## COURSE PROFILE

| Course Name | Code | Semester | Term | Theory +PS+Lab. (hour/week) | Local Credits | ECTS |
|---|---|---|---|---|---|---|
| Probability | MATH 230 | Fall | 3 | 3+1+0 | 3 | 5 |

| Prerequisites | None |
|---|---|

| Course Language | English |
|---|---|
| Course Type | Required |
| Course Lecturer | Assist.Prof. Deniz Karlı |
| Course Assistant | Erinç Özden |
| Course Objectives | The aim of the course is to introduce students to the concepts of probability. Probability is necessary to understand basic modeling and statistical techniques in engineering and in other disciplines. The students learn how to describe quantitatively unpredictable occurrences by using methods and concepts from probability theory. |
| Course Learning Outcomes | By the end of the course the students should be able to:<br>• understand the basic knowledge on fundamental probability concepts, including random variable, probability of an event, additive rules and conditional probability<br>• compute probabilities and moments such as the expected value and variance of random variables and combinations/functions of random variables<br>• recognize and interpret a variety of deterministic and nondeterministic random processes that occur in engineering<br>• solve problems independently |
| Course Content | Basic topics in probability. Probability axioms, sample space, conditional probability, counting methods. Discrete random variables; probability mass function, families of discrete random variables, expectations, function of a random variable, variance and standard deviation. Continuous random variables; distribution function, probability density function, expected values, families of continuous random variables, the normal distribution. Pairs of random variables; joint distribution function, marginal, joint probability function, functions of two random variables, variance, covariance and correlation concepts, moment generating function, central limit theorem. |

## COURSE CONTENT

| Week | Subjects | Related Preparation |
|---|---|---|
| 1 | The Basic Principle of Counting; Permutations; Combinations; Multinomial Coefficients. | Chapter 1 |

| 2 | Sample Space and Events; Axioms of Probability | Chapter 2 |
|---|---|---|
| 3 | Some Simple Propositions; Sample Spaces Having Equally Likely Outcomes | Chapter 2 |
| 4 | Conditional Probabilities; Baye's Formula & ODDS Notation. | Chapter 3 |
| 5 | Independent Events; P(.|F) is a Probability | Chapter 3 |
| 6 | Random Variables; Discrete Random Variables; Expected Value; Expectation of a Function of a Random Variable | Chapter 4 |
| 7 | Variance; Bernoulli and Binomial R.V.; Poisson R.V.; Geometric R.V. | Chapter 4 |
| 8 | Expected Value of Sums of R.V.s; Properties of the Cumulative Distribution Function | Chapter 4 |
| 9 | Expectation and Variance of Continuous R.V.s; The uniform R.V.; Normal R.V.s | Chapter 5 |
| 10 | Exponential R.V.s; Distribution of a Function of a R.V | Chapter 5 |
| 11 | Joint Distribution Functions; Independent R.V.s; Sums of Independent R.V.s | Chapter 6 |
| 12 | Conditional Distributions: Discrete Case; Conditional Distributions: Continuous Case | Chapter 6 |
| 13 | Expectation of Sums of R.V.s; Covariance, Variance of Sums and Correlation; Conditional Expectation | Chapter 7 |
| 14 | Moment Generating Function ; Inequality and The WLOLN; Central Limit Theorem | Chapter 7, Chapter 8 |

| **Course Textbooks** | Sheldon Ross, A First Course in Probability, Pearson, 8th Edition |
|---|---|
| **Recommended References** | Yates, R. D. and Goodman, D. J., *Probability and Stochastic Processes,* John Wiley & Sons, 2004 |

| **Semester Requirements** | **Number** | **Percentage of Grade** |
|---|---|---|
| Attendance/Participation | 1 | 5 |
| Laboratory | - | - |
| Application | - | - |
| Special Course Internship (Work Placement) | - | - |

| | | |
|---|---|---|
| Quizzes/Studio Critics | - | - |
| Homework Assignments | 13 | - |
| Presentation | - | - |
| Project | - | - |
| Seminar/Workshop | - | - |
| Midterms/Oral Exams | 2 | 60 |
| Final/Resit Exam | 1 | 35 |
| **Total** | 17 | 100 |

| | | |
|---|---|---|
| **PERCENTAGE OF SEMESTER WORK** | 16 | 65 |
| **PERCENTAGE OF FINAL WORK** | 1 | 35 |
| **Total** | 17 | 100 |

| Course Category | | |
|---|---|---|
| | Core Courses | X |
| | Major Area Courses | |
| | Supportive Courses | |
| | Media and Managment Skills Courses | |
| | Transferable Skill Courses | |

## COURSE'S CONTRIBUTION TO PROGRAM

| # | Program Qualifications / Outcomes | * Level of Contribution | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| 1 | To have a grasp of basic mathematics, applied mathematics and theories and applications of statistics. | | | | | X |
| 2 | To be able to use theoretical and applied knowledge acquired in the advanced fields of mathematics and statistics, | | | | | X |
| 3 | To be able to define and analyze problems and to find solutions based on scientific methods, | | | | | X |
| 4 | To be able to apply mathematics and statistics in real life with interdisciplinary approach and to discover their potentials, | | | | | X |

| No | Program Outcomes | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| 5 | To be able to acquire necessary information and to make modeling in any field that mathematics is used and to improve herself/himself, | | | | | X |
| 6 | To be able to criticize and renew her/his own models and solutions, | | | | | X |
| 7 | To be able to tell theoretical and technical information easily to both experts in detail and nonexperts in basic and comprehensible way, | | | | X | |
| 8 | To be able to use international resources in English and in a second foreign language from the European Language Portfolio (at the level of B1) effectively and to keep knowledge up-to-date, to communicate comfortably with colleagues from Turkey and other countries, to follow periodic literature, | | | | X | |
| 9 | To be familiar with computer programs used in the fields of mathematics and statistics and to be able to use at least one of them effectively at the European Computer Driving Licence Advanced Level, | X | | | | |
| 10 | To be able to behave in accordance with social, scientific and ethical values in each step of the projects involved and to be able to introduce and apply projects in terms of civic engagement, | | | | X | |
| 11 | To be able to evaluate all processes effectively and to have enough awareness about quality management by being conscious and having intellectual background in the universal sense, | | | | X | |
| 12 | By having a way of abstract thinking, to be able to connect concrete events and to transfer solutions, to be able to design experiments, collect data, and analyze results by scientific methods and to interfere, | | | | | X |
| 13 | To be able to continue lifelong learning by renewing the knowledge, the abilities and the compentencies which have been developed during the program, and being conscious about lifelong learning, | | | | X | |
| 14 | To be able to adapt and transfer the knowledge gained in the areas of mathematics and statistics to the level of secondary school, | | | | X | |
| 15 | To be able to conduct a research either as an individual or as a team member, and to be effective in each related step of the project, to take role in the decision process, to plan and manage the project by using time effectively. | | | X | | |

*1 Lowest, 2 Low, 3 Average, 4 High, 5 Highest

**ECTS ALLOCATED BASED ON STUDENT WORKLOAD BY THE COURSE DESCRIPTION**

| Activities | Number | Duration (Hours) | Total Workload |
|---|---|---|---|
| **Course Hours (Including Exams)** | 14 | 3 | 48 |

| | | | |
|---|---|---|---|
| **Tutorials** | 14 | 2 | 28 |
| **Laboratory** | - | - | - |
| **Application** | - | - | - |
| **Special Course Internship (Work Placement)** | - | - | - |
| **Field Work** | - | - | - |
| **Study Hours Out of Class** | 14 | 1 | 14 |
| **Presentations / Seminar** | - | - | - |
| **Project** | - | - | - |
| **Preparatory  reading** | 13 | 1 | 13 |
| **Homework Assignments** | 13 | 1 | 13 |
| **Quizzes** | - | - | - |
| **Midterm  Exams** | 2 | 3 | 6 |
| **Final / Resit Exam** | 1 | 3 | 3 |
| | | **Total Workload** | **125** |

## COURSE CATEGORY

| ISCED GENERAL AREA CODES | GENERAL AREAS | ISCED BASİC AREA CODES | BASIC EDUCATIONAL AREAS | |
|---|---|---|---|---|
| 1 | Education | 14 | Teacher Training and Educational Sciences | 0 |
| 2 | Humanities and Art | 21 | Art | 0 |
| 2 | Humanities and Art | 22 | Humanities | 0 |
| 3 | Social Sciences, Management and Law | 31 | Social and Behavioral Sciences | 0 |
| 3 | Social Sciences, Management and Law | 32 | Journalism and Informatics | 0 |
| 3 | Social Sciences, Management and Law | 38 | Law | 0 |
| 4 | Science | 42 | Life Sciences | 0 |
| 4 | Science | 44 | Natural Sciences | 0 |

| 4 | Science | 46 | Mathematics and Statistics | 100 |
|---|---|---|---|---|
| 4 | Science | 48 | Computer | 0 |
| 5 | Engineering, Manufacturing and Civil | 52 | Engineering | 0 |
| 5 | Engineering, Manufacturing and Civil | 54 | Manufacturing and Processing | 0 |
| 5 | Engineering, Manufacturing and Civil | 58 | Architecture and Structure | 0 |
| 6 | Agriculture | 62 | Agriculture, Forestry, Livestock, Fishery | 0 |
| 6 | Agriculture | 64 | Veterinary | 0 |
| 7 | Medicine and Welfare | 72 | Medical | 0 |
| 7 | Medicine and Welfare | 76 | Social Services | 0 |
| 8 | Service | 81 | Personal Services | 0 |
| 8 | Service | 84 | Transport Services | 0 |
| 8 | Service | 85 | Environment Protection | 0 |
| 8 | Service | 86 | Security Services | 0 |