

**UNIVERSITY OF CHEMICAL TECHNOLOGY AND METALLURGY  
CENTER OF MATERIAL SCIENCE**

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Confirmed by:.....

**SYLLABUS**

Subject: **STATISTICS**

Specialty: Material Science and Engineering

Degree: Maser of science

Prepared by:

/ Assoc. Prof. PhD V. K. Tzotchev /

Center of Material Science

Head of the Center:

/ Prof. Dsc. Donka Angelova /

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# SYLLABUS

## STATISTICS

No	Type of classes	Semester	Total hours
1	Lectures	1	30
2	Exercises	1	20
3	Assessment (Method of Evaluation)	Exam	

### COURSE DESCRIPTION

The goal of the course is to help engineers incorporate statistical methods in their work. This is an introductory course covering basic statistical ideas. Many engineer programs require a single course in probability/statistics. However, it is difficult to get to the heart of basic statistical techniques and principals in a single course. Typically introductory course on engineering statistics spend a great deal of time on basic probability ideas. In fact, basic probability can easily fill up a standard introductory course. Because engineering students often have only one probability/statistics course, the material needs to be reorganized in order to allow for coverage of statistical methodology.

No previous familiarity with probability or statistics is assumed. The mathematics is kept as simple as possible. However, students should be conversant with basic linear algebra (vectors and matrices) and calculus (derivatives, and integrals). In addition elementary computer skills is also used for much routine data analysis.

## **TOPICS**

1. DESCRIPTIVE STATISTICS- 3h
2. PROBABILITY- 1.5h
3. DISCRETE RANDOM VARIABLES AND DISTRIBUTION- 1.5h
4. CONTINUES RANDOM VARIABLES AND DISTRIBUTION- 3h
5. ESTIMATION: POINT AND INTERVAL ESTIMATOR- 2h
6. TEST OF HYPOTHESES (SIGNIFICANT TESTS) - 1.5h
7. ANALYSIS OF VARIANCE (ANOVA). ONE-WAY ANOVA- 1.5h
8. SIMPLE LINEAR REGRESSION- 1.5h
9. FITTING MODELS TO DATA. ESTIMATION OF THE PARAMETERS IN LINEAR REGRESSION MODELS. MULTIPLE REGRESSION ANALYSIS - 3h
10. DESIGN OF EXPERIMENT. DESIGNS FOR FITTING FIRST-ORDER MODELS- 1.5h
11. DESIGNS FOR FITTING SECOND-ORDER MODELS- 1.5h
12. RESPONSE SURFACE METHODOLOGY TO PROCESS OPTIMIZATION – 1.5h
13. EXPERIMENTAL DESIGNS AND MODELS FOR MIXTURE EXPERIMENTS- 3h
14. PRODUCT AND SYSTEM RELIABILITY- 2h
15. QUALITY CONTROL- 2h

## **EXERCISES**

1. Discrete random variable. Binomial and Poisson distribution – 2h
2. Continues random variable. Normal distribution – 2h
3. Eestimation of the mean, standard deviation and correlation coefficient between two variables. Confidence intervals – 2h
4. Significant test on a sample mean. Comparing two sample means. The F-test – 2h
5. Fitted line plot – 2h
6. Multiple regression analysis – 2h
7. Full factorial design – 2h
8. Central composite designs and their application for graphical optimisation. RSM – 2h
9. Simplex-lattice designs – 2h
10. Designing experiments for constrained regions – 2h

## **REFERENCE**

1. Box, G.E.P., N. Draper (1987). Empirical Model-Building and Response Surfaces. John Wiley & Sons, New York
2. Chatfield, C. (1981). Statistics for Technology. A Course in Applied Statistics. Chapman and Hall, London, New York
3. Cornell, J.A., (2002), EXPERIMENTS WITH MIXTURES: Designs, Models and the Analysis of Mixture Data, 3rd Edition, John Wiley & Sons, Inc., New York
4. Mendenhall W., T. Sincich (1992). Statistics for Engineering and the Sciences, Third Edition, Dellen Publishing Company, San Francisco.
5. Montgomery, D.C. (1997). Design and Analysis of Experiments. Fourth Edition, John Wiley & Sons, New York
6. Triola, M.F. (1997). Elementary Statistics, Sixth Edition, Eddison-Wesley Publishing Company, Reading, Massachusetts
7. Walpole, R. E., R. Myers, S. Myers (1998). Probability and Statistics for Engineers and Scientists, Sixth Edition, Prentice Hall International, Inc.
8. Weiss, N. A. (1999). Elementary Statistics, Fourth Edition, Eddison-Wesley, Reading, Massachusetts
9. <http://www.statsoft.com/textbook/stathome.html>