. To validate bioanalytical methods under established performance criteria that allow reliability of the results obtained in chemical-biological samples.

5. Course roadmap:

Phase 1.



Phase 2.



6. Structuring into stages or phases:

Stage 1: Descriptive Statistics and Probability Techniques.

Component(s) of the competence: Produce electronic documents and presentations, through the appropriate use of the main statistical techniques and probability, population, sample size, mean, variance, frequency tables, median, mode, histogram, to integrate the solution of validation problems of analytical methods in the biochemical field

Evidence of student learning	Performance criteria	Learning activities	Content	Resources
Electronic documents of Introduction to Statistics and Descriptive Statistics.	<p>The document must be at least one page long for writings and 10 slides for electronic presentations, and evidence must be uploaded to the platform.</p> <p>The documents to be submitted will be:</p> <ul style="list-style-type: none"> • Essay in Word format on introduction to statistics. • Descriptive statistics PowerPoint presentation. • Documents in Ms-Excel solving platform problems. 	<p>The teacher carries out in a face-to-face session, the framing of the learning unit, clarifying all the doubts of the students.</p> <p>Accredited activity 1</p> <p>The student makes an essay of the Introduction to Statistics, which will be delivered on the Moodle platform, on the established date and in the format indicated by the teacher, for later discussion in class. Fits the checklist.</p> <p>The student reviews the introductory concepts to statistics presented by the teacher. (MedlinePlus, 2020)</p> <p>Accredited activity 2</p> <p>The student will produce a presentation of Descriptive Statistics, which must be uploaded to the Moodle platform, according to the date and format established by the teacher, according to the checklist.</p>	<p>Concepts of introduction to statistics:</p> <ul style="list-style-type: none"> • Statistics, data, data source, population, sample, census, sampling. <p>-Concepts of descriptive statistics:</p> <ul style="list-style-type: none"> • Arrangement • Frequency tables • Histogram • Frequency Polygon • Medium, Medium, Fashion • Variance, standard deviation, coefficient of variation. 	<p>Chapters 1 and 2 of the textbook (Daniel, 2008)</p> <p>Moodle School of Medicine Platform and Ms-Teams.</p> <p>Microsoft Office 2010 or later.</p>

		<p>Accredited activity 3</p> <p>The student will solve sampling problems and descriptive statistics, adjusting to the checklist provided by the teacher and deliver it as an electronic document on the Moodle platform in the established time.</p> <p>Accredited activity 4.</p> <p>Students structure the PIA by applying statistical concepts, according to the teacher's instructions and following the corresponding checklist.</p> <p>The students will shape the PIA project, elaborating it in Ms Word with the 9 sections listed below, they will develop in this activity only the statements from 1 to 5:</p> <ol style="list-style-type: none"> 1) Cover (2) Theoretical framework (3) Hypothesis. (4) Population and sample. (5) Databases. (6) Data analysis. (7) Results. (8) Conclusions. (9) Sources of information. 		
--	--	---	--	--

Evidence of student learning	Performance criteria	Learning activities	Content	Resources
<p>Evidence 1.</p> <p>First written evaluation, on introduction to statistics, sampling and descriptive statistics.</p>	<p>The contents to be included must be an introduction to statistics, sampling and descriptive statistics.</p> <p>The evaluation is individual, written and/or through the Ms Moodle platform, with a maximum time of 90 minutes.</p> <p>The document to be submitted must be electronic or manual and will contain 10 Questions and 3 problems.</p>	<p>The teacher will administer the first written assessment physically or through the Moodle platform.</p> <p>The student will solve the evaluation, in person and/or will deliver it through the Moodle platform, in a timely manner according to the teacher's instructions.</p>	<p>-Concepts of introduction to statistics: Statistics, data, data source, population, sample, census, sampling.</p> <p>-Descriptive statistics: arrangement, tables, mean, histogram, polygon, median, mode, variance, standard deviation, coefficients.</p>	<p>Chapters 1 and 2 of the textbook (Daniel, 2008)</p> <p>Moodle School of Medicine Platform and Ms-Teams.</p> <p>Calculator.</p>
<p>Electronic documents and statistical problems, related to Probability and Probability Distributions.</p>	<p>The contents must be electronic, with a minimum size of one page, unpublished, arial font 11.</p> <p>The documents to be submitted will be:</p> <ul style="list-style-type: none"> • MS-Word essay on probability distributions. • MS-Excel document solving problems proposed 	<p>Through an electronic presentation, the teacher exposes the concepts of probability. Encourage students to discuss the topic.</p> <p>Accredited activity 5.</p> <p>The student will produce an essay of chapters 3, 4, probability and probability distributions, develop it individually according to the checklist provided by the teacher, prepare it as an electronic document and upload it to the</p>	<p>-Concepts of probability and probability distributions:</p> <ul style="list-style-type: none"> • Probability, properties, rule. • Probability distribution, classification, binomial, poisson, normal. 	<p>Chapters 3 and 4 of the textbook (Daniel, 2008)</p> <p>Moodle School of Medicine Platform and Ms-Teams.</p> <p>Microsoft Office 2010 or later.</p>

	on the Moodle platform.	<p>Moodle platform in the established time.</p> <p>Accredited activity 6.</p> <p>The student will individually solve a problem of probability and probability distributions in Excel, which they will upload to Moodle and check against a checklist</p>		
<p>Evidence 2.</p> <p>Second written evaluation, on Probability and Probability Distributions.</p>	<p>The contents must be of Probability and Probability Distribution</p> <p>The evaluation is individual, written and/or through the Ms Moodle platform, with a maximum time of 90 minutes.</p> <p>The document must be electronic and will contain 10 Questions and 3 problems: Binomial, Normal and Poisson.</p>	<p>The teacher will administer the second written assessment (SEE) physically or through the Moodle platform.</p> <p>The student will solve the evaluation, in person and/or will deliver it through the Moodle platform, in a timely manner according to the teacher's instructions.</p>	<p>-Concepts of probability and probability distribution:</p> <ul style="list-style-type: none"> • Probability, properties, rules. • Probability distribution: Binomial, Poisson, Normal. 	<p>Chapters 3 and 4 of the textbook (Daniel, 2008)</p> <p>Moodle School of Medicine Platform and Ms-Teams.</p> <p>Calculator</p>

Stage 2: Inferential Statistics Techniques.

Component(s) of the competence:

Evaluate statistical techniques, through the use of manual procedures and computational tools, for the study of problems in the biochemical field.

Evidence of student learning	Performance criteria	Learning activities	Content	Resources
Electronic documents and problems on Statistical Inference techniques.	<p>The contents must be developed in PowerPoint and Excel, minimum size of 10 slides for the presentation.</p> <p>The Problem Books must be solved in an Excel workbook, configuring a sheet for each Weightable Activity, applying the functions and formulas for each topic, and the weightable activities must be uploaded in a timely manner to the Moodle platform.</p> <p>The documents to be submitted will be prepared individually and will be:</p> <ul style="list-style-type: none"> • Presentation of their authorship, with main concepts of the chapters described. • Excel document solving four problems from chapters 6, 7, 9 and 12. 	<p>Accredited activity 7.</p> <p>The student makes a presentation contemplating the contents of chapters 6, 7, 9 and 12, develops it individually adjusting to the checklist provided by the teacher, prepares it as an electronic document, uploads it to the Moodle platform in the established time.</p> <p>The student will be able to present their presentation in person, with the coordination of the professor.</p> <p>Accredited activity (AP) 8 to 11.</p> <p>The student will solve individually in Excel 4 problems of the following topics, which they will upload to Moodle and check against the checklist:</p> <ul style="list-style-type: none"> • Estimation (AP 8). • Hypothesis test (AP 9). • Regression/correlation (AP 10). • Distribution Ji^2 (AP 11). <p>The problems are developed individually according to the checklist</p>	<p>Concepts of Inferential Statistics:</p> <p>Estimate.</p> <p>Test hypotheses.</p> <p>Regression / correlation.</p> <p>Distribution Ji^2.</p>	<p>Chapters 6, 7, 9, and 12 of the textbook (Daniel, 2008)</p> <p>Moodle School of Medicine Platform and Ms-Teams.</p> <p>Microsoft Office 2010 or later.</p>

<p>Evidence 3.</p> <p>Third Written Assessment (TEE), on Inferential Statistics:</p> <p>Estimate Hypothesis testing, Regression-Correlation, Distribution Ji^2.</p>	<p>The contents must be estimation, hypothesis testing, regression-correlation and Ji^2 distribution.</p> <p>The contents must be estimation, hypothesis testing, regression-correlation and Ji^2 distribution.</p> <p>The evaluation is individual, written and/or through the Ms Moodle platform, with a maximum time of 100 minutes.</p> <p>The document to be delivered may be manual or electronic, it must contain:</p> <ul style="list-style-type: none"> • Ten questions from chapters 6, 7, 9 and 12. • One problem for each topic: estimation, hypothesis testing, regression-correlation, and Ji^2 distribution. 	<p>provided by the teacher, prepared as an electronic document, uploaded to the Moodle platform in the established time.</p> <p>The teacher will administer the third written assessment (TEE) physically or through the Moodle platform.</p> <p>The student will solve the evaluation, in person and/or will deliver it through the Moodle platform, in a timely manner according to the teacher's instructions.</p>	<p>Concepts of the topics of Inferential Statistics:</p> <p>Estimate, Hypothesis testing, Regression and correlation.</p> <p>Distribution Ji^2.</p>	<p>Capítulos 6, 7, 9 y 12 del libro de texto (Daniel, 2008).</p> <p>Calculadora.</p> <p>Plataforma Facultad de Medicina Moodle y Ms-Teams.</p>
--	--	---	--	--

Evidence of student learning	Performance criteria	Learning activities	Content	Resources
Data Analysis and Integrative Learning Product (PIA).	<p>The contents must be of a topic in the biochemical area, unpublished, individually prepared in electronic documents of Ms Word, Excel.</p> <p>The Ms Word document contains a minimum size of 10 pages with identification of each hypothesis in the sections of analysis, results and conclusions, as well as hyperlinks, graphs, citations and sources of support and consultation.</p> <p>The electronic reports to be submitted will be:</p> <ul style="list-style-type: none"> • Word structure. • PIA project database. • Data analysis. • Pivot Tables. • Histogram graph. • Presentation of results and conclusions in PowerPoint. 	<p>The professor advises the development of the PIA of the students, who will argue it during the semester, according to the stages proposed in the Platform.</p> <p>The structure of the work must contain:</p> <p>(1) Cover, (2) Theoretical framework (3) Hypothesis, (4) Population and sample, (5) Databases, (6) Data analysis, (7) Results, (8) Conclusions, (9) Sources of information.</p> <p>Accredited activity 12. PIA Preview</p> <p>The student will develop the PIA project, delivering progress through the Moodle platform, with which they will obtain personalized feedback from the teacher.</p> <p>The work is individual, adjusting to the checklist provided by the teacher, elaborates it as electronic documents, uploads it to the Moodle platform in the established time.</p> <p>It will include in sources of information, citations and references of reliable publications, to formulate and contrast the hypotheses, analyzing the data until reaching the results and conclusions.</p>	<p>Bio-statistics concepts:</p> <ul style="list-style-type: none"> • Population and Sample • Descriptive techniques. • Hypothesis. • Databases. • Inferential techniques. • Graphics. • Sources of information. 	<p>Chapters 1, 2, 3, 4, 6, 7, 9 and 12 of the textbook (Daniel, 2008).</p> <p>Calculator.</p> <p>Moodle Medical School Platform and Ms-Teams.</p> <p>Ms-Office 2010 or later.</p>

7. Summative evaluation:

Evaluation scheme of the Learning Unit broken down by Stages and Learning Evidence:

Phase	Evidence		Weighing
Phase 1 (38%)	Evidence 1	First written evaluation of Phase 1, on Introduction to Statistics and Descriptive Statistics.	12 %
	Accredited activity 1	Written work on Essay on the Introduction to Statistics.	2 %
	Accredited activity 2	Written work on Descriptive Statistics Slideshow	2 %
	Accredited activity 3	Written work on Sampling problems and descriptive statistics	3 %
	Accredited activity 4	Written work on PIA Structure	3 %
	Accredited activity 5	Written work on Probability Essay and Probability Distributions,	2 %
	Accredited activity 6	Written work on Probability problems and probability distributions,	2 %
Phase 2 (32%)	Evidence 2	Second partial evaluation corresponding to Probability and Probability Distributions	12 %
	Accredited activity 7	Writing on Electronic Submission of Chapters 6, 7, 9 and 12, Estimation, Hypothesis Testing, Regression/Correlation, Chi2 Distribution.	5 %
	Accredited activity 8	Written work on Estimation Problems (AP 8).	3 %
	Accredited activity 9	Written work on Hypothesis Testing Problems (AP 9).	3 %
	Accredited activity 10	Written work on Regression/correlation Problems (AP 10).	3 %
	Accredited activity 11	Written work on Distribution Problems Ji2 (AP 11).	3 %
	Accredited activity 12	Written work on PIA Advancement	3 %
CIP	Evidence 3	Third partial evaluation corresponding to Inferential Statistics	12 %
CIP	Course integrative project/product	Written Work CIP Course integrative project/product	30%

8. Course integrative project/product:

Proposal to the solution of a case posed, where the various technologies of learned biostatistics are applied. It must be an unpublished product, on a subject related to the biochemical field. The structure must contain: cover, index, theoretical framework, hypothesis, justification of the sample, database, analysis, results, conclusions, sources of support and consultation. (3datos.es., 2021)

9. References:

Daniel, W. W. (2008). *Biostatistics. Mexico: Limusa.*

3datos.es. (2021). Retrieved from 3datos.es, Statistical Analysis: http://3datos.es/?gclid=EAlaIQobChMIs_Cuw4-17gIVE__jBx0CWwJDEAMYASAAEgL6ufD_BwE

Martínez, M. (2014). *Friendly biostatistics. Spain: Elsevier Spain.*

MedlinePlus. (2020). MedlinePlus. Retrieved from <https://medlineplus.gov/spanish/healthstatistics.html#:~:text=Las%20estad%C3%ADsticas%20de%20salud%20son,salud%20p%C3%ABlica%20y%20atenenci%C3%B3n%20m%C3%A9dica>.