

PALESTINE POLYTECHNIC UNIVERSITY

Faculty of Applied Science

Department of Applied Mathematics

Experimental Design & Statistical Analysis Syllabus 2<sup>nd</sup> semester 2015/2016

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**Course**

**Course Title:** Experimental Design & Statistical Analysis (4315)

**Credit Hours:** 3 credit Hours

**Type:** CBL

**Lecture Time/Location**

Section #	Time	Location	
1	11:00 – 12:15	B	615

**References**

1. Elementary Statistics: A Step by Step Approach, 8<sup>th</sup> edition, Allan G. Bluman.
2. Agresti, Alan (2002), " Categorical Data Analysis", 2<sup>nd</sup> edition, John Wiley publications.
3. Kutner Michael, Nachtsheim Christopher, Neter John & Li William, "Applied Linear Statistical Methods", 5<sup>th</sup> edition.
4. "تصميم وتحليل التجارب" ، محمد محمد الطاهر الامام. دار المريخ للنشر، ١٩٩٤ .

**Course Description**

This course will provide students with a review of basic statistical concepts as well as in-depth coverage of experimental design and data analysis techniques. This course covers statistical aspects of collecting and analyzing experimental data. Specific topics include tools for describing central tendency and variability in data; methods for performing inference on population means and proportions via sample data; statistical hypothesis testing and its application to group comparisons; regression; categorical data analysis; and analysis of variance.

Contrary to traditional courses, this course provide the learners the opportunity to interact with a real working environment. Students will have the opportunity to gain both a theoretical understanding of the logic of null hypothesis significance testing and practical experience with the analysis of experimental data using SPSS software. Therefore, leaners need of practicing theory not just understanding it. This approach of learning is called Community Based Learning (CBL).

**Community Based learning (CBL):**

CBL is a learning approach in which academic institutions and community (organizations) work together in order to meet their common needs. While traditional teaching approach separates class room from worksite; CBL engages community and worksite as extensions of the classroom. Students can acquire knowledge, build skills, and develop useful attitudes. This method:

- makes learning relevant to life.
- helps students make the crucial transition from knowing to doing (knowledge to action).

- enables students to explore ways to create and strengthen linkages in their community.
- demonstrate flexible and innovative approaches to real world problems.
- promotes discussion and debate on community issues (problems) among all stakeholders.
- enables students have the opportunity to focus on their fields of interests.

In this course students are expected to have a presence in the community throughout the semester and reflects on their experiences on a regular basis throughout the semester using course content as a basis for their analysis and understanding.

**Community Based Learning Project Description (35%):**

<b>Stage 1 (5%) (3 Large groups)</b>
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**Field Work (Building Questionnaire, Data Collection, Data Entering, Field Work Report)**

<b>Stage 2 (25%) (Small Groups)</b>
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**Research Project Report**

**Title:** Factors Affecting Newborn Weight At Three Central Hospitals In Hebron, Palestine

**List of contents:**

**1. Abstract**

- Summary.

**2. Introduction**

- Literature view (summary of 5 previous studies).
- Project aims.
- Study Hypotheses.

**3. Methodology**

- Study Design.
- Identification of population and sample.
- Data collection (Questionnaire, Pilot Testing Time frame,.....)
- Data analysis Program.

**4. Statistical Analysis**

- Univariate Statistical Analysis  
(Data distribution using Charts, Summary measures, Percentages,.....)
- Bivariate Statistical Analysis  
(contingency tables, confidence intervals, and testing, Regression, correlation, ANOVA).

**5. Results and Discussion**

**6. Conclusions Recommendations.**

**7. References.**

<b>Stage 3 (5%)</b>
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**presentation**

### **Intended Learning Outcomes (ILOs):**

After completion of this course, you will be able to do the following:

- Define the science of statistics and differentiate between statistics branches.
- Identify types of data and their measurement levels using real data from a community partner.
- Explain the difference between an observational and an experimental studies.
- Collect data from a community partner (CP) using different sampling techniques and solve different data collection problems ( missing, nonresponse,..., etc).
- Describe, summarize, and present data from community using appropriate methods, such as joint frequency table, frequency histogram and various types of bar charts .
- Perform Statistical inference (point & interval estimation, testing hypothesis) using the collected data from (CP).
- Estimate relationship between different variables using correlation and regression analysis.
- Analyze the differences between group means using different ANOVA models using experimental data collected from (CP).

## Course Outline & Calendar

The learners will work individually and collaboratively in two parallel tracks, in the class theoretical work, and practical work as the Community Based Project (CBL).

Stages	Weeks	Theoretical Activities	Practical Activities
Stage (1)	[ 1 - 4 ]	Chapter 1: The Nature of Probability and Statistics	<ul style="list-style-type: none"> <li>Introducing CBL and agreeing on the course requirement to have learners commitment and future engagement.</li> <li>Work on finding community partners (CP) committed to CBL.</li> </ul>
		Chapter 2: Frequency Distributions and Graphs	<ul style="list-style-type: none"> <li>Visits to coordinate with CP.</li> <li>In class discussions.</li> </ul>
		Chapter 3: Data Description	<ul style="list-style-type: none"> <li>Visits to coordinate with CP, identifying needs.</li> <li>Each group will collect the data from its assigned area.</li> <li>Entering Data (SPSS package).</li> <li>In class discussions.</li> <li>Sub-reports for describing the data collection stage. (2 – 3) pages</li> </ul>
Stage (2)	[ 5 – 10 ]	Chapter 4: The Normal Distribution	<ul style="list-style-type: none"> <li>Students will analyze data and give interpretation.</li> <li>Discussing the results and try to explain the causes of the problems.</li> <li>Discuss the problem solutions</li> <li>Sub-reports describing stage 2. (4 – 5) pages</li> <li>Mid-point presentations.</li> </ul>
		Chapter 5: Confidence Intervals and Sample Size	
		Chapter 6: Hypothesis Testing	
		Chapter 7: Testing the Difference Between Two Means, Two Proportions	
Stage (3)	[ 11 – 15 ]	Chapter 8: Correlation and regression	<ul style="list-style-type: none"> <li>Each group will design an experimental study.</li> <li>Each group collect experimental data.</li> <li>Students will analyze data and give interpretation.</li> <li>Discussing the results and try to explain the causes of the problems.</li> <li>Discuss the problem solutions.</li> <li>Sub-reports describing stage 3. (4 - 5) pages</li> </ul>
		Chapter 9: Categorical Data Analysis	
		Chapter 10: Experimental Design & Analysis of Variance.	
Stage (4)	16	Group Presentations Report Final Version.	<ul style="list-style-type: none"> <li>Students will submit final report covering all stages of the project.</li> <li>Students will do group presentation.</li> <li>Feedback from the community partner.</li> </ul>

## **Teaching and Learning Methods**

1. Lectures.
2. Assignments.
3. Group discussions.
4. Presentations.
5. SPSS package.
6. CBL project.

## **Evaluation (Grade Breakdown):**

1.	First Exam	25%
2.	Second Exam	
3.	Project.	
	- Field work.	5 %
	- Final report.	25 %
	- Final presentation.	5 %
	Total	35%
4.	Final Exam	40 %

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### CBL Project Rubric

Outcomes	Criteria		Outstanding ( 5 )	Acceptable ( 4 )	Marginal ( 3 )	In-progress ( 2-0)	
Fieldwork (5%)	<ul style="list-style-type: none"> <li>Commitment and serious working. (Attendance, taking share of work, Generate good ideas) [Fieldwork reports]</li> </ul>						
	<ul style="list-style-type: none"> <li>Collect data using different sampling techniques and different sources (interviews, questionnaire, CP records,...).</li> </ul>						
	<ul style="list-style-type: none"> <li>Solve data problems ( missing, nonresponse,.....).</li> </ul>						
	<ul style="list-style-type: none"> <li>Enter data using SPSS.</li> </ul>						
Report (25%)	Structure and Format (5%)	<ul style="list-style-type: none"> <li>Title page, table of contents.</li> </ul>					
		<ul style="list-style-type: none"> <li>Executive Summary, Introduction.</li> </ul>					
		<ul style="list-style-type: none"> <li>Spelling, clarity, and technical language.</li> </ul>					
		<ul style="list-style-type: none"> <li>Referencing.</li> </ul>					
	Statistical Analysis (10%)	Descriptive Statistics	<ul style="list-style-type: none"> <li>Organize data using a frequency distribution and represent data graphically.</li> <li>Summarize data using measures of central tendency, variation, and position.</li> <li>Calculate probabilities using the normal distribution.</li> </ul>				
		Inferential Statistics	<ul style="list-style-type: none"> <li>Construct confidence intervals for the population mean and proportion.</li> <li>Test hypotheses about population mean /s and proportion /s.</li> </ul>				
		Reg. and exp. design	<ul style="list-style-type: none"> <li>Fit a linear model relating two continuous variable and find the correlation coefficient.</li> <li>Construct contingency tables.</li> <li>Apply different experimental designs. ( Case - Control study, one way ANOVA,.....).</li> </ul>				
	Interpretation (5%)	<ul style="list-style-type: none"> <li>Identify connections between the experience and material from course learning.</li> </ul>					
		<ul style="list-style-type: none"> <li>Draw logical conclusions, provides reasons, explains assumptions.</li> </ul>					
		<ul style="list-style-type: none"> <li>Give the limitations and recommendations. (Student reflections)</li> </ul>					
Presentation (5%)	<ul style="list-style-type: none"> <li>Degree of confidence in the ideas being presented.</li> </ul>						
	<ul style="list-style-type: none"> <li>Ability to communicate ideas.</li> </ul>						
	<ul style="list-style-type: none"> <li>Answering questions.</li> </ul>						
	<ul style="list-style-type: none"> <li>Performing as a team and finishing on time.</li> </ul>						

