M. Sc. Program in Statistics

The plan of study for the Department of Statistics and Operations Research
Specialization: Statistics
Degree: Masters degree of Science

Compulsory courses		
Course Code	**Name of course**	**Unit**
STAT 520	Theory of statistics I	3
STAT 531	Analysis of variance	3
STAT 533	Regression analysis	3
STAT 559	Theory of statistics II	3
STAT 570	Stochastic processes I	3

Optional courses		
Course Code	**Name of course**	**Unit**
STAT 523	Special topics in Statistics	3
STAT 532	Analysis of biomedical categorical data	3
STAT 534	Design of experiments	3
STAT 536	Nonparametric statistics	3
STAT 556	Linear models	3
STAT 557	Order Statistics	3
STAT 558	Time Series Analysis	3
STAT 574	Survival analysis	3
STAT 576	Sample survey	3
STAT 578	Applied multivariate Analysis	3
OPER 563	Theory of reliability and life testing	3

Statistics Course Description

STAT 520: Theory of Statistics (I) **Credit hours: 3**

Theory of probability. Probability spaces, continuous and discrete distributions, functions of random variables, multivariate distributions, expectation, conditional expectation, characteristic functions, central limit theorem, useful convergence results, sampling distributions of order statistics, empirical distribution function.

STAT 523: Special Topics in Statistics **Credit hours: 3**

This course offers either some important topics which are not included in other enlisted courses or some special research topics of current research interest.

STAT 531: Analysis of Variance **Credit hours: 3**

Analysis of variance for one-way, two-way and higher-way classification models. Analysis of standard designs and factorial experiments. Multiple comparisons, orthogonal contrasts, and regression. Analysis using concomitant information. Some consideration of non-orthogonal data.

STAT 532: Analysis of Biomedical Categorical Data **Credit hours: 3**

Categorical response data. Methods for rats and proportions. Describing two-way contingency tables. Models for binary response variable. Loglinear models. Fitting loglinear and logit models. Building and applying loglinear models. Loglinear - logit models for ordinal variables. Multi-nominal response models. Models for matched pairs. Analysis of repeated categorical response data.

STAT 533: Regression Analysis **Credit hours: 3**

Multiple linear regression; Residual analysis; Polynomial regression; Indicator variables; Model building and variable selection; Non-linear and robust regression.

STAT 534: Design of Experiments **Credit hours: 3**

Basic concepts; Blocking as a method of improving precision; RCB designs; LS and GLS designs (construction); Factorial experiments; 2n factorial experiments; Confounding and fractional replications; 3n factorial experiments; BIB designs; Youden & Lattice designs; PBIB designs; Response surface designs.

STAT 536: Non-parametric Statistics **Credit hours: 3**

Classes of distribution-free statistics; linear rank statistics and their applications to location, scale, scale and location problems; one, tow- and multiple-sample problems; Non-parametric estimation; asymptotic distributions; Goodness of fit tests.

STAT 556: Linear Models **Credit hours: 3**

Generalized inverse of matrices; Distribution of quadratic forms; Non-full rank models; estimable functions; General linear hypothesis; One-way and two-way classifications (nested \& crossed); Some aspects of random effects and mixed-effects models.

STAT 557: Order Statistics **Credit hours: 3**

Basic theory of distributions of order statistics and their applications in quantile confidence intervals and in tolerance limits; Moments of order statistics; Application of order statistics in estimation and hypothesis testing.

STAT 558: Time Series Analysis **Credit hours: 3**

Time series as a stochastic process; Stationarity; orthogonal decomposition of time series (Wald's decomposition); ergodic theorems in time series (estimation of the series moments); auto-correlation and auto-covariance functions and their properties; Hilbert spaces [projection theorem, m. s. convergence, conditional expectation and best linear prediction in L2, (; P); Fourier series] stationary ARMA processes, spectral representation of stationary process.

STAT 559: Theory of Statistics (II) **Credit hours: 3**

Methods of point estimation, properties of estimators, confidence intervals. Hypothesis testing, uniformly most powerful tests, likelihood ratio tests, univariate normal inference. Some aspects of sequential testing, decision theory and analysis of categorical data.

STAT 574: Survival Analysis **Credit hours: 3**

Survival data and distributions. Survival data models. Inference in parametric models. The proportional hazards model Statistical computer packages for survival analysis. Likelihood construction. Inference based on ranks in the accelerated failure time model.

STAT 576: Sample Survey **Credit hours: 3**

Theory and application of commonly used sampling techniques. Simple and stratified random sampling; cluster, multistage and systematic sampling. Estimation of parameters: ratios, regression coefficients, and correlation linearization, jackknife and bootstrap. Selected topics: model-based estimation, regression analysis from complex survey data. Relevant computer packages.

STAT 578: Applied Multivariate Analysis **Credit hours: 3**

The multivariate normal distribution; estimation of the mean vector and the covariance matrix. The distribution of the sample covariance matrix and the sample generalized variance. Techniques for analyzing multivariate data. Emphasis on MANOVA and tests on the structure of the dispersion matrix. Topics will include discriminant, factor, profile, and cluster analysis. Data analysis will be done using relevant computer packages

OPER 563: Reliability and Life Testing **Credit hours: 3**

Structural properties of coherent systems. Reliability of coherent systems. Classes of life distributions based on ageing notions. Concepts of positive and negative dependence. Point and interval estimation procedure for life testing distributions. Testing reliability hypothesis.