UNIVERSITY OF JAMMU
NOTIFICATION
(10/April/ ADP/ 0)

It is hereby notified for the information of all concerned that the Vice-Chancellor in anticipation approval of the Academic Council, is pleased to authorize adoption of the revised Syllabi and Courses of Study in the subject of Statistics for M.Sc. IV-Semester of Master's Degree Programme for the examination to be held in the year mentioned below along with the %age of change:

<table>
<thead>
<tr>
<th>M.Sc. -IVth-Semester</th>
<th>For the year May 2010, 2011 &amp; 2012</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Compulsory courses</strong></td>
<td></td>
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<tr>
<td>Course No.</td>
<td>Title</td>
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<tr>
<td>ST-570</td>
<td>Stochastic Process</td>
</tr>
<tr>
<td>ST-571</td>
<td>Programming in C++</td>
</tr>
<tr>
<td><strong>Optional Courses:</strong> (Students may opt any two of the following courses)</td>
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</tr>
<tr>
<td>Course No.</td>
<td>Title</td>
</tr>
<tr>
<td>ST-572</td>
<td>Econometrics</td>
</tr>
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<td>ST-577</td>
<td>Operations Research</td>
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<tr>
<td>ST-578</td>
<td>Non-Parametric Inference</td>
</tr>
<tr>
<td>ST-579</td>
<td>Information Theory</td>
</tr>
<tr>
<td>ST-580</td>
<td>Bio- Statistics</td>
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<tr>
<td>ST-581</td>
<td>Demography</td>
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<td>ST-582</td>
<td>Actuarial Statistics</td>
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<tr>
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<td>Based on ST-571</td>
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<td>ST-576</td>
<td>Practical on using Statistical Computing</td>
</tr>
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</table>
Syllabus for the examination to be held in 2010, 2011, 2012.

Compulsory Courses

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Practical

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<td>Based on ST-571</td>
</tr>
<tr>
<td>ST-576</td>
<td>Practical on using Statistical Software</td>
</tr>
</tbody>
</table>
FOURTH SEMESTER

DETAILED SYLLABUS

Course No. ST-570
Title: Stochastic Processes

Credits: 4
Maximum Marks: 100
a) Semester examination : 80
b) Semester assessment : 20

Duration of examination: 3 hours.

Syllabus for the examinations to be held in 2010, 2011 and 2012.

OBJECTIVES: The aim of this course is to provide the knowledge of Stochastic Processes to the students.

Unit I
Introduction to stochastic processes (SP’s), Classification of SP’s according to state space and time domain. Countable state Markov Chains (MC’s), Chapman-Kolmogorov equations; calculation of n-step transition probability and its limit, Stationary distribution, Classification of states; transient MC, Random walk and gambler’s ruin problem.

Unit II
Discrete state space continuous time MC, Kolomogorav-Feller differential equations, Poission Process, birth and death processes, Applications to queues and storage problems, wiener process as a limit of random walk, first passage time and other problems.

Unit III
Renewal Theory: Elementary renewal theorem and applications, statement and uses of key renewal theorem, study of residual life time process, stationary process, weakly stationary and strongly stationary process.

Unit IV
Branching process, Galton-Watson branching process, probability of ultimate extinction, distribution of populations size, Martingale in discrete time inequality, convergence and smoothing properties, Statistical inference in MC and Markov processes.

NOTE FOR PAPER SETTING:

Section A will contain 4 compulsory questions of 8 marks each, one question from each unit. Section B will contain 8 questions, 2 from each unit and 4 questions, one from each unit, of 12 marks each to be attempted.
Books Recommended:


DETAILED SYLLABUS

Course No. ST-571  Title: Programming in C++

Credits: 4  Maximum Marks: 80

Duration of examination: 3 hours.

Syllabus for the examinations to be held in 2010, 2011 and 2012.

OBJECTIVES: The aim of this course is to provide the knowledge of programming in C++ to the students.

Unit I


Unit II

Flow of control: Conditional statements, General form of if-else statement, if else if ladder, Nested if? As an alternative to if, General form of switch, Nested Switch. Simple control statement, for loop statement, while loop, do while loop. Variation in loop statements; Nested Loops, Loop termination: break, continue, go to, exit (). Single character input get char (), single character output (put char ()), gets and puts functions. Structured Data Type: Array, General form of Declaration and Use: one dimensional array, String two dimensional. Array initialization.

Unit III

Functions: General form, Function Prototype, definition of function, accessing a function. Passing arguments to function. Specifying argument Data type, Default argument, Constant argument, Call by value and Call by reference, returning value and their types, Calling function with arrays, Scope rules of function and variables. Local and Global variables, Storage class specifiers: extern, auto, register and static. Standard Header files – string.h, math.h, stdlib.h, iostream.h. Standard library functions-string and char related functions: isalnum(), isalpha(), isdigit(), islower(), isupper(), tolower(), toupper(), strcmp(), strlen(), strin(), stren(), strcmp (). Mathematical functions: fabs(), frexp() ,fmod (), log(), log10(), pow(), sqrt(), cos(), abs().

Unit IV

Structures: specifying a structure, defining a structure variable, accessing structure members. Functions and structures. arrays of structures, arrays within a structure, Structure within structure Class: Specifying a class, public and private data members and member functions, defining objects, calling member function, constructor and destructor functions.
NOTE FOR PAPER SETTING:

Section A will contain 4 compulsory questions of 8 marks each, one question from each unit. Section B will contain 8 questions, 2 from each unit and 4 questions, one from each unit, of 12 marks each attempted.

Books Recommended:

1. Robert Lafure : C ++ Programming
5. Ankit Asthana : Programming in C++, Narosa publication, Delhi
DETAILED SYLLABUS

Course No. ST-572
Title: Econometrics

Credits: 4

Maximum Marks : 100
a) Semester examination : 80
b) Semester assessment : 20

Duration of examination : 3 hours.

Syllabus for the examinations to be held in 2010, 2011 and 2012

OBJECTIVES: The aim of this course is to provide the knowledge of Econometric methods to the students.

Unit I
A review of least squares and maximum likelihood methods of estimation of parameters in classical linear regression model and their properties (BLUE), Generalized Least Square Models, construction of confidence regions and tests of hypothesis, prediction, use of extraneous information in the form of exact and stochastic linear constraints, Restricted regression and mixed regression methods of estimation and their properties. Testing of extraneous information.

Unit II
Multicollinearity, its effects and deletion, Remedial methods including the ridge regression. Specification error analysis, inclusion of irrelevant variables and deletion of dominant variables, their effects on the efficiency of optimization procedure.

Unit III

Unit IV
Seemingly unrelated regression equation model, Ordinary least squares and feasible generalized least squares methods and their asymptotic properties.

Simultaneous equation model, problem of indentification, A necessary and sufficient condition for the identifiability of Parameters in a structural equation, Ordinary Least squares, indirect least squares, two stage least squares and limited information maximum likelihood method, K-class estimators, Asymptotic properties of estimators.
NOTE FOR PAPER SETTING:

Section A will contain 4 compulsory questions of 8 marks each, one question from each unit. Section B will contain 8 questions, 2 from each unit and 4 questions, one from each unit, of 12 marks each to be attempted.

BOOKS RECOMMENDED:

1. Vinod, H.D. and A. Ullah : Recent Advances in Regression Methods, (Marcel Dekkar)
5. Koutsoyiannis, A : Theory of Econometric (Macmillan)
9. Baltagi : Econometrics (Springer rer log)
DETAILED SYLLABUS

Course No. ST-574
Title: Practical-VII
Credits: 4

Maximum Marks: 100
a) Semester examination: 50
b) Sessional assessment: 50

Duration of Examination: 3 hours

Objectives: To expoloe students at running programs using C++ language.

SYLLABUS

Based on the Course No. ST-571 during the semester.

<table>
<thead>
<tr>
<th>Topic</th>
<th>No. of Practicals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple Programmes using Operators</td>
<td>3</td>
</tr>
<tr>
<td>If else statement</td>
<td>3</td>
</tr>
<tr>
<td>Switch Statement</td>
<td>2</td>
</tr>
<tr>
<td>Loops</td>
<td>10</td>
</tr>
<tr>
<td>Arrays</td>
<td>6</td>
</tr>
<tr>
<td>Function</td>
<td>6</td>
</tr>
<tr>
<td>Classes &amp; Structure</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>33</td>
</tr>
</tbody>
</table>

Note for paper setting:

The paper for practical examination shall be set jointly by the external and internal examiners. Four questions will be set in all and the students will be required to attempt any two questions.
DETAILED SYLLABUS

Course No. ST-576
Title : Practical-VIII

Credits: 4
Maximum Marks : 100
a) Semester examination : 50
b) Sessional assessment : 50

Duration of Examination: 3 hours

Objectives: To expose students to the computation work using standard statistical software.

SYLLABUS

<table>
<thead>
<tr>
<th>Topic</th>
<th>No. of Practicals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graphical Representation of data</td>
<td>3</td>
</tr>
<tr>
<td>Measures of central tendency &amp; Dispersion</td>
<td>5</td>
</tr>
<tr>
<td>Testing of Significance</td>
<td>6</td>
</tr>
<tr>
<td>Correlation and regression</td>
<td>5</td>
</tr>
<tr>
<td>ANOVA</td>
<td>4</td>
</tr>
<tr>
<td>Factor Analysis</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
</tr>
</tbody>
</table>

Note for paper setting:

The paper for practical examination shall be set jointly by the external and internal examiners. Four questions will be set in all and the students will be required to attempt any two questions.
DETAILED SYLLABUS

Course No. ST-577

Title: OPERATION RESEARCH

Credits: 4

Maximum Marks: 100
a) Semester examination : 80
b) Semester assessment : 20

Duration of examination : 3 hours.

Syllabus for the examinations to be held in 2010, 2011 and 2012

OBJECTIVES: This course introduces the students to various optimization techniques of operations Research and some models of queueing theory.

Unit I
Inventory control, Introduction, Deterministic models, Economic lot size model with and without shortages, Probabilistic models, Single period model with uniform and continuous demand, models with price breaks, Newspapers boy problems.

Unit II
Introduction of queueing theory, Concepts and various definitions, classification of queues and their problems, distribution of arrivals and service time, theorems based on arrival and departure times. Different queueing models M/M/1 (FCFS, α, α), Probability distribution of different times and their expected values, Generalized M/M/1 Model, M/M/1 (FCFS, N) and M/M/C (α, α, FCFS)

Unit III
Replacement Problems, Replacement of items that deteriorate, Replacement of items that fail completely, Recruitment and production problems, equipment renewal problems. Simulation, Types of Simulation, limitations of simulation, generation of random numbers and Monte-Carlo Simulation. Applications of Simulation to inventory control and Queueing problems.

Unit IV
Introduction to decision theory, Types of decision, Decision models, Types of Environment, EMV, EVPI, EOL. Decision making under uncertainty, Conflict and Decision Tree Analysis. Decision making under utilities: utility functions, curves and their construction. Posterior probabilities and Bayesian Analysis.

NOTE FOR PAPER SETTING:

Section A will contain 4 compulsory questions of 8 marks each, one question from each unit. Section B will contain 8 questions, 2 from each unit and 4 questions, one from each unit, of 12 marks each to be attempted.
BOOKS RECOMMENDED:

2. S. D. Sharma : Operations Research
3. N.U. Prabhu, Wiley : Queues and Inventions
6. N.D. Vohra & Tata Mc Gran hall : Quantitative Techniques
DETAILED SYLLABUS

Course No. ST-578  Title: Non-Parametric Inference

Credits: 4  Maximum Marks: 100
a) Semester examination : 80  
   b) Semester assessment : 20

Duration of examination : 3 hours.

Syllabus for the examinations to be held in 2010, 2011 and 2012

OBJECTIVES: To make students familiar with non-parametric concepts.

Unit I
Distribution of F (x), Order Statistics and Their distributions, Coverage probabilities and confidence intervals, empirical distribution function and its properties, asymptotic distributions of order-statistics, bounds on expected values.

Unit II

Unit III
Two sample problems, Mann-Whitney-Wilcoxon test, Wilcoxon test, general linear rank statistic, Vander Warden Statistic, Scale problems-Statements and applications of Mood Statistic, freund-Ansari-Bradley-David-Barton statistics, Siegel-Tukey Statistic, Sukhatme test.

Unit IV

NOTE FOR PAPER SETTING:

Section A will contain 4 compulsory questions of 8 marks each, one question from each unit. Section B will contain 8 questions, 2 from each unit and 4 questions, one from each unit, of 12 marks each to be attempted.

Books Recommended:

2. DAS Fraser  : Non-parametric Methods in Statistics.
3. Rohatgi  : An Introduction to probability Theory & Math statistics
Books Recommended:

1. Shannon CE (1948):

   Information Theory, Cambridge University Press.


   An Introduction to Information Theory, Dover Publications.

6. Robert Ash
   Information Theory
DETAILED SYLLABUS

Course No. ST-579

Title: Information Theory

Credits: 4

Maximum Marks: 100

a) Semester examination: 80

b) Semester assessment: 20

Duration of examination: 3 hours.

Syllabus for the examinations to be held in 2010, 2011 and 2012

Objectives: To introduce information theoretic concepts.

Unit-I

Concept of Entropy and information measures, Formal requirements of the average uncertainty, Shannon’s measure of information and its properties, Joint and Conditional Entropy, Relative entropy and mutual information, Uniqueness of the entropy function, Jensen’s Inequality and its consequences, Fano’s Inequality, Asymptotic Equipartition Property, Entropy Rate.

Unit-II

Elements of encoding, redundancy and efficiency, binary codes, Shannon-Fano Encoding, Necessary and sufficient conditions for noiseless coding, Average length of encoded message, Kraft Inequality, McMillan Inequality, Optimal Codes, Huffman Code, Fundamental theorem of discrete noiseless coding.

Unit-III


Unit-IV

Channel capacity, symmetric channels, Binary symmetric channel, Binary Erasure channel, Properties of channel capacity. Joint AEP theorem, channel coding theorem (statement only), Fano’s inequality and converse to the coding theorem, Hamming codes.

NOTE FOR PAPER SETTING:

Section A will contain 4 compulsory questions of 8 marks each, one question from each unit. Section B will contain 8 questions, 2 from each unit and 4 questions, one from each unit, of 12 marks each to be attempted.
DETAILED SYLLABUS

Course No. ST-580

Title : BIO-STATISTICS

Credits: 4

Maximum Marks : 100
a) Semester examination : 80
   b) Semester assessment : 20

Duration of examination : 3 hours.

Syllabus for the examinations to be held in 2010, 2011 and 2012

OBJECTIVES: This course introduces the students to various applications of statistics in biology and medical fields.

UNIT-I

Basic biological concepts in genetics, Mendel’s law, Hardy-Weinberg equilibrium, random mating, distribution of allele frequency (dominant/co-dominant cases), Approach to equilibrium for X-linked genes, natural selection, mutation, and genetic drift, equilibrium when both natural selection and mutation are operative.

UNIT-II

Planning and design of clinical trials, Phase I, II, and III trials. Consideration in planning a clinical trial, designs for comparative trials. Sample size determination in fixed sample designs.

UNIT-III

Functions of survival time, survival distributions and their applications viz. exponential, gamma, weibull, Rayleigh, lognormal, death density function for a distribution having bathtub shape hazard function. Tests of goodness of fit for survival distributions (WE test for exponential distribution, W-test for lognormal distribution, Chi-square test for uncensored observations).

UNIT-IV

Type I, Type II and progressive or random censoring with biological examples, Estimation of mean survival time and variance of the estimator for type I and type II censored data with numerical examples. Idea of Stochastic epidemic models: Simple epidemic models (by use of random variable technique).

NOTE FOR PAPER SETTING:

Section A will contain 4 compulsory questions of 8 marks each, one question from each unit. Section B will contain 8 questions, 2 from each unit and 4 questions, one from each unit, of 12 marks each to be attempted.
Books recommended:

DETAILED SYLLABUS

Course No. ST-581

Title: DEMOGRAPHY

Credits: 4

Maximum Marks: 100
a) Semester examination : 80
b) Semester assessment : 20

Duration of examination: 3 hours.

Syllabus for the examinations to be held in 2010, 2011 and 2012

OBJECTIVES: To introduce application of statistics in the field of vital statistics demography and population studies.

UNIT-I


UNIT-II


UNIT-III

Financial calculation, cause deleted tables and multiple detection, Sample variance of life table functions, Probability distribution of life table functions- Probability distribution of the number of survivors and observed expectation of life, joint probability distribution of the number of survivors and the number of distribution.

UNIT-IV


NOTE FOR PAPER SETTING:

Section A will contain 4 compulsory questions of 8 marks each, one question from each unit. Section B will contain 8 questions, 2 from each unit and 4 questions, one from each unit, of 12 marks each to be attempted.
Books Recommended:

1. Spigelman : Introduction to Demography.
2. Cox : Demography.
DETAILED SYLLABUS

Course No. ST-582
Title : Actuarial Statistics

Credits: 4
Maximum Marks : 100
a) Semester examination : 80
b) Semester assessment : 20

Duration of examination : 3 hours.

Syllabus for the examinations to be held in 2010, 2011 and 2012

Objective: To introduce and expose students to application of statistics in actuarial field.

Probability Models and Life Tables

Unit-I
Utility theory, insurance and utility theory, models for individual claims and their sums, survival function, curtate future lifetime, force of mortality. Life table and its relation with survival function, examples, assumptions for fractional ages, some analytical laws of mortality, select and ultimate tables. Multiple life functions, joint life and last survivor status, insurance and annuity benefits through multiple life functions evaluation for special mortality laws.

Unit-II
Multiple decrement models, deterministic and random survivorship groups, associated single decrement tables, central rates of multiple decrement, net single premiums and their numerical evaluations. Distribution of aggregate claims, compound Poisson distribution and its applications.

Insurance and Annuities

Unit-III
Principles of compound interest: Nominal and effective rates of interest and discount, force of interest and discount, compound interest, accumulation factor, continuous compounding.
Life insurance: Insurance payable at the moment of death and at the end of the year of death-level benefit insurance, endowment insurance, deferred insurance and varying benefit insurance, recursions, commutation functions.

Unit-IV
Life annuities: Single payment, continuous life annuities, discrete life annuities, life annuities with monthly payments, commutation functions, varying annuities, recursions, complete annuities-immediate and apportionable annuities-due.
NOTE FOR PAPER SETTING:

Section A will contain 4 compulsory questions of 8 marks each, one question from each unit. Section B will contain 8 questions, 2 from each unit and 4 questions, one from each unit, of 12 marks each to be attempted.

Books Recommended:
9. Relevant Publications of the Actuarial Education Co., 31, Bath Street, Abingdon, Oxfordshire OX143FF (U.K.)
DETAILED SYLLABUS

Course No. ST-583

Title: Statistical Computing

Credits: 4

Maximum Marks: 100
a) Semester examination: 80
b) Semester assessment: 20

Duration of examination: 3 hours.

Syllabus for the examinations to be held in 2010, 2011 and 2012

Objective: To introduce statistical computing.

Unit-I


Unit-II


Unit-III


Unit-IV

Non-linear regression: Method; Estimation; Intrinsic and Parameter-effects curvature; application. EM algorithm and applications. Smoothing with kernels: density estimation, choice of kernels.

NOTE FOR PAPER SETTING:

Section A will contain 4 compulsory questions of 8 marks each, one question from each unit. Section B will contain 8 questions, 2 from each unit and 4 questions, one from each unit, of 12 marks each to be attempted.
Books Recommended:
1. Bishop, C.M. Neural Networks for pattern Recognition, Oxford University Press.