



**Iligan Institute of Technology**  
of the Mindanao State University  
Quality Education for a better Mindanao

## **MASTER OF SCIENCE IN STATISTICS**

### **Introduction**

The M.S. Statistics program is the first and so far the only such degree program being offered in the Mindanao and Visayas regions. It is especially designed to provide the knowledge, skills and training one needs in professionalizing his career in statistics and is a prerequisite program for those who intend to pursue a doctorate in statistics.

A two-year degree program, the M.S. Statistics covers in-depth studies in statistical theories and concepts coupled with actual field surveys and use of statistical software.

### **Objectives**

1. Develop a new breed of intellectuals to initiate and promote the growth of statistics, which is an indispensable tool for research and development, in this region.
2. Provide government agencies and industries with employees who are competent to handle sensitive tasks such as: evaluate government programs, formulate policies, and conduct researches.

### **Admission Requirements**

In addition to the requirements of the University for admission into the Graduate School, an applicant must possess a baccalaureate degree in either mathematics or statistics, or must be able to satisfy the minimum requirements as determined by the Graduate Committee.

### **Degree Requirements**

The student must:

1. complete a total of 36 units of approved coursework which includes 6 units of master's thesis;
2. pass the comprehensive examination in all core and required courses which the exam must be taken after successful completion of all the core and required courses; and
3. defend a thesis successfully.

**MASTER OF SCIENCE IN STATISTICS (MS STAT)**  
(LIST OF COURSES BY SEMESTER)

**First Year, First Semester**

Course No.	Course Title	Units	Hrs/Wk			Pre-requisite(s)
			Lec	Lab	Total	
Stat 331	Theory of Probability	3	3	0	3	Math 112
Stat 342	Sampling Designs	3	3	0	3	Stat 131
Stat 325	Statistical Computing I	2	1	3	4	Math 108 or CSc 11
	Total	8	7	3	10	

**First Year, Second Semester**

Course No.	Course Title	Units	Hrs/Wk			Pre-requisite(s)
			Lec	Lab	Total	
Stat 332	Theory of Statistical Inference	3	3	0	3	Stat 331
Stat 351	Linear Models	3	3	0	3	Stat 132
Stat Elective		3	3	0	3	Stat 331
	Total	9	9	0	9	

**Second Year, First Semester**

Course No.	Course Title	Units	Hrs/Wk			Pre-requisite(s)
			Lec	Lab	Total	
Stat 358	Multivariate Analysis	3	3	0	3	Stat 351
Stat Elective		3	3	0	3	Stat 331
Stat Elective		3	3	0	3	Stat 331
Stat 398	Graduate Seminar	1	1	0	1	Stat 332
	Total	10	10	0	10	

**Second Year, Second Semester**

Course No.	Course Title	Units	Hrs/Wk			Pre-requisite(s)
			Lec	Lab	Total	
Stat Elective		3	3	0	3	Stat 331
Stat 400	Master's Thesis	6	0	0	0	
	Total	9				

**TOTAL NUMBER OF UNITS: 36**

\* May be chosen from the list of electives in Option A (Computational Statistics) or in Option B (Mathematical Statistics), depending on the student's interest.

**COURSES OFFERED**

Core Courses

Stat 331      Theory of Probability  
 Stat 332      Theory of Statistical Inference  
 Stat 342      Sampling Designs  
 Stat 351      Linear Models  
 Stat 358      Multivariate Analysis

Required Course

Stat 325      Statistical Computing I

## Electives

Four (4) subjects or twelve (12) units to be chosen from the list of electives in Option A or in Option B, depending on the student's interest.

### Option A (Computational Statistics)

Stat 326	Statistical Computing II
Stat 343	Categorical Data Analysis
Stat 353	Econometric Methods
Stat 354	Survival Analysis
Stat 355	Time Series Analysis
Stat 359	Neural Networks
Stat 360	Environmental Statistics
Stat 362	Nonparametric Methods
Stat 364	Statistical Quality Control
Stat 365	Operations Research
Stat 371	Special Topics in Statistics

### Option B (Mathematical Statistics)

Stat 356	Chaos Theory
Stat 357	Fuzzy Sets
Stat 361	Bayesian Analysis
Stat 363	Robust Statistics
Stat 366	Stochastic Processes
Stat 367	Decision Theory
Stat 368	Density Estimation
Stat 371	Special Topics in Statistics
Stat 398	Graduate Seminar
Stat 400	Master's Thesis

## CATALOGUE OF COURSES

### STAT 325 STATISTICAL COMPUTING I

Introduction to scientific computing which includes programming tools, modern programming methodologies, design of data structure and algorithms, numerical computing and graphics, and use C++ for several substantial scientific programming projects.

Credits : 2 units (1 hr lec, 3 hrs lab)  
Prerequisite(s) : Math 108 or CSc 11 (Basic Computer Programming)

### STAT 326 STATISTICAL COMPUTING II

Advance scientific computing which includes programming languages for simulation.

Credits : 3 units (2 hrs lec, 3 hrs lab)  
Prerequisite(s) : Stat 325 (Statistical Computing I)

### STAT 331 THEORY OF PROBABILITY

Sample space, random variables, probability distributions, expectation, convergence of sequences of random variables, laws of large numbers, central limit theorems, characteristic functions, moment generating functions, conditional probabilities.

Credits : 3 units (3 hrs lec, 0 hr lab)  
Prerequisite(s) : Math 112 (Real Analysis I)

### STAT 332 THEORY OF STATISTICAL INFERENCE

Estimation, methods of properties of estimation, tests of hypothesis, characteristic of the test.

Credits : 3 units (3 hrs lec, 0 hr lab)  
Prerequisite(s) : Stat 331 (theory of Probability)

### STAT 342 SAMPLING DESIGNS

Concepts in designing sample surveys, non-sampling errors, simple random sampling, systematic sampling, sampling with varying probabilities, stratified sampling, use of auxiliary variable, cluster sampling, multi-stage sampling, and adaptive sampling.

Credit : 3 units (3 hrs lec, 0 hr lab)  
Prerequisite(s) : Stat 131 (Probability and Probability Distributions)

### STAT 343 CATEGORICAL DATA ANALYSIS

Cross classified tables, multi-dimensional tables, log-linear models, logistic regression, measures of association, inference for categorical data.

Credit : 3 units (3 hrs lec, 0 hr lab)  
Prerequisite(s) : Stat 332 (Theory of Statistical Inference)

STAT 351      LINEAR MODELS

Subspaces and projections, multivariate normal distributions, non-central distributions, distribution of quadratic forms, the generalized linear model of full column rank, tests about the mean and variance, the generalized linear model not of full column rank, estimability and testability, regression analysis.

Credit                : 3 units (3 hrs lec, 0 hr lab)  
Prerequisite(s)    : Stat 132 (Statistical Inference)

STAT 353      ECONOMETRIC METHODS

Dynamic econometric models, simultaneous-equation models and time-series economics.

Credit                : 3 units (3 hrs lec, 0 hr lab)  
Prerequisite(s)    : Stat 332 (Theory of Statistical Inference)

STAT 354      SURVIVAL ANALYSIS

Functions of survival time, estimation and survival functions, survival distributions and their applications, distribution fitting and Goodness-of-Fit test.

Credit                : 3 units (3 hrs lec, 0 hr lab)  
Prerequisite(s)    : Stat 332 (Theory of Statistical Inference)

STAT 355      TIME SERIES ANALYSIS

Descriptive techniques, stationary and non-stationary processes, estimation of process mean and auto-covariance function, invariable Box-Jenkins methodology.

Credit                : 3 units (3 hrs lec, 0 hr lab)  
Prerequisite(s)    : Stat 332 (Theory of Statistical Inference)

STAT 356      CHAOS THEORY

Introduction to dynamical systems and chaos, sensitive dependence, critical points, strange attractors, applications of chaos.

Credit                : 3 units (3 hrs lec, 0 hr lab)  
Prerequisite(s)    : Stat 331 (Theory of Probability)

STAT 357      FUZZY SETS

Fuzzy systems, introduction to fuzzy logic, operations on fuzzy sets, fuzzy relations, the extension principle.

Credit                : 3 units (3 hrs lec, 0 hr lab)  
Prerequisite(s)    : Stat 331 (Theory of Probability)

STAT 358      MULTIVARIATE ANALYSIS

Multivariate normal distribution, multivariate analysis of variance, multivariate regression, principal component analysis, factor analysis, discriminant analysis, cluster analysis, multidimensional scaling, correspondence analysis, canonical correlation analysis, graphical and data oriented techniques.

Credit                : 3 units (3 hrs lec, 0 hr lab)  
Prerequisite(s)    : Stat 351 (Linear Models)

STAT 359      NEURAL NETWORK

Introduction of neural networks, component and structure, application of neural networks, artificial neural networks.

Credit                : 3 units (3 hrs lec, 0 hr lab)  
Prerequisite(s)    : Stat 332 (Theory of Statistical Inference)

STAT 360      ENVIRONMENTAL STATISTICS

Statistics for Ecology, Biology, Chemistry, Forestry and Fishery, sampling strategies, spatial sampling, distance sampling.

Credit                : 3 units (3 hrs lec, 0 hr lab)  
Prerequisite(s)    : Stat 332 (Theory of Statistical Inference)

STAT 361      BAYESIAN ANALYSIS

Bayesian statistical methods, structure of Bayesian inference, sequential experiments, empirical and hierarchical analysis, robustness, numerical procedures.

Credit                : 3 units (3 hrs lec, 0 hr lab)  
Prerequisite(s)    : Stat 332 (Theory of Statistical Inference)

STAT 362      NONPARAMETRIC METHODS

Distribution-free statistics, U-statistics, power functions, asymptotic relative efficiency of tests, confidence intervals and bounds, point estimation, linear rank statistics, other methods of constructing distribution-free distributions.

Credit                : 3 units (3 hrs lec, 0 hr lab)  
Prerequisite(s)    : Stat 332 (Theory of Statistical Inference)

STAT 363      ROBUST STATISTICS

Breakdown point and robust estimators, influential functions, M, R and L estimators, robust tests, robust regression.

Credit                : 3 units (3 hrs lec, 0 hr lab)  
Prerequisite(s)    : Stat 332 (Theory of Statistical Inference)

STAT 364      STATISTICAL QUALITY CONTROL

Principles of statistical quality control in manufacturing: modeling, process quality, control charts, process capability, acceptance sampling, methods and reliability.

Credit                : 3 units (3 hrs lec, 0 hr lab)  
Prerequisite(s)    : Stat 332 (Theory of Statistical Inference)

STAT 365      OPERATIONS RESEARCH

Introduction to operations research, linear programming, dynamic programming, queuing theory and inventory models, PERT-CPM and network analysis.

Credit                : 3 units (3 hrs lec, 0 hr lab)  
Prerequisite(s)    : Stat 331 (Theory of Probability)

STAT 366      STOCHASTIC PROCESSES

Markov chains, Markov processes, Poisson processes, renewal processes, Martingales.

Credit               : 3 units (3 hrs lec, 0 hr lab)  
Prerequisite(s)   : Stat 331 (Theory of Probability)

STAT 367      DECISION THEORY

Basic concepts, risk functions, Bayes and minimax solutions of decision problems, statistical decision problems and functions, information of general decision problems.

Credit               : 3 units (3 hrs lec, 0 hr lab)  
Prerequisite(s)   : Stat 331 (Theory of Probability)

STAT 368      DENSITY ESTIMATION

Methods of density estimation, nonparametric density estimation, optimal properties of estimates, asymptotic properties.

Credit               : 3 units (3 hrs lec, 0 hr lab)  
Prerequisite(s)   : Stat 332 (Theory of Statistical Inference)

STAT 371      SPECIAL TOPICS IN STATISTICS

New development in Statistics.

Credit               : 3 units (3 hrs lec, 0 hr lab)  
Prerequisite(s)   : Stat 332 (Theory of Statistical Inference)

STAT 398      GRADUATE SEMINAR

Thesis proposal preparation and presentation by students.

Credit               : 1 unit  
Prerequisite(s)   : Stat 332 (Theory of Statistical Inference)

STAT 400      MASTER'S THESIS

Research work, explanatory study, or extensive survey on a certain topic in statistics.

Credit               : 6 units  
Prerequisite(s)   : Passed comprehensive examination is a requirement of the oral thesis defense.