Course Description

MATH 140 Introduction to Mathematics 2(2+0) credit hours
Linear equations and applications, linear inequalities, absolute value in equations and inequalities, complex numbers, quadratic equations and applications, functions, odd and even functions, operations on functions, inverse functions, exponential and logarithmic functions, trigonometric functions, conic sections, systems of equations and inequalities, matrices, matrix operations.

MATH 150 Differential Calculus 3(3+0) Credit hours
The concept of limit, computation of limits, continuity and its consequences, limits involving infinity, formal definition of limit, the concept of derivative, computation of derivatives (power rule, higher order derivatives, acceleration), the product and quotient rules, the chain rule, derivatives of exponential and logarithmic functions, implicit differentiation and inverse trigonometric functions, the mean value theorem, indeterminate forms and L'Hopital's rule, maximum and minimum values, increasing and decreasing functions, concavity and the second derivative test, optimization, related rates.
Prerequisites : MATH 140

MATH 111 Integral Calculus 4(3+1) Credit hours
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.
Prerequisites: MATH 150

MATH 201 : Differential and Integral Calculus 4(3+1) Credit hours
Cartesian, cylindrical and spherical coordinate systems. Functions of two and three variables, limits and continuity, partial derivatives, the chain rule, extrema of functions of two variables, Lagrange multipliers. Double integrals, moments and center of mass, double integrals in polar coordinates, triple integrals, application of triple integrals, triple integrals in cylindrical and spherical coordinates, surface area. Sequences, infinite series, convergence tests, representation of functions by power series, Taylor and Maclaurin series, the binomial series.
Prerequisites: MATH 111

MATH 225 Introduction to Differential Equations 4(3+1) Credit hours
Classification of Differential equations and their origins. Methods of solution of first order differential equations, orthogonal trajectories. Linear equations with constant coefficients and variable coefficients. Linear system of equations, power series solutions of linear differential equation of the second order with polynomial coefficients, Laplace transform and the convolution. Fourier's series.
Prerequisites : MATH 201

MATH 240 Introduction to Linear Algebra 4(3+1) Credit hours
Matrices and their operations, types of matrices. Elementary transformations. Determinants and their elementary properties. Inverse of a matrix. Linear systems of equations. Vector spaces, linear independence, finite dimensional spaces, subspaces. Inner product spaces. Linear transformations, kernel and image of a linear transformation. Eigenvalues and eigenvectors of a matrix and of a linear operator.
Prerequisites : MATH 111

MATH 251 Optimization Techniques 3(3+0) Credit hours
Nature of problems, weak variations, the first variation, Euler's equation. The second variation, Jacobi's equation. Relative maxima and minima. Integrals with variable end points. Applications to problems in economics and finance. Strong variations, the Weierstrass E-function.
Prerequisites: MATH 225, MATH 280

MATH 280 Introduction to Real Analysis 4(3+1) credit hours
Bounded subsets of the real line; supremum and infimum, completeness axiom; convergent sequences, Cauchy criterion, subsequences; series of numbers, generalized tests of convergence; limits of functions, continuity on an interval, intermediate value property, extrema; differentiability, mean value theorem and its consequences, Taylor's theorem; Riemann integral; Uniform convergence of sequences and series of functions, tests for uniform convergence, power series.
Prerequisites: MATH 201

MATH 380 Stochastic Processes 4(3+1) credit hours
Axiomatic definition of probability, random variables and their probability distributions, relation with distribution functions. Expectations, conditioning with respect to a class of random variables. Stochastic processes, finite dimensional probabilities, isonomous processes. Discrete Markov chains, transition probabilities, recurrence, long term distributions. Continuous time Markov chains, Jump processes, birth-death processes, Poisson processes, Weiner processes.
Prerequisites: MATH 280, STAT 215

MATH 422 Partial Differential Equations 4(3+1) credit hours
Fourier series and integrals: piecewise smooth functions, fundamental theorem of Fourier series, Fourier transform, Fourier integral. Partial differential equations: basic concepts, first order equations and their methods of solution. Linear second order equations: classification, methods of solution, reduction to system of first order, separation of variables, Fourier transform, boundary-value problems. Boundary-value problems for the evolution equation, applications in heat transfer, diffusion phenomena, population growth. The error function and other special functions.
Prerequisites: MATH 225

MATH 450 Numerical Methods 4(3+1) credit hours
Introduction to numerical methods with emphasis on mathematical models. Solution of linear and nonlinear systems of equations, eigenvalue problems and approximation, techniques of optimization, Monte Carlo methods, and applications to ordinary differential equations and integration.
Prerequisites : MATH 225, MATH 240

STAT 100 Introduction to Statistics 3(2+1) credit hours
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.
Prerequisites: MATH 150

STAT 105 Statistical Methods 3(2+1) credit hours
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.
Prerequisites: STAT 100

STAT 215 Probability (1) 4(3+1) credit hours
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.
Prerequisites: STAT 100, MATH 111

STAT 223 Theory of Statistics (1) 3(2+1) credit hours
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 Baysian 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.
Prerequisites: STAT 215

STAT 328 Statistical Packages 3(2+1) credit hours
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.
Prerequisites: STAT 105

STAT 332 Regression Analysis 3(2+1) credit hours
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 - …etc.
Prerequisites: STAT 328, MATH 240

STAT 436 Time Series and Forecasting 3(2+1) credit hours
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.
Prerequisites: STAT 335

OPER 441 Modeling and Simulation 4(3+1) credit hours
Random number generators - Monte Carlo techniques - Simulation design - Input modeling - Model validation - Analysis of simulation output - Evaluation of alternatives - Applications to various operations research models using simulation languages such as SLAM, GPSS and Arena.
Prerequisites: STAT 215, CSC 202

ACCT 201 Principles of Accounting and Financial Reporting 3(3+0) credit hours
The course aims at providing an understanding of accounting by focusing on the accounting system and principles and practices of financial accounting and preparing of financial reports in merchandising and services proprietorships, in addition, the course introduces the principles of financial reports analysis.

ECON 101 Principles of Microeconomics 3(3+0) credit hours
This course aims at provide the necessary theoretical background on microeconomics theory. It includes: Introduction: definition, methodology, tools of economics, and the economic problem; the price mechanism: basics of supply and demand, and the market analysis of consumer behavior, market demand, equilibrium, and elasticity, theory of production and costs, market structures, supply and demand for factors of production.

ECON 102 Principles of Macroeconomics 3(3+0) credit hours
This course provides the necessary theoretical background on macroeconomics theory. It also includes concepts of national income, the national accounts, determination of the semester of equilibrium of national income, money and banking, inflation, foreign trade, economic growth and development, introduction to the aggregate demand and aggregate supply model.
Prerequisites: ECON 101

FIN 200 Principles of Finance 3(3+0) credit hours.
The main topics covered in this course include: financial environment, interest rates and time value of money, financial reports and their analysis, capital budgeting, and risk and return.
Prerequisites: ACCT 201

FIN 210 Corporate Finance 3(3+0) credit hours.
The main topics covered in this course include: financial planning, cost of capital, both long and short-term finance decisions, investment decisions, capital structure, dividend policy, and mergers and acquisitions.
Prerequisite: FIN 200

ACTU 361 Mathematics of Finance (1) 3(3+0) credit hours
Basic problems in interest; annuities and perpetuities; amortization and sinking funds; rates of return; bonds and related securities; life insurance.
Prerequisites: MATH 201

ACTU 362 Actuarial Mathematics (1) 3(3+0) credit hours.
Measurement of mortality; pure endowments; life insurance; net single premiums; life annuities; net annual premiums; special topics.
Prerequisites: ACTU 361, STAT 215

ACTU 363 Actuarial Mathematics Lab (1) 1(0+1) credit hour.
Tutorial sessions for SOA and CAS exams.
Prerequisites: Department approval.

ACTU 364 Actuarial Mathematics Lab (2) 1(0+1) credit hour.
Tutorial sessions for SOA and CAS exams.
Prerequisites: Department approval.

ACTU 461 Mathematics of Finance (2) 4(3+1) credit hours
Mathematical models of bond and stock prices leading to arbitrage pricing of options and other derivative securities, and portfolio management; risk free and risky assets; futures and options.
Prerequisites: ACTU 361

ACTU 462 Actuarial Mathematics (2) 3(3+0) credit hours.
Net level premium reserves; multiple life functions; multiple decrements; the expense factor; special topics.
Prerequisites: ACTU 362

ACTU 464 Risk Theory 3(3+0) credit hours.
Applications of contingency theory in health insurance, individual and collective risk theory, ruin theory.
Prerequisites: ACTU 362, MATH 380

ACTU 465 Credibility Theory 3(3+0) credit hours.
Credibility approach to heterogeneous data, regression and Bayesian models; examples from insurance.
Prerequisites: ACTU 464

ACTU 466 Loss Distributions 3(3+0) credit hours.
Probability model fitting to loss data; estimation and testing under a variety of procedures and sampling designs.
Prerequisites: ACTU 464, STAT 436

ACTU 467 Pension Mathematics 3(3+0) credit hours
Valuation methods; gains and losses; dynamic control; special topics.
Prerequisites: ACTU 462

ACTU 468 Quantitative Methods in Finance 4(3+1) credit hours
First order recurrences. The Cobweb model. Elementary theory of the firm, Cobb-Douglas firm. Second order recurrences, dynamics of economy. Financial markets. Quantitative methods: Binomial trees and arbitrage, spreadsheets to compute stocks and option trees. Continuous time models: Black-Scholes, Hedging strategies, bond models and interest rate options. Computational methods for bonds. Currency markets and foreign exchange risks.
Prerequisites: MATH 380

ACTU 499 Field Training 3(1+2) credit hours.
A plan is prepared so that students are offered suitable training at the Saudi Arabian Monetary Fund, banks, or insurance organizations and companies.
Prerequisites: ACTU 462

ECON 201 Microeconomic Analysis 3 (3+0) credit hours
This course aims at developing the theoretical background selected on microeconomic theory with applications. The price system: demand and supply, elasticities: price, income and cross elasticities, analysis of consumer behavior, production and cost theory, pricing and market structures: perfect competition, monopoly, monopolistic competition, oligopoly, theory of distribution, introduction to welfare theory.
Prerequisites : ECON 102

CSC 201 Computer Programming 4(3+1) credit hours
Introduction to C programming. Structured program development. Program control. Functions. Recursion. Arrays. Pointers. Strings. Structured and enumerations. File processing. Data structures.

CSC 202 Computer Programming Using Matlab 4(3+1) credit hours
Interacting with MATLAB - program design and algorithm development - M-files - designing GUI (graphical user interface) - calculus with MATLAB - vectors and data matrices - strings - functions - 2-D and 3-D graphics - MATLAB programming - 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.
Prerequisites: CSC 201