

## **Ph. D. Program in Statistics**

**The plan of study for the Department of Statistics and Operations Research**

**Specialization: Statistics**

**Degree: PH. D. degree of Science**

<b>Compulsory courses</b>		
<b>Course Code</b>	<b>Name of course</b>	<b>Unit</b>
STAT 611	Probability theory I	3
STAT 621	Statistical Inference I	3
STAT 622	Statistical Inference II	3

<b>Optional courses</b>		
<b>Course Code</b>	<b>Name of course</b>	<b>Unit</b>
STAT 612	Probability theory II	3
STAT 613	Stochastic Process II	3
STAT 623	Survival analysis	3
STAT 624	Theory of nonparametric statistics	3
STAT 625	Advanced topics in experimental design	3
STAT 626	Theory of time series	3
STAT 627	Generalized linear models	3
STAT 628	Multivariate analysis	3
STAT 629	Special topics in statistics	3

# Statistics Course Description

## **STAT 611 Probability theory I**

**Credit hours: 3**

Probability spaces in the framework of measure theory; Random variables as measurable function; Modes of convergence; Dominated convergence theorem: Distribution functions; Decomposition of a distribution function; Convergence of distribution functions; Weak compactness theorem and Helly-Bray lemma.

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## **STAT 612 Probability theory II**

**Credit hours: 3**

Summability of independent random variable, laws of large numbers, convergence in distribution, characteristic functions, uniqueness and continuity theorems, the Lindeberg-Feller central limit theorem, degenerate convergence criterion

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## **STAT 613 Stochastic Processes**

**Credit hours: 3**

Continuous time Markov processes. The Poisson and allied processes. The Kolmogorov equations. Renewal theory.

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## **STAT 621 Statistical inference I**

**Credit hours: 3**

Sufficiency, completeness likelihood, multiparameter estimation; linear estimation; maximum likelihood estimation; Bayesian estimation; large sample properties and procedures.

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## **STAT 622 Statistical inference II**

**Credit hours: 3**

Testing statistical composite hypotheses; invariance principles, Bayesian statistics, large sample properties and procedures.

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## **STAT 623 Survival analysis**

**Credit hours: 3**

Theory of analysis of randomly right censored failure time data: failure time models, inference in parametric models, the proportional hazards model, likelihood construction of failure time data, rank analysis in accelerated failure time models.

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## **STAT 624 Theory of nonparametric statistics**

**Credit hours: 3**

Theoretical foundations of nonparametric statistics: theory of U-statistics, Noether's theorem and Pitman asymptotic relative efficiency, estimation and hypothesis testing with one and two sample location (scale) models, theory of linear rank statistics, applications to general linear models analyses.

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## **STAT 625 Advanced topics in experimental design**

**Credit hours: 3**

The general  $p^n$  factorial stem; split-plot experiments, blocking, fractional replication. Quasi factorial or lattice designs. Incomplete block designs - constructions and analysis. Response surface designs - objective, models and criteria. Continuous design theory; optimal design measure and some simple equivalence results. Multiresponse experiments. Designs for non-linear models.

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**STAT 626 Theory of time series** **Credit hours: 3**

The Ito calculus and stochastic differential equations, stochastic integrals, ergodic theorems. Non-stationary time series and evolutionary spectra. Prediction, filtering and control of non-stationary processes. Nonlinear (bilinear, threshold, and exponential autoregressive) time series models. Special topics in recent time series research.

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**STAT 627 Generalized linear models** **Credit hours: 3**

Theory of generalized linear models, quasi-likelihood models, higher order asymptotic, generalized estimating equa, GLIM computer package.

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**STAT 628 Multivariate analysis** **Credit hours: 3**

Singular transformations and the generalized Jacobian. The multivariate normal distribution, Wishart distribution, and the U distribution. Distribution of the latent roots of one Wishart matrix in the metric of another. Noncentral counterparts of these distributions. Introduction of zonal polynomials.

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**STAT 629 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.

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