

School of Agronomy and Veterinary

Analytic Program

Master of Sciences In Agropecuary Production

School of Agronomy and Veterinary

MCPA 01

I. Course ID:

Name:	Statistics I
Semester:	Fall
Course Type:	
Number of theory hours/week:	2
Number of practice hours/week:	1
Total class hours/week:	3
Total hours/course/semester:	39 weeks of classes/ 58.5 hours of classes and exams
Type of practice:	Computer programming
Number of additional hours for the student:	3 hours per week of classes
Course-requirements:	
Number of credits:	

II. CURRICULUM:

Name of the formative department:	
Name of instructor:	Rubén Montes de Oca, M.S. Invited instructor. Mathematical-Statistician of the U. S. Food and Drug Administration, Silver Spring, Maryland. "Opinions expressed are personal and not necessarily the FDA's opinion" or in Spanish "Las opiniones expresadas son personales y no representan necesariamente la opinion de la FDA".

Palma de la Cruz, Municipio de Soledad de Graciano Sánchez, S. L. P., January 2018

III. CONTRIBUTION TO THE STUDENT:	The student will be able to work with Statisticians communicating ideas and helping planning research hypotheses. The student will also have basic knowledge to conduct his/her own statistical analysis. The student will have sufficient statistical knowledge to understand statistical outputs from the statistical software SAS or R, and statistical analyses published in published research papers.
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IV. TOPICS TO DEVELOP:	Transversal competence	Do not fill up
	Professional competence	Do not fill up

V. GENERAL OBJECTIVES:	<p>At the end of the course the student will be able to:</p> <p>Analyze data using SAS University or R Check for probability distributions and perform statistical testing Identify and use big data, massive data, longitudinal or cross-sectional data</p> <p>Design experiments Part I Formulate and test statistical hypothesis of experiments</p> <p>Write s statistical analysis plan Part I Create and interpret regression models I</p>
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VI. TOPICS				
Unidad 1:	Use of statistical software SAS University and R Probability distributions and statistical testing Identify and use big data, massive data, longitudinal and cross-sectional data	Weeks 1 a 7	36 %	
Objective:	The student will test statistical software. The student will create data sets as well as import data sets from Excel and CSV. The student will present descriptive statistics: number of observations, median, mean, proportions, and outliers. The student will test quality of data and will learn how identify a well-maintained data set. The student will use SAS University and R for analyzing data, among other, the NHANES data of the CDC, and will pay attention to nutrition, as well as chemical compounds detected in blood and urine in the US population. The student will be exposed to several probability distributions with emphasis in the Normal and the Poisson distributions.			
Topics and subtopics	Reading and other resources	Teaching methods	Learning activities	Number of hours per topic
1.1. Use of R and SAS University 1.2. Entering data into R and SAS University 1.3. Import Excel and CSV data as well as other formats 1.4. Descriptive statistics and graphics 1.5. Public data sets: NHANES 1.6. Probability distributions and statistical testing 1.7. Data management: merge and concatenate	<p>Examples developed by the SAS Institute: http://support.sas.com/documentation/cdl/en/proc/61895/HTML/default/viewer.htm#a002473539.htm</p> <p>The NHANES data and documentation: https://www.cdc.gov/nchs/nhanes/index.htm</p> <p>Legally free downloadable books: https://en.wikibooks.org/wiki/Statistics https://github.com/gjkerns/IPSUR/blob/master/IPSUR.pdf</p> <p>Reading material: The importance of a good statistical design: https://www.washingtonpost.com/news/morning-mix/wp/2018/06/14/why-a-major-paper-on-the-mediterranean-diet-was-just-retracted-and-replaced-by-a-prestigious-journal/?utm_term=.54798f04cba8</p> <p>Chapters 23 and 28 of the book Statistics, and chapters 5 and 6 of the book Introduction to Probability and Statistics using R.</p>	<p>Teaching methods: The student will report by writing or orally the following:</p> <p>Replicate results and analyses from the statistical software examples.</p> <p>Data experimentation by creating data sets and subsets.</p> <p>Statistical description of data.</p> <p>Read documentation of data collection methodology and recommendations for the use of downloadable data sets.</p> <p>Talk with the instructor to understand how to maintain a data base, including actualization or updates, and quality control.</p> <p>Exercises of downloading and reading data sets from the web.</p>	<p>The student will work individually and in group using statistical software.</p> <p>Read NHANES documentation and apply it to his/her work</p> <p>Read other material assigned by the instructor</p> <p>Written exam.</p>	4 4 2 5 2 2 2

Unit 2:	Design of experiments, Part I Hypothesis formulation and testing	Weeks 8 to 10	16%	
Objective:	Read and understand several papers with design of experiments. Understand the importance of randomization. Understand statistical hypotheses and how to test them. The concept of error.			
Topics and subtopics	Reading and other resources	Teaching methods	Learning activities	Number of hours per topic
2.1. What is an experiment? 2.2. Randomization and sample size 2.3. Your hypothesis and which are your measurements 2.4. What happens if the experiment did not go as planned	Examples developed by the SAS Institute: http://support.sas.com/documentation/cdl/en/proc/61895/HTML/default/viewer.htm#a002473539.htm Chapters 15 and 16 of the book Practical Regression and ANOVA using R	Teaching methods: The student will report by writing or orally what was learned.	The student will work individually and in group using statistical software. The student will explain his/her assigned experiments to the instructor and to the class.	2 1 4 2

Unit 3:	Write a statistical analysis plan, Part I Develop and interpret regression models I	Weeks 11 to 19	48 %	
Objective:	The student should be by now familiarized with design of experiments and data analyses including hypothesis testing, will be able to formulate his/her own regression models and will be able to write a statistical analysis plan showing knowledge of statistics.			
Topics and subtopics	Reading and other resources	Teaching methods	Learning activities	Number of hours per topic
3.1. Understand possible models to analyze data. 3.2. Regression models and implementation in SAS University or R. 3.3. The importance of writing a document understandable by other disciplines containing introduction to the proposed research, objectives, methods, and conclusions, as well as including details of the statistical analyses proposed. 3.4. Randomization and sample size.	Chapters 30 and 31 of the book Introduction to Probability and Statistics using R	Teaching methods: The student will explain the learned material to the class.	The student will work individually and in group using statistical software. Writing of statistical analysis plan and explain before the instructor and class.	8 7 7 5

VII. CAPABILITY AND KNOWLEDGE THAT THE STUDENT WILL ACQUIRE FROM THE COURSE	
Capability to	Know how to
<ul style="list-style-type: none"> Formulate research hypothesis Analyze data and know probabilities of errors when taking a decision Program in SAS University or R Present information in an understandable and reproducible fashion Write a statistical analysis plan Prepare report to colleagues of the course 	<ul style="list-style-type: none"> Program in SAS University or R. Formulate hypothesis and methodology to detect reproducible truths. Write understandable ideas.

VIII. GENERAL STRATEGY FOR TEACHING AND LEARNING:	1.- Expose the student to real experiments and help to conduct data analysis 2.- Introduce the student to search information on several topics working with multiple disciplines. 3.- Develop independence and confidence directing him/her to find adequate solutions.
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IX. MECHANISMS AND EVALUATION PROCESS:	Criteria
	<p>Type of exams to pass the course:</p> <p>1. Partial exams: Timing: at the end of unit 1 and unit 3. Number of exams: 2</p> <p>a) First partial exam.</p> <p>Contents: Unit: 1</p> <p>Form: Written and oral y oral.</p> <p>Relative value: 40 %</p> <p>b) Second partial exam.</p> <p>Contents: Units: 2, 3</p> <p>Form: Written and oral.</p> <p>Relative value: 60 %</p> <p>Relative value of partial exams in final grade: 40%</p> <p>2. Required academic activities:</p> <p>Computer lab: 40 %</p> <p>Reading material 20%</p> <p>Writing analysis plan 40%</p> <p>Relative value of required activities: 60%</p>

X. BIBLIOGRAPHY

Basic texts:

1. Statistics. - Wikibooks. <https://en.wikibooks.org/wiki/Statistics>
2. Introduction to Probability and Statistics using R. G. Jay Kerns. Second Edition 21010. <https://github.com/gjkerns/IPSUR/blob/master/IPSUR.pdf>
3. Practical Regression and ANOVA using R. Julian J. Faraway <http://www.mathstat.ualberta.ca/~wiens/stat568/misc%20resources/Faraway-PRA.pdf>
4. SAS User's Guide, Second Edition. https://support.sas.com/documentation/cdl/en/statug/63033/HTML/default/viewer.htm#statug_chap0_sect002.htm