

Co-funded by the  
Erasmus+ Programme  
of the European Union

**Project Title:** Modernization of Teaching Methodologies in Higher Education: Eu Experience For Jordan And Palestinian Territory

**Project acronym:** METHODS

**Project Number:** 561940-EPP-1-2015-1-JO-EPPKA2-CBHE-JP

**Funding scheme:** Erasmus+ Programme (Capacity-Building projects in the field of Higher Education (E+CBHE))

**Start date of the project:** 15/10/2015                      **Duration:** 36 months

<b>Deliverable title</b>	<b>Course Outline Probability</b>		
<b>Author(s)</b>	<b>Dr. Huwaida Rabie</b>		
<b>Organisation name(s)</b>	<b>Bethlehem University</b>		
<b>WP Number</b>	<b>5</b>		
<b>WP Leader</b>	<b>Birzeit University</b>		
<b>Due date of delivery</b>	<b>16/6/2017</b>	<b>Project month</b>	
<b>Submission date</b>	<b>18/6/2017</b>	<b>Project month</b>	
<b>Total number of pages</b>	<b>9</b>		

**Project co-ordinator name, title and organisation:**

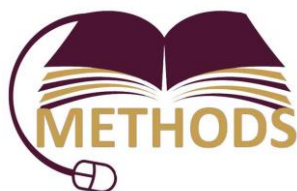
Prof. Ahmed Al-Salaymeh, The University of Jordan (UJ)

**Address:** Queen Rania Street, Amman 11942, Jordan

**Tel:** +962-6-53 55 000 Ext. 22816 **Mob:** +962-777-64 4364 **Fax:** +962-6-53 00 237

**Email:** [methods@ju.edu.jo](mailto:methods@ju.edu.jo)

**Project website:** <http://methods.ju.edu.jo>



Co-funded by the  
Erasmus+ Programme  
of the European Union

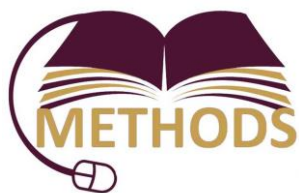
## Bethlehem University

### Dr. Huwaida Rabie

<b>Course title/code</b>	Probability – Math331	
<b>Instructor /office</b>	Dr. Huwaida Rabie /S202	
<b>Semester- Year</b>	Fall 2017	
<b>Compulsory/Elective</b>	Compulsory	
<b>Prerequisites</b>	MATH 241 (MATH 238 highly recommended)	

<b>Course Description</b>	<p>This is a junior/senior course in mathematics of probability and statistics. The course introduces random experiments and associated random variables, probability concept, methods of enumeration, conditional and independent probability distributions, random variables of discrete and continuous types, expectation and variance, different types of distributions (discrete and continuous), moment generating function, transformation of random variables and distribution functions associated with random variables, and bivariate random variables.</p>
---------------------------	--

<b>Generic Competences*</b>	<p>Self-regulated learning</p> <p>To analyze the different strategies and ways to achieve the requirements of the learning activity and choose the best way to proceed in the context conditions.</p>
<b>Specific Competences (SCs)</b>	<ol style="list-style-type: none"><li>1. To identify random variables as discrete or continuous based on random experiments.</li><li>2. To apply the multiplication principles and the permutations and the combinations rules to new counting problems.</li><li>3. To compare different probability distributions of discrete and continuous random variables, including conditional probability distributions, in terms of their means, variances, and moment generating functions.</li><li>4. To select the appropriate probability distribution model that is applicable to a real life problem related to probability calculations.</li></ol>



Co-funded by the  
Erasmus+ Programme  
of the European Union

- These competences related also to the project Methods

	Course contents	SC1	SC2	SC3	SC4
1	Narrated PowerPoint	X	X	X	X
2	Watching videos	X	X	X	X
3	Forum discussion	X	X	X	X
4	Problem based learning	X	X	X	X
5	Quizzes and Exams	X	X	X	X
6	Game and race activities	X	X		X
7	In class discussions	X	X	X	X
8	Group Presentations	X	X	X	X
9	Reading assignments	X	X	X	
10	Non-graded Assignments	X	X	X	X

Schedule				
Week	Subject	Activity Description *	Evaluation Criterion	
			Description	%
1	1. Introduction to the course 2. Forming groups	<ul style="list-style-type: none"> <li>• Convey course information ( flipped classroom and MOOC)</li> <li>• Students will have a week from the time the material uploaded on EClass to prepare for their group presentations</li> <li>• Forum discussion provides feedback for the group presentation. Forum discussion will be timely opened and closed before the next class meeting.</li> <li>• I will initiate the discussion by posting</li> </ul>	NA	

ERASMUS+ Programme – METHODS Project Number: 561940-EPP-1-2015-1-JO-EPPKA2-CBHE-JP

**DISCLAIMER:** This project has been funded with support from the European Commission. This publication [communication] reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

		some related questions.		
2	<p>1. Random experiments and random variables</p> <p>2. Properties of probability</p>	<p><b>Flipped classroom</b></p> <p><b>Before class</b></p> <p>a. Reading p.1-20</p> <p>b. watching video</p> <p><b>In class</b></p> <ul style="list-style-type: none"> <li>• Communicate student's reasoning by commenting on students forum discussion</li> <li>• Group presentation</li> <li>• game activity ( coin tossing )</li> <li>• race activity ( dice rolling)</li> </ul> <p><b>After class</b></p> <p>a. Non-graded textbook assignments</p> <p>b. Each group has to post 2-3 real life examples that use probability from newspapers, TV, ...</p>	<p>group 1 presentation</p> <p>Forum discussion</p> <p>Exam 1</p> <p>Final Exam</p>	<p>4**</p> <p>0.7</p> <p>2.5</p> <p>2</p>
3	<p>Methods of Enumeration</p>	<p><b>Flipped classroom</b></p> <p><b>Before class</b></p> <p>a. Reading p.22-29</p> <p>b. Narrated PowerPoint</p> <p>c. Online practice exercise</p> <p><b>In class</b></p> <ul style="list-style-type: none"> <li>• Group presentation</li> <li>• Discussion focusing on important strategies when dealing with combination and permutation problems ( order/ no order, with/without replacement).</li> <li>• Communicate student's reasoning and understanding</li> <li>• Group activity (Think-pair-share) solving</li> </ul>	<p>group 2 presentation</p> <p>Forum discussion</p> <p>In class online quiz 1</p> <p>Exam 1</p> <p>Final Exam</p>	<p>0.7</p> <p>1.7</p> <p>2.5</p> <p>2</p>

		<p>worksheet problems</p> <ul style="list-style-type: none"> <li>• quiz</li> </ul> <p><b>After class</b></p> <ol style="list-style-type: none"> <li>Finish the worksheet at home</li> <li>Textbook Assignments</li> </ol>		
4	<ol style="list-style-type: none"> <li>Conditional and</li> <li>Independent probabilities</li> </ol>	<p>Flipped classroom</p> <p><b>Before class</b></p> <p>Reading p.33-40 + p.44-48 Narrated PowerPoint /video</p> <p><b>In class</b></p> <ul style="list-style-type: none"> <li>• Discussion</li> <li>• Group presentation</li> <li>• Game activity ( marble bags)</li> <li>• quiz</li> </ul> <p><b>After class</b></p> <p>Textbook Assignments</p>	<p>group 3 presentation</p> <p>Forum discussion</p> <p>In class online quiz 2</p> <p>Exam 1</p> <p>Final Exam</p>	<p>0.7</p> <p>1.7</p> <p>2.5</p> <p>2</p>
5	Bayes Theorem	<p><b>Before class</b></p> <p><b>Video</b></p> <p><b>In class</b></p> <ul style="list-style-type: none"> <li>• Group presentation</li> <li>• individual problem solving</li> </ul> <p><b>After class</b></p> <p>Textbook Assignments</p>	<p>group 4 presentation</p> <p>Forum discussion</p> <p>Exam 1</p> <p>Final Exam</p>	<p>0.7</p> <p>2.5</p> <p>2</p>
6	<ol style="list-style-type: none"> <li>Discrete random variables</li> <li>Mathematical Expectation</li> </ol>	<p><b>Before class</b></p> <ol style="list-style-type: none"> <li>Reading p.57-65 and p.68-73</li> <li>video</li> </ol> <p><b>In class</b></p> <ul style="list-style-type: none"> <li>• Discussion</li> <li>• Re-forming groups</li> </ul> <p><b>After class</b></p> <p>Textbook Assignments</p>	<p>Exam 1</p> <p>Final Exam</p>	<p>2.5</p> <p>2</p>
7	Mean, variance and Standard deviation	<p><b>Before class</b></p> <ol style="list-style-type: none"> <li>Reading p.75- 84</li> <li>video</li> <li>Practice exercise</li> </ol> <p><b>In class</b></p> <ul style="list-style-type: none"> <li>• Discuss the importance of these measures and</li> </ul>	<p>group 1 presentation</p> <p>Forum discussion</p> <p>In class online quiz 3</p>	<p>4**</p> <p>0.7</p> <p>1.7</p>

		<p>misconceptions</p> <ul style="list-style-type: none"> <li>• Group presentation</li> <li>• Group problem solving (Sample exam 1 questions)</li> <li>• quiz</li> </ul> <p><b>After class</b></p> <ol style="list-style-type: none"> <li>Each group has to post a probability problem (game) that needs to calculate the average win (loss)</li> <li>Textbook Assignments</li> <li>post solutions of sample exam1</li> </ol>	<p>Exam 1</p> <p>Final Exam</p>	<p>2.5</p> <p>2</p>
8	Bernoulli and Binomial distributions	<p><b>Before class</b></p> <ol style="list-style-type: none"> <li>Reading p. 88-95</li> <li>Narrated PowerPoint/ video</li> </ol> <p><b>In class</b></p> <ul style="list-style-type: none"> <li>• Group presentation</li> <li>• Communicate student's reasoning and understanding</li> <li>• Individual problem solving focusing on the thought process involved in the solution</li> <li>•</li> </ul> <p><b>After class</b></p> <p>Textbook Assignments</p>	<p>group 2 presentation</p> <p>Forum discussion</p> <p>Exam 2</p> <p>Final Exam</p>	<p>0.7</p> <p>2.5</p> <p>2</p>
9	<ol style="list-style-type: none"> <li>The moment generating function</li> <li>The Poisson distribution</li> </ol>	<p><b>Before class</b></p> <ol style="list-style-type: none"> <li>Reading p. 100-108</li> <li>Video</li> <li>Practice exercise</li> </ol> <p><b>In class</b></p> <ul style="list-style-type: none"> <li>• Group presentation</li> </ul> <p>Individual problem solving to</p> <ul style="list-style-type: none"> <li>• demonstrate how the moment generating functions are used to</li> </ul>	<p>group 3 presentation</p> <p>Forum discussion</p> <p>Exam 2</p> <p>Final Exam</p>	<p>0.7</p> <p>2.5</p> <p>2</p>

		<p>identify random variables distributions</p> <ul style="list-style-type: none"> <li>• apply a Poisson distribution to real life problem</li> </ul> <p><b>After class</b> Textbook Assignments</p>		
10	<p>1. Continuous distributions</p> <p>2. Continuous random variables - The Uniform distribution</p>	<p><b>MOOC</b> Reading p.125-136 Free web search help</p> <p><b>Flipped classroom</b> <b>Before class</b> a. Reading p.142-151 +p. 154-159 b. video <b>In class</b></p> <ul style="list-style-type: none"> <li>• Group presentation</li> <li>• Discussion</li> <li>• Group problem solving aimed to deduce rules of mean, variance and moment generating functions similar to those of discrete distributions</li> </ul> <p><b>After class</b> Textbook Assignments Individual assignment</p>	<p>In class online quiz 4 (Mooc material)</p> <p>group 4 presentation</p> <p>Forum discussion</p> <p>Exam 2</p> <p>Final Exam</p>	<p>1.7</p> <p>0.7</p> <p>2.5</p> <p>2</p>
11	<p>1. The Gamma and</p> <p>2. Chi-square distributions</p>	<p><b>Flipped classroom</b> <b>Before class</b> a. Video b. Practice exercise <b>In class</b></p> <ul style="list-style-type: none"> <li>• Group problem solving (Think- pair- Share) discovering the real life applications of the gamma and chi-square distributions)</li> <li>• Re-forming groups</li> </ul> <p><b>After class</b> Textbook Assignments</p>	<p>Exam 2</p> <p>Final Exam</p>	<p>2.5</p> <p>2</p>

12	Distributions of random variable	<p><b>Flipped classroom</b></p> <p><b>Before class</b></p> <p>a. Reading p.171- 181 b. Video or narrated PowerPoint</p> <p><b>In class</b></p> <ul style="list-style-type: none"> <li>• Group presentation</li> <li>• Discussion focusing on the difference between “change of variable technique“ and “Distribution technique” when finding distributions of random variables</li> <li>• Group problem solving</li> </ul> <p><b>After class</b> Textbook Assignments</p>	<p>group 1 presentation</p> <p>Forum discussion</p> <p>In class quiz 5</p> <p>Exam 2</p> <p>Final Exam</p>	<p>4**</p> <p>0.7</p> <p>1.7</p> <p>2.5</p> <p>2</p>
13	Distributions of two random variables	<p><b>Flipped classroom</b></p> <p><b>Before class</b></p> <p>a. Reading p. 193-205 b. link to tutorial lesson</p> <p><b>In class</b></p> <ul style="list-style-type: none"> <li>• Group presentation</li> <li>• Discussion to develop student’s higher thinking</li> <li>• Group problem solving (Sample Exam 2)</li> </ul> <p><b>After class</b></p> <p>a. Textbook Assignments b. post solutions of sample Exam2</p>	<p>group 2 presentation</p> <p>Forum discussion</p> <p>In class quiz 6</p> <p>Exam 2</p> <p>Final Exam</p>	<p>0.7</p> <p>1.7</p> <p>2.5</p> <p>2</p>
14	<p>1. The correlation coefficient</p> <p>2. The conditional distributions</p>	<p><b>Flipped classroom</b></p> <p><b>Before class</b> Reading p.207-213 + p.216-223</p> <p><b>In class</b></p> <ul style="list-style-type: none"> <li>• Discussion about relationship between variables and important formulas</li> </ul>	<p>group 3 presentation</p> <p>Forum discussion</p> <p>In class online quiz 7</p> <p>Final Exam</p>	<p>0.7</p> <p>1.7</p> <p>2</p>



		<ul style="list-style-type: none"> <li>Group presentation</li> </ul> <p><b>After class</b> Textbook Assignments</p>		
15	Transformations of random variables	<p><b>Flipped classroom</b></p> <p><b>Before class</b></p> <ol style="list-style-type: none"> <li>Reading p.228-236</li> <li>Video</li> </ol> <p><b>In class</b></p> <ul style="list-style-type: none"> <li>Group presentation</li> <li>Discussion and focus on new important random variables such as double exponential and F distributions</li> </ul> <p><b>After class</b> Textbook Assignments</p>	<p>group 4 presentation</p> <p>Forum discussion</p> <p>Final Exam</p>	<p>0.7</p> <p>2</p>
16	<ol style="list-style-type: none"> <li>Distributions of sum of random variables</li> <li>Course Reflection</li> </ol>	<p><b>Flipped classroom</b></p> <p><b>Before class</b> Reading p.247-252</p> <p><b>In class</b></p> <ul style="list-style-type: none"> <li>Focus on important theorems</li> <li>Review session</li> <li>Individual course reflection</li> </ul> <p><b>After class</b> Textbook Assignments</p>	Final Exam	2
			Total	<p>92.3 – lowest quiz = 90.7</p> <p>There is a bonus of 0.7</p>

\* PBL, MOOC, Inverted Classroom should be introduced within activity description

\*\* : Each student in a group will be evaluated out of 4 points. Each student will present 3 times giving a total of 12 points.

<p><b>Textbook</b></p> <p><b>References</b></p>	<ul style="list-style-type: none"> <li>Probability and Statistical Inference. Robert V. Hogg and Elliot A. Tanis 7<sup>th</sup> edition.</li> <li>Probability and Statistics for Engineering and the Sciences (8<sup>th</sup></li> </ul>
---	--

	<p>edition) by Jay L. Devore. Books/Cole, Cengage Learning, Canada (2012).</p> <ul style="list-style-type: none"> <li>• Probability and Statistics (3rd edition) by Morris H. Degroot, Mark J. Schervish, 2001, Addison-Wesley.</li> <li>• John E. Freund's Mathematical Statistics: With Applications ( 7th edition) by John E. Freund, Irwin Miller, Marylees Miller, 2003, Prentice Hall.</li> <li>• Peck, Roxy, Chris Olsen, and Jay Devore, Introduction to Statistics and Data Analysis, 4<sup>th</sup> edition, Brooks/Cole (Cengage Learning), Boston, 2012.</li> <li>• Wackerly, Mendenhall, and Scheaffer, Mathematical Statistics with Applications, 7<sup>th</sup> edition, Brooks/Cole (Cengage Learning), Boston. 2008.</li> </ul>	
<p><b>Overall Assessment Criteria</b></p>	<p><b>Method</b></p>	<p><b>Weight [%]</b></p>
	<p>Attendance / class participation</p>	<p>10</p>
	<p>Forum discussion to provide feedback for group presentation</p>	<p>8</p>
	<p>Exam 1</p>	<p>15</p>
	<p>Exam 2</p>	<p>15</p>
	<p>Quizzes - lowest is dropped</p>	<p>10</p>
	<p>Presentation</p>	<p>12</p>
	<p>Final Exam</p>	<p>30</p>