**Course Specification**

**(ST 121: Probability and Statistics 1)**

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| **University:** | Helwan University |
| **Faculty:** | Faculty of Computers & Information |
| **Department:** | Computer science |

**1. Course Data**

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| --- | --- |
| **Code:** | ST 121 |
| **Course title:** | Probability and Statistics 1 |
| **Level:** | 2 |
| **Specialization:** | General |
| **Credit hours:** | 3 hours |
| **Number of learning units (hours):**  | (3) theoretical (2) tutorial |

**2. Course Objective**

Sample space ; probability axioms ; combinational techniques ; conditional probability ; independence and Bayes theorem ; Random variables ; distribution functions ; moments and generating function ; Some probability distributions ; Joint distribution ; the Chebyehev inequality and the law of large numbers ; The central limit theorem and sampling distribution.

**3. Intended Learning Outcomes:**

1. **Knowledge and Understanding**

A5. Describe the Statistical Methods.

1. **Intellectual Skills**

B2. Select appropriate Mathematical method to solve a specific problem.

1. **Professional and Practical Skills**
2. **General and Transferable Skills**

D9. Follow Logical Thinking in real time problem solving.

D10. Follow Critical and Analytical Thinking.

**4. Course contents**

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| --- | --- | --- | --- |
| **Topic** | **No. of hours** | **Lecture** | **Tutorial/ Practical** |
| Random experiments, sample space and events, the algebra of events (sets, unions, intersections, complementation, De Morgan's laws). Axioms of probability. Equally likely events. | 6 | 2 | 2 |
| Conditional probability of an event. Multiplication rule. Partition theorem, Bayes theorem and applications. Independent events.  | 3 | 1 | 2 |
| Random variables. Definition. Distribution function. Discrete random variables and probability mass function. Continuous random variables, probability density function and its relation to the distribution function. Calculating probabilities of events defined by random variables. Finding the distribution function of random variables using equivalent events (simple cases).  | 6 | 2 | 2 |
| Expectation of a random variable and of a function of a random variable. Variance of a random variable. Basic properties of expectation and variance.  | 6 | 2 | 2 |
| The Binomial, Normal and Poisson distributions.  | 3 | 1 | 2 |
| Bernoulli trials. The geometric and negative binomial distribution. The sample proportion as an estimator to the general proportion. Poisson and Normal approximation to Binomial.  | 6 | 2 | 2 |
| Random samples and populations. Simple statistics and their distributions. Sample mean as an estimator of the population mean. Properties of the sample mean. Sample variance as an estimator of the population variance. Unbiasedness.  | 6 | 2 | 2 |

**Mapping contents to ILOs**

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| --- | --- |
| Topic | Intended Learning Outcomes (ILOs) |
| Knowledge and understanding | Intellectual Skills | Professional and practical skills | General and Transferable skills |
| Random experiments, sample space and events, the algebra of events (sets, unions, intersections, complementation, De Morgan's laws). Axioms of probability. Equally likely events. | A1, A5 |  |  |  |
| Conditional probability of an event. Multiplication rule. Partition theorem, Bayes theorem and applications. Independent events.  | A1, A5 |  |  |  |
| Random variables. Definition. Distribution function. Discrete random variables and probability mass function. Continuous random variables, probability density function and its relation to the distribution function. Calculating probabilities of events defined by random variables. Finding the distribution function of random variables using equivalent events (simple cases).  | A1, A5, A27 | B1, B2, B4 | C1, C2, C4, C22 | D4, D5, D9, D10 |
| Expectation of a random variable and of a function of a random variable. Variance of a random variable. Basic properties of expectation and variance.  | A1, A5 | B10, B20 |  |  |
| The Binomial, Normal and Poisson distributions.  | A1, A5 |  |  |  |
| Bernoulli trials. The geometric and negative binomial distribution. The sample proportion as an estimator to the general proportion. Poisson and Normal approximation to Binomial.  | A1, A5 |  |  |  |
| Random samples and populations. Simple statistics and their distributions. Sample mean as an estimator of the population mean. Properties of the sample mean. Sample variance as an estimator of the population variance. Unbiasedness.  | A1, A5 |  |  |  |

**5. Teaching and Learning Methods**

4.1- Class Lectures

4.2- Use of S/W packages and system for numerical methods and simulation.

**6. Teaching and Learning Methods for students with limited capability**

 Using data show

 e-learning management tools

**7. Students Evaluation**

**a) Used Methods**

5.1- Problem-solving assignments

**b) Time**

Assessment 1: Sheet 1 Week 4

Assessment 2: Sheet 2 Week 7

Assessment 3: Midterm Exam Week 10

Assessment 5: final written exam Week 15

**c) Grades Distribution**

Reports and presentations 35%

Attendance and Participation 5%

Final-term Examination 60%

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 Total 100%

Any formative only assessments

**List of Books and References**

**a) Notes**

Course Notes

- Handouts

**b) Mandatory Books**

 **Title:** [A First Course in Probability](http://130.88.3.194/TalisPrism/doSearch.do?REF=%3C1=%221.0%22%3E%3C2%3E%3C3%3E%3CAnd%3E%3C3%3E%3C=%3E%3C4%3Eauthor%3C/4%3E%3C5%3ERoss%3C/5%3E%3C/=%3E%3C/3%3E%3C3%3E%3C=%3E%3C4%3Etitle%3C/4%3E%3C5%3Efirst+course%3C/5%3E%3C/=%3E%3C/3%3E%3C/And%3E%3C/3%3E%3C7%3E%3C%3C9%3E%3C8%3E1%3C/8%3E%3C/%3C9%3E%3C/7%3E%3C/2%3E%3C6=%22talislms%22+%3E%3C/6%3E%3C/1%3E&interface=Webpage), 6th edition

 **Author(s):** S. Ross

 **Publisher:** Prentice Hall, 2005

 **ISBN:** 978-0130338518

**c) Suggested Books**

 **Title:** Elementary Probability

 **Author(s):** D. Stirzaker

 **Publisher:** Cambridge University Press, 2004

 **ISBN:** 978-0521421836

**d) Other publications**