



Science Faculty

Study Plan for Bachelor Degree

in

Statistics

2008

Study Plan for Bachelor Degree in Statistics

The Department of Statistics at Yarmouk University offers a Bachelor's Degree on the completion of the following requirements:

1. The fulfillment of the conditions stated in the regulations of awarding the Bachelor's Degree at Yarmouk University No. (2) for the year 1991 and its amendments issued in accordance with the bylaws of awarding academic degrees and diplomas at Yarmouk University No. 76 for the year 1976.
2. University course requirements stated under the above regulations (27 Credit Hrs).
3. Faculty of Science course requirements stated earlier (21 Credit Hrs).
4. Department course requirements:

I. Single Major (86 Credit Hrs.):

(1) Obligatory courses (62 Credit Hrs.):

Stat 105, Stat 111, Stat 201, Stat 205 , Stat 211, Stat 234, Stat 271, Stat 272, Stat 281, Stat 334, Stat 363 , Stat 373, Stat 374, Stat 375, Stat 382, Stat 464, Stat 472 , Stat 483 , Math 102, Math 201, Math 241, Math 251.

(2) Elective courses (24 Credit Hrs.)

A-(12 credit Hrs.): To be chosen from the following courses.

Stat 273, Stat 278, Stat 312, Stat 364, Stat 372, Stat 376, Stat 377, Stat 378, Stat 421, Stat 461, Stat 462, Stat 471, Stat 474, Stat 475, Stat 481, Stat 492, Stat 493, Stat 499.

B- (12 credit Hrs.): To be chosen from the following courses.

Econ 101, Econ 102, PAD 101, PAD 102, Acc 101, Acc 102, B.F 209, B.F 210, BA 160, BA 270, MKT 220, CS 130, Math 203, Math 204, Math 301, Math311, Math 312, Math 321, CIS 103, MIS 120.

**Table (1)
Single Major Credit Hours**

Requirements	Obligatory	Elective	Total
University	21	6	27
Faculty	21	–	21
Department	62	24	86
Total	104	30	134

II. Major / Minor (86 Credit Hrs.):

(1) Major (in Statistics) (65 Credit Hrs.):

a-Obligatory courses (59 Credit Hrs.):

Stat 105, Stat 111, Stat 201, Stat 205 , Stat 211, Stat 234, Stat 271, Stat 272, Stat 281, Stat 334, Stat 373, Stat 374, Stat 375, Stat 382, Stat 464, Stat 472 , Stat 483 , Math102, Math 201, Math 241, Math 251.

b-Elective courses (6 Credit Hrs.): To be chosen from the courses offered by the Department of Statistics and/or from the following courses but outside the Minor.

Econ 101, Econ102, PAD 101, PAD 102, Acc 101, Acc102, B.F 209, B.F 210, BA 160, BA 270, MKT 220, CS 130, Math 203, Math 204, Math 311, Math 312,Math 321, CIS 103, MIS 120.

(2) Minor (21 Credit Hrs.): in any of the Departments of the Faculty of Science, the Departments of the Faculty of Information Technology and Computer Sciences and the Faculty of Economics and Administrative Sciences according to the minor course listing by each Department.

**Table (2)
Major / Minor Credit Hours**

Requirements	Obligatory	Elective	Total
University	21	6	27
Faculty	21	–	21
Department (Major)	59	6	65
Minor			21
Total	104	30	134

III. Minor in Statistics (21 Credit Hrs):

(1) Mathematical Statistics (21 Credit Hrs.):

a-Obligatory courses (15 Credit Hrs.):

Stat 111, Stat 211, Stat 234, Stat 271, Stat 334.

b-Elective courses (6 Credit Hrs.): To be chosen from the courses offered by the Department of Statistics at level of 200 and above.

(2) Applied Statistics (21 Credit Hrs.):

a-Obligatory courses (15 Credit Hrs.):

Stat 201, Stat 271, Stat 373, Stat 374, Stat 375.

b-Elective courses (6 Credit Hrs.): To be chosen from the courses offered by the Department of Statistics at level of 200 and above.

Table (3)
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No.	Title	No.	Title
0	General Statistics	5	-----
1	Theory of Probability	6	Statistical Methods
2	Stochastic Process	7	Applied Statistics
3	Mathematical Statistics	8	Statistical Computing
4	-----	9	Research, Seminar and Special Topics

Table (4)
Courses Offered by the Statistics Department for the Bachelor's Degree in Statistics

No.	Course No.	Course Name	Cr Hrs	Prerequisites
1.	Stat. 100	Statistics for Every Body	3	
2.	Stat. 101	Introduction to Statistics (1)	3	
3.	Stat. 105	Statistical Lab (1)	1	Stat. 101 or Concurrent
4.	Stat. 107	Statistics (Non science students)	3	
5.	Stat. 111	Introduction to Probability (1)	3	
6.	Stat. 201	Introduction to Statistics (2)	3	Stat. 101 or Stat. 107
7.	Stat. 203	Biostatistics (For non Statistics students)	3	Stat. 101
8.	Stat. 205	Statistical Lab (3)	1	Stat. 201 or Concurrent
9.	Stat. 211	Introduction to Probability (2)	3	Stat. 111, Math. 101
10.	Stat. 213	Probability (for Education students)	3	
11.	Stat. 234	Statistical Inference (1)	3	Stat. 211
12.	Stat. 271	Sampling Methods	3	Stat. 111 or Stat 201
13.	Stat. 272	Time Series	3	Stat. 201
14.	Stat. 273	Cluster Analysis	3	Stat. 201
15.	Stat. 278	Operation Research (1)	3	
16.	Stat. 281	Statistical Packages	3	Stat. 201
17.	Stat. 302	Mathematical Statistics (for Education students)	3	Stat. 213
18.	Stat. 312	Probability Theory	3	Stat. 211
19.	Stat. 334	Statistical Inference (2)	3	Stat. 234
20.	Stat. 363	Non Parametric Statistics	3	Stat. 201
21.	Stat. 364	Environmental Statistics	3	Stat. 201
22.	Stat. 372	Applied Biostatistics	3	Stat. 201 or Stat. 203
23.	Stat. 373	Statistical Demography	3	Stat. 101
24.	Stat. 374	Design of Experiments and Analysis of Variance (1)	3	Stat. 201
25.	Stat. 375	Regression Analysis	3	Stat. 201
26.	Stat. 376	Reliability Theory	3	Stat. 234
27.	Stat. 377	Quality Control	3	Stat. 201, Stat. 111
28.	Stat. 378	Operation Research (2)	3	Stat. 278
29.	Stat. 382	Categorical Data Analysis	3	Stat. 201
30.	Stat. 400	Statistical Mathematics (Remedial course for graduate students)	3	Department. Approval
31.	Stat. 401	Statistics & Probability (remedial course for graduate students)	3	Department. Approval
32.	Stat. 421	Stochastic Processes	3	Stat. 211
33.	Stat. 461	Sequential Analysis	3	Stat. 334
34.	Stat. 462	Bayesian Methods	3	Stat. 234

35.	Stat. 464	Multivariate Analysis	3	Stat. 234, Math. 241
36.	Stat. 471	Advance Sampling Methods	3	Stat. 271
37.	Stat. 472	Survey Designs	3	Stat. 271
38.	Stat. 474	Design of Experiments & Analysis of Variance (2)	3	Stat. 374
39.	Stat. 475	Applied Multivariate Data Analysis	3	Stat. 464
40.	Stat. 481	Statistical Computations	3	Stat. 111
41.	Stat. 483	Case Studies	3	Stat. 201+ 4 th year level
42.	Stat. 491	Seminar	1	Department. Approval
43.	Stat. 492	Special Topics in Statistics	3	Department .Approval
44.	Stat. 493	Advanced Topics in Statistics	3	Department .Approval
45.	Stat. 499A	Research Project	1	Department. approval
46.	Stat. 499B	Research Project	2	Department. approval
47.	Stat. 499C	Research Project	3	Department. approval

الخطة الارشادية باللغة الانجليزية

Guide Line Program for the Department of Statistics Students

First year

First Semester		Second Semester	
<u>Course</u>	<u>Credit hours</u>	<u>Course</u>	<u>Credit hours</u>
Stat. 101	3	Stat. 201	3
Stat. 105	1	Stat. 205	1
Math. 101	3	Stat. 111	3
Cs 101	3	Math. 102	3
Univ. req.	3	Univ. req.	3
Univ. req.	3	Faculty req.	3
Total	16 C.H.	Total	16 C.H.

Second year

First Semester		Second Semester	
<u>Course</u>	<u>Credit hours</u>	<u>Course</u>	<u>Credit hours</u>
Stat. 211	3	Stat. 281	3
Stat. 271	3	Stat. 373	3
Math. 201	3	Stat. 312	3
Faculty req.	3	Stat. 272	3
Dept. req.	3	Faculty req.	3
Faculty req.	3	Dept. req.	3
Total	18 C.H.	Total	18 C.H.

Three year

First Semester		Second Semester	
<u>Course</u>	<u>Credit hours</u>	<u>Course</u>	<u>Credit hours</u>
Stat. 234	3	Stat. 334	3
Stat. 374	3	Stat. 375	3
Math. 241	3	Stat. 363	3
Stat. 382	3	Univ. req.	3
Dept.. req.	3	Univ. req.	3
Dept.. req.	3	Dept. req.	3
Total	18 C.H.	Total	18 C.H.

Four year

First Semester		Second Semester	
<u>Course</u>	<u>Credit hours</u>	<u>Course</u>	<u>Credit hours</u>
Stat. 464	3	Stat. 472	3
Stat. 483	3	Univ. req.	3
Univ. req.	3	Univ. req.	3
Univ. req.	3	Dept. req.	3
Dept. req.	3	Dept. req.	3
Total	15 C.H.	Total	15 C.H.

وصف المساقات باللغة الانجليزية

Stat. 100 – Statistics for Every Body

(3 credit hrs.)

Statistics: Brief description of what Statistics is all about, Common areas of use, Steps of scientific research, Types of data and methods of collecting data, Descriptive Statistics: (Summarizing data, one and two way frequency tables, Bar and Pie charts, Stem and leaf displays), Measures of central tendency and variability (mean, median, mode, standard deviation, range), probability and random variables, simple applications of uses of binomial and normal distributions (no Theory), simple index numbers, rates and indices in vital statistics, scatter diagrams and correlation.

Stat. 101 - Introduction to Statistics (1)

(3 credit hrs.)

Collecting data, census and sampling survey, Bias, Types of data. Sampling methods. Describing data using graphical methods , Measures of location and variability. Probability, Random variables and sampling distributions. Point and interval estimate, Simple linear regression, correlation coefficient hypothesis testing for a single population parameter.

Stat. 105 - Statistical Lab (1)

(1 credit hr.)

Experiments to describe data by graphs of frequency tables, calculating some statistical measures (mean, standard deviation, percentiles), calculating probabilities and areas under the curve for distributions of random variables (Binomial, Normal), verifying the Center Limit Theorem, estimating (point and interval) and testing hypothesis for one population mean. All above to be done using statistical package MINITAB.

Stat. 107 - Statistics (Non-science Students)

(3 credit hrs.)

Collecting data, census survey and sampling survey. Types of data. Sampling methods. Descriptive statistics. Probability, discrete and continuous random variables, sampling distributions. Statistical estimation (point and interval). Hypothesis testing. Simple linear regression, correlation coefficient. Index numbers.

Stat. 111 - Introduction to Probability (1)

(3 credit hrs.)

Sets, sample space, methods of enumeration. Axioms of probability, independent events, random variables, probability distribution , Expectation, Chebyshev's Inequality, Moment generating function. Conditional probability. Binomial, Poisson, Normal, Gamma, and other distributions.

Stat. 201 – Introduction to Statistics (2)

(3 credit hrs.)

Inferences concerning the parameters of two populations, Regression and correlation (one and two variables), Design and analysis of experiment (one way and two-way), Categorical data analysis in contingency tables, χ^2 test for goodness of fit and independence. Introduction to nonparametric statistics.

Stat. 203 - Biostatistics (For non Statistics students)

(3 credit hrs.)

Biological data and measures, parametric and non parametric tests for proportions, categorical data analysis (cross-sectional, prospective, retrospective) and relative risks measure, Evaluation of laboratory Tests (specificity, sensitivity and related tests), Efficiency of vaccine, survival functions, Tests for difference in survival curves using clinical life tables, Dose-Response curve and estimating Effective Doses ED_p .

Stat. 205 - Statistical Lab (3) (1 credit hr.)

Statistical inference concerning the parameters of two populations. Analysis of variance and Experimental designs (CRD, RBD, Factorial), correlation and regression analysis, Analysis of categorical data (one-way, two-way contingency tables), χ^2 -test for goodness of fit and independence. All above to be done using statistical package MINITAB, SPSS or any other suitable statistical package suggested by the department.

Stat. 211 – Introduction to Probability (2) (3 credit hrs.)

Multivariate distributions, marginal and conditional distributions, moments of linear combinations of R.V., conditional expectation, multinomial distribution, multivariate hypergeometric distribution, bivariate normal distribution, methods of probability distribution, transformation, moment generating functions, sampling distributions, t-distribution, F-distribution and χ^2 distribution.

Stat. 213 - Probability (Education Students) (3 credit hrs.)

Sets and algebra of sets, counting methods, probability functions, discrete and continuous random variables. Discrete & continuous uniform distribution, binomial distribution, hypergeometric distribution, Poisson distribution, negative binomial distribution, gamma distribution, F distribution, Beta distribution, expected value, variance, moment generating functions, multivariate distributions, marginal distributions, conditional distributions, correlation and independence.

Stat. 234 - Statistical Inference (1) (3 credit hrs.)

Review for methods of determining probability distributions, order statistics, convergence in distribution, convergence in probability, limits of moment generating functions, central limit theorem, point estimation, methods of estimation, properties of estimators, interval estimation, pivotal method, confidence intervals using large samples.

Stat. 271 - Sampling Methods (3 credit hrs.)

Census and sample surveys. Population and sample design. Collecting data, Sampling techniques. (simple, systematic, stratification and stratified random sample). Ratio and regression estimators. Cluster sampling with one and two stages.

Stat. 272 - Time Series (3 credit hrs.)

Classical Decomposition Models, Time Series Regression Models, Exponential Smoothing Models. Stationary Time Series. The Autocorrelation And Partial Autocorrelation Functions. Ordinary Arma Models. Seasonal Arima Models. Steps of Model Building: Identification, Estimation and Diagnostic Checking. Forecasting.

Stat. 273 - Cluster Analysis (3 credit hrs.)

The rule of cluster analysis, Similarity measures, relation between distance, k-means measures. Methods of division of data into groups, linkage methods, descriptive methods (histograms and trees). Statistical Testing analysis for cluster, problems of clustering.

Stat. 278 - Operation Research (1) (3 credit hrs.)

Formulation of LP problems: Solution by graphical method for the case of two variables, sensitivity analysis, resources allocation and scheduling problems, Algebraic solution of LP problems, the simplex method, Duality of LP problems and sensitivity analysis, Transportation and assignment problems, Game theory.

Stat. 281 - Statistical Packages (3 credit hrs.)

Using statistical packages such as SAS, SPSS, MINITAB to do statistical analysis according to different statistical methods. The course includes preparing a term paper using real data to be collected by students.

Stat. 302 – Mathematical Statistics (Education students) (3 credit hrs.)

Review of distributions, functions of random variables, point estimation, maximum likelihood estimation, method of moments for estimation, comparison of estimators, interval estimation, testing hypotheses, most powerful tests, likelihood ratio test.

Stat. 312 - Probability Theory (3 credit hrs.)

Measure theory approach to probability, Sets, fields and σ -fields. Probability distribution, mathematical expectation, Different types of convergence. Moment generating function, some limit theorems for distributions.

Stat. 334 - Statistical Inference (2) (3 credit hrs.)

Testing hypothesis, Neyman-Pearson Lemma, most powerful tests, probability ratio tests, χ^2 - distribution of some quadratic models, stochastically independent test, sufficient statistics, Rao-Blackwell theorem, uniqueness and completeness, exponential families, Cramer-Rao. inequality, UMVUE.

Stat. 363 - Nonparametric Statistics (3 credit hrs.)

Examples of nonparametric statistical methods. Statistical inference for one and two samples problems. Nonparametric measures of association. Some nonparametric goodness of fit tests, Kolomogrov and Simirnov tests.

Stat. 364 - Environmental Statistics (3 credit hrs.)

Basic ideas of Statistical Modeling for environmental applications, causation vs association with environmental factors, limits of detection, spatial statistics and sampling, Geostatistics, Hierarchical modeling.

Stat. 372 - Applied Biostatistics (3 credit hrs.)

Types of data and measurements in biostatistics, Epidemiological studies, biostatistical methods for categorical data analysis, measures of association between risk and response factors, clinical trails and methods of collecting data, clinical life tables and related survival functions, χ^2_{MH} test for comparing survival curves, dose-response curves and EDp estimation methods.

Stat. 373 - Statistical Demography (3 credit hrs.)

Age-sex composition, rates, population growth models, mortality rates (crude and specific) , Direct and indirect methods for adjustment of rates, Life tables and construction of life tables. migration, natality, marriage, and divorce rates and proportions, Census in Jordan, Vital statistics.

Stat. 374 - Design of Experiments and Analysis of Variance (1) (3 credit hrs.)

One way analysis of variance, multiple comparison, model adequacy checking. Randomized block design, Latin square design, Graeco-latin square design. Incomplete block design, factorial designs (2k and 3k designs).

Stat. 375 - Regression Analysis (3 credit hrs.)

Simple linear regression, (least square method, testing and estimation) residuals analysis (model checking), matrix formulation. Simultaneous inference, multiple regression, polynomial regression. Selection of independent variables (model building).

Stat. 376 - Reliability Theory (3 credit hrs.)
Concept of reliability, component and system reliability, reliability of series and parallel systems. Repairable systems, concept of availability. Life distributions: exponential, Weibull, log-normal etc., hazard functions, Complete and censored data, Statistical methods of estimation and inference. Accelerated life testing. Computer simulation.

Stat. 377 - Quality Control (3 credit hrs.)
The concept of quality and causes of quality variation. Shewhart control charts for attributes and variables, operating characteristic functions. Exponentially weighted moving average, control charts for sample averages. Acceptance sampling plans for attributes and variables.

Stat. 378 - Operation Research (2) (3 credit hrs.)
Integer linear programming, non-linear mathematical models: Single Variable Optimization, net work models, non probabilistic and probabilistic Inventory models, Some simple queuing models.

Stat. 382 - Categorical Data Analysis (3 credit hrs.)
 2×2 and $r \times c$ contingency tables, measures of association, Partitioning of chi-square, statistical models for binary data, the generalized linear model, logistic model and loglinear model for multi-dimensional contingency tables analysis.

Stat. 400 - Statistical Mathematics (3 credit hrs.)
(remedial course for graduate students)

Stat. 401 - Statistics and Probability (3 credit hrs.)
(remedial course for graduate students)

Stat. 421- Stochastic Processes (3 credit hrs.)
Random walk, Markov chains, classification of states and processes, Transition matrices. Renewal processes. Expected size of the population. Birth and death processes. Simple and general effect of migration.

Stat. 461 - Sequential Analysis (3 credit hrs.)
Sequential tests of statistical hypotheses. Intervals for the sample size and sequential tests. SPRT. Wald identity. Termination with probability one of SPRT. Confidence bands for sample size and SPRT.

Stat. 462 - Bayesian Methods (3 credit hrs.)
Theory of Bayes, Prior and posterior distributions, Bayesian estimates and testing methods. Decisions and payoff tables. Maximin and minimax principle. Optimal decision using experimental data. Utility and construction of utility tables.

Stat. 464 - Multivariate Analysis (3 credit hrs.)
Some basic concepts of statistics. The multivariate normal distribution, Estimation and tests for the mean vector and covariance matrix. Analysis of variance in case of multivariate data.

Stat. 471 - Advance Sampling Methods (3 credit hrs.)
Sampling theory for simple and stratified samples. Other sampling methods, cluster sampling in two and three stages, double sampling, proportional sampling, unequal probability sampling, distance sampling.

- Stat. 472 - Survey Designs (3 credit hrs.)**
Types of Statistical Studies, Sampling Design and Survey Design, Data collection techniques, Types of errors in Surveys, Steps of Planning and implementation of a Survey, Selection Bias and Non-Response, Questionnaire Design, Sensitive Questions and Randomized Response, Estimation of Rare events, Postal, Telephone Surveys and Other Methods of Measurements, Web. Page and Email Based Surveys, Report Writing. Oral Presentation and Discussion of Students' Projects.
- Stat. 474 - Design of Experiments and Analysis of Variance (2) (3 credit hrs.)**
Models in analysis of variance, multiple comparisons, single factor and multiple factors models. Crossed and nested experiments. Incomplete block designs, factorial designs.
- Stat. 475 - Applied Multivariate Data Analysis (3 credit hrs.)**
Examples of multivariate data. Principle component analysis. Classification and discrimination, canonical correlation analysis, Factor analysis.
- Stat. 481 - Statistical Computations (3 credit hrs.)**
The concepts and methodology of simulation, methods of generating uniform random numbers. Calculating the probability distributions and their percentiles. Methods of generating non-uniform random numbers. Monte Carlo methods for integrations. (Knowing programming language such as FORTRAN or C++ for using IMSL-Package is essential)..
- Stat. 483 - Case Studies (3 credit hrs.)**
There are two parts in this course: First parts consist of reading some papers on statistical application and different case studies and discuss it in the class in terms of the scientific research rules . The second part consist of statistically analyzing some real life data (term paper) and discussing it in the class.
- Stat. 491 – Seminar (1 credit hr)**
- Stat. 492 - Special Topics in Statistics (3 credit hrs.)**
- Stat. 493 - Advanced Topics in Statistics (3 credit hrs.)**
- Stat. 499 A - Research Project (1 credit hr.)**
- Stat. 499 B - Research Project (2 credit hrs.)**
- Stat. 499 C - Research Project (3 credit hrs.)**