



King Saud University
College of Science
Vice Dean Academic Affairs
Study Plans



Statistics Study Plan



Statistics and Research Operation Department

2013-1434H



King Saud University
College of Science
Vice Dean Academic Affairs
Study Plans



Statistics Stud Plan

1 st Semester				
Course Code	Course Title	Pre-Req.	Co-Req.	Credits (Lect.- Exre.-Pract.)
CI 140	Learning, Thinking and Research Skills	-	-	3 (3+0+0)
CHS 150	Health and Fitness (2)	-	-	1 (1+0+0)
ENG 140	English Language (1) (E)	-	-	8 (8+0+0)
MATH 140	Introduction to Mathematics (E)	-	-	2 (1+1+0)
Total of Credit Hours				14

2 nd Semester				
Course Code	Course Title	Pre-Req.	Co-Req.	Credits (Lect.- Exre.-Pract.)
CT 140	Computer Skills (E)	-	-	3 (0+0+3)
MC 140	Communication Skills	-	-	2 (2+0+0)
ENG 150	English Language (2) (E)	ENG 140	-	8 (8+0+0)
MATH 150	Differential Calculus (E)	MATH 140	-	3 (2+1+0)
ENT 101	Entrepreneurship	-	-	1 (1+0+0)
Total of Credit Hours				17

3 rd Semester				
Course Code	Course Title	Pre-Req.	Co-Req.	Credits (Lect. - Exre. - Pract.)
STAT 100	Introduction to Statistics	MATH 150	-	3(2+1+0)
OPER 100	Introduction to Operations Research		STAT 100	4(3+1+0)
MATH 111	Integral Calculus (E)		-	4(3+1+0)
Elective University requirement course			-	2(2+0+0)
Elective University requirement course			-	2(2+0+0)
Optional course from Group B			-	3
Total of Credit Hours				18

4 th Semester				
Course Code	Course Title	Pre-Req.	Co-Req.	Credits (Lect. - Exre. - Pract.)
STAT 105	Statistical Methods	STAT 100	-	4(3+1+0)
CSC 201	Computer Programming (E)	-	-	4(3+1+0)
MATH 244	Linear Algebra (E)	MATH 111	-	3(3+0+0)
MATH 207	Advanced Integral and Differential Calculus (E)		-	3(2+1+0)
STAT 215	Probability (1)	STAT 100 + MATH 111	-	4(3+1+0)
Total of Credit Hours				18

5 th Semester				
Course Code	Course Title	Pre-Req.	Co-Req.	Credits (Lect. - Exre. - Pract.)
CSC 202	Computer programming using MATLAB (E)	CSC 201	-	3(2+1+0)
STAT 223	Theory of Statistics (1)	STAT 215	-	3(2+1+0)
STAT 328	Statistical Packages (E)	STAT 105	-	3(2+1+0)
Elective University requirement course			-	2(2+0+0)
Elective University requirement course			-	2(2+0+0)
Optional course from Group B			-	3(3+0+0)
Total of Credit Hours				16

6 th Semester				
Course Code	Course Title	Pre-Req.	Co-Req.	Credits (Lect. - Exre. - Pract.)
STAT 315	Probability (2) (E)	STAT 215 + MATH 207	-	3(2+1+0)
STAT 319	Theory of Statistics (2) (E)	STAT 222 + MATH 207	STAT 315	3(2+1+0)
STAT 333	Nonparametric Statistical methods	STAT 105	-	3(2+1+0)
STAT 331	Sampling techniques	STAT 223	-	3(2+1+0)
STAT 332	Regression analysis	STAT 328 + MATH 244	-	3(2+1+0)
Optional course from Group B			-	3
Total of Credit Hours				18

7 th Semester				
Course Code	Course Title	Pre-Req.	Co-Req.	Credits (Lect. - Exre. - Pract.)
436 STAT	Time Series and Forecasting	STAT 332	-	3(2+1+0)
437 STAT	Design and Analysis of Experiments	STAT 328	-	3(2+1+0)
438 STAT	Multivariate Statistical Methods	STAT 332	-	3(2+1+0)
497 STAT	Graduation Project (1) (E)		STAT 436 + STAT 438	1(1+0+0)
Optional course from Group A			-	7
Total of Credit Hours				17

8 th Semester				
Course Code	Course Title	Pre-Req.	Co-Req.	Credits (Lect. - Exre. - Pract.)
STAT 439	Data Analysis (E)	STAT 436 + STAT 438	-	3(2+1+0)
STAT 441	Quality control	STAT 319	-	3(3+0+0)
STAT 401	Econometrics (E)	STAT 332	-	3(2+1+0)
STAT 498	Graduation Project(2) (E)	STAT 497	-	2(2+0+0)
Optional decision from Group			-	7
Total of Credit Hours				18

(Lect. – Exer. – Pract.) = (Lecture – Exercise – Practical)



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List of the Elective Courses of the University Requirements

(Student elects 8 credit hours)

Course Code	Course Title	Pre-requisite	Credits (Lect. – Exer. - Pract.)
IC 100	Studies in the Biography of the Prophet	-	2 (2+0+0)
IC 101	Introduction of Islamic Culture	-	2 (2+0+0)
IC 102	Islam and Building up the Society	-	2 (2+0+0)
IC 103	Economic System in Islam	-	2 (2+0+0)
IC 104	Political system in Islam	-	3 (2+0+1)
IC 105	Human Rights	-	3 (2+0+1)
IC 106	Islamic Jurisprudence	-	2 (2+0+0)
IC 107	Ethics of Occupation	-	2 (2+0+0)
IC 108	Contemporary Issues	-	2 (2+0+0)
IC 109	Woman and Her Developmental Role	-	2 (2+0+0)

List of the Elective Courses

Elective courses from the Department (Group A): (Student elects 14 credit hours)				
Course Code	Course Title	Pre-requisite	Co-requisite	Credits (Lect - Exer- Pract)
STAT 231	Population study "Demography"	STAT 100	-	2 (1+1+0)
STAT 325	Decisions Theory	STAT 223	-	3 (2+1+0)
STAT 362	Reliability Theory	STAT 223	-	3 (2+1+0)
STAT 399	Longitudinal Data Analysis	STAT 332	-	3 (2+1+0)
STAT 406	Survival Analysis	STAT 223	-	3 (2+1+0)
STAT 430	Insurance Methods	STAT 326	-	3 (2+1+0)
STAT 432	Survey Methods	STAT 331	-	2 (1+1+0)
STAT 434	Linear Models	MATH 244	-	3 (2+1+0)
OPER 213	Linear Programming	OPER 100	MATH 244	4 (3+1+0)
OPER 322	Inventory Control	OPER 213 + MATH 207	-	3 (2+1+0)
OPER 351	Network Analysis	OPER 213 + CSC 202	-	3 (2+1+0)
OPER 441	Modeling and Simulation	STAT 215 + CSC 201	-	4 (3+1+0)
OPER 472	Stochastic Processes and Queues	OPER 213 + STAT 215	-	4 (3+1+0)



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Elective courses from outside the Department (Group B): (Student elects 9 credit hours)				
Course Code	Course Title	Pre-requisite	Co-requisite	Credits Lect. – Exer. – Pract.)
MATH 225	Introduction to Differential Equations	MATH 207	-	4 (3+1+0)
MATH 352	Numerical Analysis (1)	MATH 244	-	4 (3+1+0)
MATH 382	Real Analysis (1)	MATH 207	-	4 (3+1+0)
ACCT 202	Principles of Cost Managerial Accounting	ACCT 201	-	3
ACCT 311	Accounting for Government and Non-Profit Organizations	ACCT 201	-	3
ACCT 317	Intermediate Accounting (1)	ACCT 201	-	3
ACCT 318	Intermediate Accounting (2)	ACCT 317	-	3
ECON 101	Principles of Microeconomics		-	3
ECON 102	Principles of Macroeconomics	ECON 101	-	3
ECON 201	Microeconomics Analysis	ECON 102	-	3
ECON 202	Macroeconomics Analysis	ECON 102	-	3
ECON 211	Money and Banking	ECON 102	-	3
ECON 314	Islamic Economics	ECON 102	-	3
ECON 317	Managerial Economics	ECON 102	-	3
ECON 318	Transportation and Insurance Economics	ECON 102	-	3
MKT 201	Principles of Marketing	MGT 101 Econ 101	-	3
FIN 200	Principles of Finance	ACCT 201	-	3
FIN 210	Corporate Finance	FIN 200	-	3
FIN 220	Investment Essentials	FIN 200	-	3
FIN 230	Financial markets and institutions	FIN 200	-	3
FIN 240	Principles of Risk & Insurance	FIN 200	-	3
FIN250	International Finance	FIN 200	-	3
QUA 127	Mathematics of Finance	MATH 140	-	3

List of service courses to other Specialization and Colleges.

Course Code	Course Title	Credits (Lect. – Exer.- Pract.)	College of
STAT 100	Introduction to Statistics	3 (2+1+0)	GEO - MATH - OPER - Agriculture
STAT 105	Statistical Methods	4 (3+1+0)	OPER + Math
STAT 106	Biostatistics	2 (1+1+0)	MBIO – ZOOL -Agriculture
STAT 122	Applied statistics (1)	3 (2+1+0)	Agriculture - Arts
STAT 145	Biostatistics	2 (1+1+0)	Health Science
STAT324	Probability and statistics for Engineers and scientists	3 (2+1+0)	Engineering - Computer Sciences - Architecture and Planning



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Short Courses Description

I- Compulsory courses from the Department [credit hours (Lect. – Exer. – Pract.)]

STAT 100: Introduction to Statistics

3(2+1+0)

Descriptive statistics - Measures of central tendency - Measures of dispersion - Basic probability concepts - Conditional probability - Expectation - Variance - Bayes law- Random variables - Probability distribution - Binomial distribution - Poisson distribution - Hypergeometric distribution - Normal distribution – Applications by Excel.

OPER 100: Introduction to Operations

4(3+1+0)

History and nature of Operations Research. Introduction to system analysis. Problem investigation and formulation. Linear programming models and graphical solutions. Sensitivity analysis. Transportation problem. Assignment problem. Introduction to graph theory and optimization in networks: The shortest path problem . Introduction to stochastic models in operations research.

STAT 105 Statistical Methods

4(3+1+0)

Some Statistical distributions - Sampling distributions - Central limit theorem - Chebychev's inequality - Interval estimation - Testing hypotheses (two populations case) - Introduction to experimental designs (CRD and RBD)- Analysis of variance (one and two ways) - Regression (simple) - Correlation (Pearson and Spearman) - Chi square tests and application - Some nonparametric tests.

STAT 215: Probability (1)

4(3+1+0)

Random variables and probability distributions (Discrete and continuous) - Famous discrete and continuous probability distributions – Random vectors - Expectation and variation - Discrete bivariate probability distributions - Marginal and conditional probability distributions - Independence - correlation and covariance - Moments and moment generating function - Distributions of Function of one and two random variable.

STAT 223: Theory of Statistics (1)

3(2+1+0)

Sampling distributions - Central limit theorem - Point Estimation - Properties of estimator: unbiasedness - mean square error - consistency - sufficiency - minimal sufficiency - Exponential family - Uniformly Minimum Variance Unbiased Estimator - Cramer-Rao inequality - Fisher's information - Rao-Blackwell theorem - sufficiency and completeness - Lehmann-Sheffe theorem - Methods of Estimation: Method of Moments - Maximum Likelihood estimators and their properties including asymptotic properties - The Bayesian Approach: Use of a prior density - Bayes estimators - Bayes estimators with mean square error loss function - invariant methods: Location invariant and scale invariant classes of estimators - Interval estimation (one population case): Confidence interval estimators - Pivotal methods - Bayesian credible intervals

STAT 315: Probability (2)

3(2+1+0)

Sequence of Events – Continuous random vector - Joint probability distribution - marginal and conditional probability functions - Conditional expectation and variation - Joint probability distributions of functions of random variables- Joint moment generating functions - Order statistics- Probability inequalities- Sequences of random variables and modes of convergences - Central limit theorem and proof - normal approximation



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STAT 319: Theory of Statistics (2)

3(2+1+0)

Interval estimation (two population cases): Confidence interval estimators - Pivotal methods - Hypotheses Testing: Type I and Type II error - power of the tests - Most powerful test - Neymann-pearson lemma - asymptotic tests - unbiased test - uniformly most powerful test. Monotone tests – Neymann Pearson theorem - power curves - Likelihood ratio tests - asymptotic distribution of likelihood ratio statistics - The Sequential Probability Ratio Test - Goodness of-fit Tests - Bayesian testing hypotheses.

STAT 328: Statistical Packages

3(2+1+0)

Using program code in a statistical software package (Excel – Minitab – SAS – SPSS - R - Maple - Matlab) to write a program for data and statistical analysis. Topics include creating and managing data files - graphical presentation - and Monte Carlo simulations.

STAT 331: Sampling Techniques

3(2+1+0)

Definition of the population and how we select the sample - Types of surveys - sampling methods - Parameters estimation (Population mean - Population ratios - Population total) - Confidence intervals for population parameters - Selecting the sample size for estimating population mean and total number.

STAT 332: Regression Analysis

3(2+1+0)

Simple linear regression model - Multiple linear regression - Analysis of residuals and predictions. - Stepwise regression - Some nonlinear regression models and data transformations - Student will use statistical computer packages such as SAS, SPSS, Minitab.

STAT 333: Nonparametric Statistics Methods

3(2+1+0)

Concept of nonparametric statistics -Statistical tests based on the binomial distribution (binomial test and estimation of ratio - quantile test - tolerance limits) - Contingency tables in (median tests - measures of dependence - chi-square tests - Cochran test for related observations) - Some nonparametric tests that depend on ranks (two independent samples -several independent samples -test for equal variances - measures of rank correlations-nonparametric regression methods - several related samples - tests of randomization) -Tests of the Kolmogorov-Smirnov type (the Kolmogorov goodness of fit tests - goodness of fit tests for families of distributions).

STAT 401: Econometrics

3(3+0+0)

Simple and Multiple regression models - Non-Linear regression models - Dummy Variables - Multicollinearity Problem-Identification Errors - Generalized Least Square Method – Heteroscedasticity Problem - Autocorrelation Problem - Time series models- Simultaneous Equations-Errors in variables.

STAT 436: Time Series and Forecasting

3(2+1+0)

Data sources: Historical data- the Web. Checking time series components: trend – seasonality - cyclical. Transformation: Differences method - Seasonal adjustment. Forecasting: How to forecast future - adequacy of a forecast - regression forecasting against time series forecasting - some adequacy measures (MAD - MSE - MAPE). Decomposition and smoothing of times series: moving averages - exponential smoothing. Box-Jenkins models ARIMA(p -d -q): Autocorrelation and partial autocorrelation functions - identification of appropriate model - dealing with seasonal time series - fitting models to real and simulated data sets. Diagnostic checks on the residuals. Case studies: training on how to analyze real life data sets using the statistical package MINITAB - write reports.



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STAT 437: Design and Analysis of Experiments

3(2+1+0)

Introduction: Review of statistical inference. Main principals of experimental design: Replication – Randomness – Blocks – Simple comparisons experiments: t-test and alike tests. Single Factor Experiments: Completely randomized desing – Model adequacy checking – Contrasts and orthogonal contrasts – Comparing pairs of treatment means. Block designs: Randomized complete block design – Latin square design – Graeco-Latin square design. Factorial designs : Two-Factor factorial design – Three-Factor factorial design – General factorial designs. Designs with two-level factors: Two factors with two levels designs – Three factors with two levels designs – General two-level factors designs. Confounding. Fractional factorial designs.

STAT 438: Multivariate Statistical Methods

3(2+1+0)

Matrix algebra and Random Vector- The multivariate normal distribution -Inferences about a Mean vector- Hotelling's T and comparisons of several multivariate Means –MANOVA (One and two way) - Principle components --Discrimination and classification Application using computer packages. SAS-SAS/IML -SPSS – Minitab.

STAT 439: Data Analysis

3(2+1+0)

Introduction to Data Analysis. Introduction to software. Introduction to types of Data: study of qualitative and quantitative variable. Graphical representation of data. Sample studies for paired data. Correlation for qualitative and quantitative data. ANOVA - Regression Analysis: Logistic regression. K means - Time series Analysis. **Remark:** This course is based on SAS or SPSS or MINITAB.

STAT 441: Quality control

3(3+0+0)

Historical background of Quality Control - What is Quality? - the formation of Quality Control - Quality Planning - Quality Improvement - Quality Assurance and Total Quality Management - Modeling Process Quality - Review of statistical distributions used in Quality Control - Statistical inference and test of hypotheses - Statistical Process Control (SPC) - Magnificent Seven - Introduction of Control Charts - Statistical process in Quality Improvement - Pareto Chart - Cause and Effect Diagram - Scatter Diagram - Types of control charts - Control Charts for Variables - Process Capability Ratios - Process Capability Cpk - Control Charts for Attribute data - Acceptance Sampling - Operating Characteristic Curve. Introduction to Statistical Quality Control, by Douglas C. Montgomery.

STAT 497: Graduation Project (1)

1(1+0+0)

Recognition of the problem (chosen from real- world problems) under study. Gathering of references and collection of data for problem investigation under the supervision of a faculty member.

STAT 498: Graduation Project (2)

2(2+0+0)

The student builds and solves the model of the problem previously investigated in STAT 498 under the supervision of a faculty member.



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II- Compulsory courses from Outside the Department [credit hours (Lect. – Exer. – Pract).]

MATH 111: Integral Calculus 4(3+1+0)

Definition of Definite Integral and its Properties - The Anti-derivative - Indefinite Integral and the Fundamental Theorem of Calculus. Change of Variables. Integrals of natural and general exponential functions. Integrals of natural and general Logarithmic functions. Derivatives and Integrals of Hyperbolic and Inverse-Hyperbolic functions. Techniques of Integration: by parts - Trigonometric substitutions - Completing the square - Integrals of rational functions - Miscellaneous Substitutions. Indeterminate forms - Improper Integrals. Applications of Integration: Area - Solids of Revolutions - Arc length and Surface of Revolution - Linear Motion - Work - Momentum and Center of Mass. Numerical Integration. Polar coordinates - relation between polar and Cartesian coordinates - Graphs of polar curves - Area in polar coordinates. Parametric Equations.

MATH 207: Advanced Differential and Integral Calculus 3(2+1+0)

Cartesian coordinates - functions of two or several variables - limits and continuity - partial derivatives - chain rule - maxima and minima for functions of two and several variables - Lagrange multipliers - double integrals and their applications - triple integrals and their applications - sequences - infinite series - geometric series - convergence tests - alternative series - absolute convergence - conditional convergence - functions representation by power series - Taylor' series - Maclaurin' series - Binomial series - first order differential equations.

MATH 244: Linear Algebra 3(2+0+0)

Matrices and their operations - types of matrices. Elementary transformations. Determinants - elementary properties. Inverse of a matrix. Linear systems of equations. Vector spaces - linear independence - finite dimensional spaces - linear subspaces. Inner product spaces. Linear transformations - kernel and image of a liner transformation. Eigen values and Eigen vectors of a matrix and of a linear operator.

CSC 201: Computer Programming 4(3+1+0)

Introduction: Introduction to C programming. Structured program development. Program control. Functions. Recursion. Arrays. Pointers. Strings. Structures and enumerations. File processing. Data structures.

CSC 202: Computer Programming Using MATLAB 3(2+1+0)

Interacting with MATLAB - program design and algorithm development - M-files - designing GUI (graphical user interface) - calculus with MATLAB - vectors and matrices - strings - functions - 2-D and 3-D graphics - MATLAB programming - data analysis operations - errors - applications: (randomness - simulation - Markov process - linear equations - some numerical methods) - integrating MATLAB based algorithms with external applications and languages - such as C - C++ - Fortran - Java - COM - and Microsoft Excel.

III- Elective Courses from the Department [credit hours (Lect. – Exer. – Pract).]

STAT 231: Population Study "Demography" 2(2+0+0)

Introduction - The Nature of Demography - Rates and Ratios - Relative numbers - The use of ratios in demography - Vital statistics rates - Types of ratios - Sex ratio - Child-Woman ratio - Territorial distribution - Density of population - The rate of population growth - Crude birth and death rate - Age-Specific death rate - Infant death rate - Age-Specific birth rate - General fertility ratio - Total fertility rate



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- Gross reproduction rate - Accuracy and Error - Life Tables - The smoothing of data. - The Study of Mortality - Measurement of Fertility - Growth of Population - Migration and the Distribution of Population.

STAT 325: Decision Theory

3(3+0+0)

The elements of making decision problem without data: Utility - Actions Space - State of nature space- Pure actions - MinMax and Bayes actions - MinMax mixed actions - Using data for making decisions (Decision Rule)- MinMax pure and mixed decision rules- Bayes decision rule - Estimation as a decision problem: for instance Bayes Estimate - Testing hypothesis as a decision problem: for instance - Most powerful - MinMax and Bayes tests - Comparing between tests.

STAT 362: Reliability Theory

3(3+0+0)

Concept of reliability - structural properties of Coherent systems - Reliability of coherent systems - Joint Structural and Reliability importance - Some parametric lifetime models (continuous and discrete) - Classes of lifetime distributions (notions of aging) - Reliability operation - Specialized models (competing risks - accelerated models - ..) - Life data analysis.

STAT 399: Longitudinal of Data Analysis

3(2+1+0)

Exploring longitudinal data. Analysis of variance for repeated measures. Single-Group Repeated Measures. Crossover Designs and Parallel Group. General Linear Mixed Models. Generalized Linear Models for Longitudinal Data. MLE and Restricted/Residual Maximum Likelihood Estimation(REML). Multilevel Models. ;Using GLM - MIXED and GENMOD in SAS

STAT 406: Survival Analysis

3(3+0+0)

Description of survival distributions - survival and hazard function - their relationship - Problems of inference - Estimation and comparison of survival curves (Kaplan-Meier and life-table estimates - ...) - Estimation under complete and censored data (type I - type II - progressive - ...). Hypothesis testing - Life testing - Parametric regression models - Cox proportional models.

STAT 430: Insurance Methods

3(2+1+0)

Survival Distributions: Future lifetime - life tables; fundamental theorems for calculating moments of actuarial functions - Other actuarial functions; 3 assumptions for fractional ages; analytical laws of mortality - Net Single Premiums for Life Insurance Contracts: Definition using a stochastic approach - distribution of the actuarial - present value function for different insurance contracts - Life Annuities: Actuarial accumulation function; aggregate payment and current payment techniques - life annuities with monthly payments - complete annuities (immediate) - apportionable annuities (due) - recursive equations - Net Annual Premiums: Actuarial equivalence principle; basic contracts; monthly premiums; life insurance with accumulation type benefits - Reserves: Definition of prospective loss - basic contracts - monthly premiums reserves: recursive equations for discrete reserves - reserves at fractional durations - allocation of the loss to the policy years.

STAT 432: Survey Research

2(2+0+0)

Research Methodology (Choosing Research Problems - and Methods) - Ethical issues in scientific research - An introduction if Survey Methodology - Inference and Error in Surveys - Research problem - goals - questions - and hypotheses for quantitative and qualitative studies - Target Population - Sampling frames - Coverage - Sampling Design and Sampling Error - Non-response in sampling surveys - Data collection methods - Types of Variables - data and measures - Method of Data collection - Computerized Data Descriptive - and Analysis.



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STAT 434: Linear Models

3(3+0+0)

Review of necessary concepts of matrix algebra - Normal distribution with n-variables - Quadratic forms and their distributions - The general linear model of full rank - Estimation and hypothesis testing in the full rank model - Estimation and hypothesis testing in the less than full rank model - Computational methods - Applications in regressions - experimental design and ANOVA using statistical packages.

OPER 213: Linear Programming

4(3+1+0)

Definitions and formulation of linear programs - Graphical solution. Review of linear algebra and convex analysis - Algebra of the simplex method - The simplex method - The revised simplex method - Duality theory and economic interpretation of duality. Sensitivity analysis - Some applications of linear programming.

OPER 322: Inventory Control

3(2+1+0)

Definitions and models of inventory control - The simple economic order quantity (EOQ) model - The EOQ model with shortages - The economic production quantity (EPQ) model - The (EPQ) model with shortages - Single or multiple items constrained inventory control models - Some dynamic inventory control models with deterministic or probabilistic demand - Inventory control models with continuous demand rate - Some probabilistic inventory control models.

OPER 351: Network Analysis

3(2+1+0)

Introduction to Graph theory - Network models - Mathematical formulation of network problems - Shortest path problem: Bellman algorithm, Dijkstra's algorithm, Bellman-Ford algorithm - Maximum Flow Problem: Ford and Fulkerson algorithm, Max-flow min-cut theorem - Minimum cost flow problem. Project scheduling: CPM and PERT.

OPER 441: Modeling and Simulation

4(3+1+0)

Introduction to Systems and Modelling. Hand Simulation. Spreadsheet modelling and simulation using EXCEL. Random Numbers and Variables properties and generation. Input Analysis. Introduction to SIMAN. Introduction to GPSS. Time advancing mechanisms. List processing. GPSS Commands and Blocks. System Numerical Attributes (SNA). Case studies.

OPER 472: Stochastic Processes and Queuing Models

4(3+1+0)

Definition of stochastic processes - Finite Markov chains. One step and multi-steps transition probability matrices - Chapman-Kolmogorof equation. State classification. Long run distribution of Markov chains - Continuous-time Markov processes (Birth-and-death processes, Poisson process) - Queuing theory and models: Cumulative diagrams of queues. Performance measures - Basic Markovian queuing models (single server queue, multi-server queue, finite capacity queues) - Some Non-Markovian queues - Some Non-Markovian queues with bulk arrival and service.

IV- Elective Courses from outside the Department

[credit hours (Lect. – Exer. – Pract).]

MATH 225: Introduction to Differential Equations (E)

4(3+1+0)

Classification of differential equations and their origin: interval of definition, Solutions, Cauchy initial value problems: Existence and Uniqueness - **Method of solving of first order differential equations:** Separable equation exact equations, special integrating factors, substitution and transformation, Linear differential equations with constants coefficients, Bernoulli equations, method of reduction of order - **Higher order linear differential equation (HOLDE):** Basic theory of HOLDE Existence-Uniqueness theorem, linearly independent and dependent functions, Wronskian - **Method of solving of HOLDE:** homogeneous linear equation with constant coefficients, method of variation of



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parameters, undetermined coefficient method, superposition principle, Cauchy-Euler equations, reduction of order method - **Laplace transformations:** Definitions and properties, inverse Laplace transformation, applications: solving initial value problems - **Power series solutions of linear differential equations of second order with:** Polynomial coefficients near an ordinary point - Orthogonal functions and Fourier Series - **Linear system of differential equations:** solving system by elimination, matrix methods for linear system.

MATH 352 : Numerical Analysis (1)

4(3+1+0)

Numerical methods for nonlinear equations. Error and convergence, analysis. Direct & iterative methods for linear systems. Error analysis & iterative methods convergence. Interpolation & approximation, error analysis. Numerical differentiation & numerical integration & their error analysis .

MATH 382 : Real Analysis (1) (E)

4(3+1+0)

Basic properties of the field of real numbers, completeness axiom, countable sets. Sequences and their convergence, monotone sequence, Bolzano-Weierstrass theorem, Cauchy criterion. Basic topological properties of the real numbers. Limit of a function, continuous functions and properties of continuity, uniform continuity, compact sets. The derivative of a function, mean value theorem, L'Hospital rule, Taylor theorem.

IV- Service Courses to Other Specialization and Colleges [credit hours (Lect. – Exer. – Pract).]

STAT 100: Introduction to Statistics

3(2+1+0)

Descriptive statistics - Measures of central tendency - Measures of dispersion - Basic probability concepts - Conditional probability - Expectation - Variance - Bayes law- Random variables - Probability distribution - Binomial distribution - Poisson distribution - Hypergeometric distribution - Normal distribution – Applications by Excel.

STAT 105: Statistical Methods

4(3+1+0)

Some Statistical distributions - Sampling distributions - Central limit theorem - Chebychev's inequality - Interval estimation - Testing hypotheses (two populations case) - Introduction to experimental designs (CRD and RBD)- Analysis of variance (one and two ways) - Regression analysis (simple) - Correlation (Pearson and Spearman) - Chi square test and its applications - Some nonparametric tests.

STAT 106: Biostatistics

2(1+1+0)

Introduction to Bio-Statistics, types of data and graphical representation. Descriptive statistics: Measures of Central tendency- Mean, median, mode, Measures of dispersion-Range, Standard deviation, coefficient of variation. Calculating Measures from an Ungrouped Frequency Table Approximating Measures from Grouped Data. Basic probability, conditional probability, concept of independence, Sensitivity, Specificity etc, and Bayes Theorem for predictive probabilities. Some discrete probability distributions: cumulative probability distribution, Binomial, and Poisson –their mean and variance. Continuous probability distributions: Normal distribution, Standard normal and t distributions. Statistical inference: Point and interval estimation, Type of errors, Concept of P-value, testing hypothesis about one and two samples means and proportions including paired data – different cases under normality.

STAT 122: Applied statistics

3(2+1+0)

Learn how to construct graphs from distributions tables - Understanding the concepts of the statistical theory and applications to real data Learn how to describe data (variables) in statistical language- Learn how to measure of central tendency for grouped data - Learn how to measure of dispersion for grouped data - Analysis of correlations and regression - Theory of probability and random variables.



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Some of the probability distributions (Binomial - Normal).

STAT 145: Biostatistics for Medical Science Students

2(2+0+0)

Have knowledge of elementary probability and probability distributions - Summarize data by a suitable statistic - Graphical presentation of data including Box plot - Ability to use the z and t tests for one and two samples - Conduct hypothesis tests about one and two means and proportions and draw conclusion.

STAT 324: Probability and statistics for Engineers and scientists

2(2+0+0)

Determine the Sample space for any trial - Define the Random variables (Discrete and Continuous distributions - Find the mean (mathematical expectation) and the variance of a random variable. Mean and variance of a linear combination of independent random variables - Know the properties of the famous Discrete distributions (Uniform, Binomial, Hyper geometric, Poisson) - Know the properties of the famous of Continuous distributions (Uniform, Exponential, Normal) - Find the unknown population parameters by Estimation methods: Point estimation, Confidence interval estimation - Conduct the Hypotheses Testing (single Population parameter (mean, proportion, difference between two means and difference between two proportions of independent populations).

Important Note: The student must review the department concerned for decisions that taught outside the college (Compulsory and Elective).