

FROM THE HEAD OF THE DEPARTMENT

With the advent of the computers, the globe has witnessed the importance of preserving and analyzing a plethora of data. As a result there is an increasing demand for appropriate analytical and interpretation skills.

Every company is now rich in data but very few can make use of these data even for simple decision. The situation demands professionals who can make as much use of available data as possible.

Our aim is : “ To Provide foundation for lifetime learning, so that each student can reach the pinnacle of glory. We provide statistical knowledge and equip our students with enough technical expertise, which will enable them to lead their organization effectively to new frontiers. Our department has started two post graduate diplomas to help various industries in analyzing data. These diplomas could be an alternative to the management degree. Hence students will take benefit of this course and will lead a very good life. I wish them goodluck.

Dr. (Mrs.) Smita Prakash Nabar

Statistics:

Statistics is all pervasive. It touches every aspect of life, research and business.

From birth to death statistics is associated with human being.

Statistics is the development and application of techniques involved with design of investigation, summarization and inference from results of investigation to population from which results are derived. Statistics offers a rational theory in context of uncertainty with the central aim of characterizing how an individual should act in order to avoid certain kinds of undesirable behavioral inconsistencies.

Twenty first century experiences information explosion. To manage this information we need knowledge workers. Statistics will help these knowledge workers to draw accurate conclusions in all the fields including health, psychology, ecology, politics, music, lifestyle choices etc. etc. and enhance the quality of life.

Department of Statistics:

Sixty years back renowned professor and great visionary Prof. M.C. Chakrabarti founded the department of Statistics. It is the oldest and most recognized teaching and research institute in the country. It offers post graduate courses M. A / M.Sc, M.Phil and Ph.D programmes in Statistics. It has close interaction with industry through its executive development programmes.

The Department has 5 core and visiting faculty members besides dozens of industry experts delivering lectures on various topics.

To live up to its reputation of excellent teaching and research Department, We had launched two new programs , first of their kind in the country—“Post graduate Diploma in Applied Statistics with Software” and Post Graduate Diploma in Actuarial Science”

University of Mumbai
POST GRADUATE DIPLOMA IN ACTUARIAL SCIENCE

Introduction:

Actuaries are statisticians involved in number crunching and handling tons of mortality and other statistics to device the correct pricing of insurance policies. As an actuary, he has the opportunity to work in a wide **POST GRADUATE DIPLOMA IN APPLIED STATISTICS WITH SOFTWARE (PGDASS)**

The Course:

Department of Statistics, University of Mumbai has specially designed a one-year Post Graduate Diploma in Applied Statistics with Software for students and professionals who wish to make a successful and rewarding career in business and research.

Focus:

The focus of the course will not be on statistics or mathematics; but on applications of these techniques for taking better business and research decisions. All the techniques required in business and research to take sound decisions will be covered in the course. Besides, the latest software like SAS and SPSS will be used in the course to solve all the business and research problems. Students will be given hands-on training on computers for all the techniques.

The course focuses more on practical aspects of the problems and therefore all the techniques will be discussed with real-life, research and industry data. The course, besides statistics and mathematics, highlights the importance of good communications and will expose students to the latest techniques of communications to become a successful professional in any field.

Faculty:

Department of Statistics is very choosy about the faculty that will teach the course. After careful deliberations the Department of Statistics has drawn up a

list of highly qualified, experienced and expert professors and industry professionals.

Projects:

To make the course more relevant to business and research, students will be undertaking industry and corporate projects under the expert guidance of the faculty.

Assessment:

The assessment of students will be made continuously on the basis of class tests, presentations, case studies and group-projects. There will be external examination at the end of each semester.

Papers:

There will be eight papers including a project besides interim projects in each subject. The title of the papers are as follows:

1. Basic Statistics
2. Marketing Research
3. Regression and Linear Model
4. Decision Making and Forecasting
5. Statistical Process Control
6. Medical Statistics
7. Multivariate Techniques
8. Communication skills and Project

Facility:

To deliver the best measuring of the industry and research standards, students will be provided excellent facilities during the course as:

- ☞ Networking of computers and Internet.
- ☞ The latest software like SAS, MINITAB and SPSS.
- ☞ LCD Projector and white boards.
- ☞ Air conditioned computer lab
- ☞ Audio system.

Placement:

After completion of the course, assistance in placement will also be offered to students to get better placements in the corporate and research world.

Industries that would absorb these students are pharmaceuticals and healthcare, consultancy firms, Marketing Research Agencies, Financial companies, Insurance companies, Consumer Durable companies, FMCG companies etc.

Eligibility:

Any graduate from Mumbai University or any other recognized university.

Admissions are strictly on the basis of entrance test.

No. of Seats : 50

Duration of Course: One year full time course. Timings will be intimated later

“POST GRADUATE DIPLOMA IN ACTUARIAL SCIENCE” (PGDAS)

The Course:

The department has formulated another unique course keeping in mind the ever growing demand of insurance and risk management industry. The course will develop world-class actuaries with focus on product design, policy pricing and assets-liability management in the areas of insurance, pension, investment, banking and healthcare management.

The Faculty:

To live to its reputation of having excellent, qualified and experienced faculty with decades of expertise, the department has drawn up a list of faculty who would deliver the best for the course.

Assessment:

The assessment of students will be made continuously on the basis of assignment and class tests for internal assessment. There will be External Examination at the end of each semester.

Papers:

There will be eight papers. The title of the papers are as follows:

1. Financial mathematics
2. Finance and Financial reporting
3. Probability and Mathematical Statistics
4. Economics
5. Contingencies
6. Statistical Methods
7. Statistical models
8. Financial and Statistical Economics

Placement:

After successful completion of the course, assistance will be offered to the students to get placements in the corporate and research world.

Industries that would absorb these students are Consultancy firms, Financial companies, Insurance companies, Banks etc.

Eligibility:

Any graduate from Mumbai University or any other recognized university.

Admissions are strictly on the basis of entrance test.

No. of Seats : 50

Duration of Course: One year full time Course. Timing will be intimated later.

number of areas in life insurance, general insurance, reinsurance, pension funds, risk management and so on. The work profile includes product design, policy pricing and assets-liability management among others.

The Insurance Regulatory and Development Authority (IRDA) mandates that life insurance companies must have at least one appointed actuary, while general insurers can meet their actuarial needs with the help of consultants.

Over the next three years, industry sources expect the number of actuaries in private sector life insurance to double. Consultants feel that over five years, the number can reach 600 in life and about 300 in non – life. Demand for actuaries is likely to intensify as new entrants look at India and some expatriates in existing companies return home. While the opportunities for young, experienced students is currently good, long-term demand will come at the experienced, senior, appointed actuary level.

Fees structure:

Rs. 40,000/- fee per year

Rs. 1,000/- Examination fee per student per term.

Rs. 800/- P. G. Registration Fee.

Note: If there is a change in the examination fee structure then the excess Amount will be afterwards.

Scheme of Examination:

The evaluation of the performance of a student in each paper shall be based upon both internal assessment and external examination. The external examination will be held only once the conclusion of an academic term. The external examination will consist of EIGHT papers and each of THREE hours.

Subject	Title	Internal	External	Total
Paper I	Financial Mathematics	40	60	100
Paper II	Finance & Financial Reporting	40	60	100
Paper III	Probability and Mathematical Statistics	40	60	100
Paper IV	Economics	40	60	100
Paper V	Contingencies	40	60	100
Paper VI	Statistical Methods	40	60	100
Paper VII	Statistical Models	40	60	100
Paper VIII	Financial and Statistical Economics	40	60	100

First term will consist of first four papers & Second term will consist of next four papers.

Detailed Syllabus for the Subject:

PAPER-I : FINANCIAL MATHEMATICS

1. Generalized cash – flow model
2. Concepts of compound interest and discounting
3. Interest rates or discount rates in terms of different time periods
4. Real and money interest rates
5. The present value and the accumulated value of a stream of equal or unequal payments using specified rates of interest and the net present value at a real rate of interest, assuming a constant rate of inflation.
6. Definition of compound interest functions including annuities certain
7. Definition of an equation of value
8. Repayment of loan by regular instalments of interest and capital
9. Discounted cash flow techniques
10. The investment and risk characteristics of various types of asset available for investment purposes
11. Elementary compound interest problems
12. The delivery price and the value of a forward contract using arbitrage free pricing methods
13. Structure of interest rates
14. Simple stochastic models for investment returns

Reference Books:

1. UK Institute of Actuaries core leading for the subject CT1 financial mathematics
2. Baxter, Robert. Finance Mathematics, Medford, OR: Baxter Instructional Materials, 1992. Sixth Edition Revised and Expanded.
3. Hart, W. L. Mathematics of Investment, Lexington, MA: D.C. Heath, 1975, Fifth Edition.
4. Karatzas, Ioannis and Shreve, Steven E., Methods of Mathematical Finance, New York, NY: Springer, 1998.
5. Kellison, Stephen G. The Theory of Interest, Homewood, IL: Richard D. Irwin, 1970, 1990. Second Edition.
6. Martin, Peter G. and Burrow, Michael. Applied Financial Mathematics, New York, NY; Sydney: Prentice Hall, 1991.
7. Roman, Steven. The Mathematics of Finance, Irvine, CA: Innovative Textbooks, 1993.
8. Watsham, Terry J. and Parramore, Keith. Quantitative Methods in Finance, London; Boston, MA: International Thomson Business Press, 1997. First Edition.

PAPER- II : FINANCE & FINANCIAL REPORTING

1. Principal terms in investment and asset management
2. Key principles of finance
3. Structure of Joint Stock Company and the different methods of financing by which it may be financed
4. Basic principles of personal and corporate taxation
5. The characteristics of the principal forms of financial instrument used by companies
6. Factors to be considered by a company when deciding on its capital structure and dividend policy
7. Definition of company's cost of capital & the nature of the investment projects
8. The basic construction of accounts of different types and principal features of the accounts of a company
9. Interpretation of the accounts of a company or a group of companies and limitations of such interpretation.
10. Financial techniques used in the assessment of capital investment projects

Reference Books:

1. UK Institute of Actuaries Core Reading for subject CT2 Finance and Financial Reporting.
2. Brigham, Eugene F and Houston, Joel F., Fundamentals of financial management. 9th ed. Harcourt Brace, 2000 ISBN 0030314615

3. Holmes, Geoffrey and Sugden, Alan, interpreting company reports and accounts. 7th ed. Prentice Hall, 1999 ISBN 027364615X.
4. Samuels, J.M; Wilkes, F.M; Bray Shaw, R.E., management of company finance. 6th ed. International Thomson, 1995 ISBN 1861522290.
5. Brealey, Richard A and Myers, Stewart C., principles of corporate finance. 6th ed. McGraw-Hill, 1999 ISBN 0077095650

PAPER- III : PROBABILITY AND MATHEMATICAL STATISTICS

1. Main features of a data set (exploratory data analysis)
2. Concepts of probability
3. Concepts of random variable, probability distribution, distribution function, expected value, variance and higher moments
4. Probability generating function, moment generating function, cumulative generating function and cumulant
5. Basic discrete and continuous distributions
6. Concepts of independence, jointly distributed random variables and conditional distributions, use of generating functions
7. Central limit theorem and its application
8. Concepts of random sampling, statistical inference and sampling distribution
9. Methods of estimation and properties of estimators
10. Confidence intervals for unknown parameters
11. Testing of hypotheses
12. Correlation and regression analysis
13. Concepts of analysis of variance
14. Concepts of conditional expectation and compound distribution

Reference Books:

1. UK Institute of Actuaries core reading for reading for subject CT3 Probability and mathematical Statistics
2. Rohatgi V.K. & A.K. MD. Ehsanes Saleh: An introduction to probability theory and mathematical statistics, 2nd ed. John Wiley and Sons, 2001.
3. Wackesly D. D; Mondonhall III, William and Scheffer, R.L. mathematical statistics with applicable Duxbury, 2002

PAPER- IV : ECONOMICS

1. The interaction between supply and demand of a product and the way in which equilibrium market prices are determined

2. Elasticity of demand and supply and the effects on a market of different levels of elasticity
3. Application of utility theory to economic and financial problems
4. Profit maximizing firms
5. Different sorts of competition, or lack of it, the practical effect on supply and demand
6. Microeconomic principles to increase their understanding of the markets and the regulatory issues and the ramification of strategic decisions
7. Structure of the public sector finances of an industrialised economy
8. Definition of GDP, GNP and Net National Product, concepts useful in describing the economy and in making comparisons between countries, their limitations
9. The propensity to save or to consume by the private sector or the corporate sector affects the economy
10. The impact of fiscal monetary policy and other forms of government intervention on different aspects of the economy, and in particular on financial markets
11. Role of exchange rates and international trade in the economy and the meaning of the term balance of payments
12. The major factors affecting the rate of inflation, the level of interest rates, the exchange rate, level of unemployment, rate of economic growth in the economy of an industrialized country

Reference Books:

1. Institute of Actuaries core reading for the subject CT7 Economics
2. Begg David, Stanley Fischer and Rudiger Dornbusch (1997), Economics (5th ed.) and Economics workbook, McGraw Hill
3. Samuelson Paul and William Norhaus (1998), Economics (16th ed.) McGraw Hill
4. Wonnacott P. and R. Wonnacott (1990), Economics (4th ed.) John Wiley
5. Gwartney James D. and Richard L. Stroup (1997) Economics: Private and public choice (8th ed.), HBJ College & School Division.
6. Lipsey Richard G. and Chrystal K. Alec (1999), Principles of economics, Oxford University Press.

PAPER- V : CONTINGENCIES

1. Simple assurance and annuity contracts
2. Practical methods of evaluating expected values and variances of the simple contracts
3. Calculation of ultimate or select mortality, net premiums and net premium provisions of simple insurance contracts
4. Calculation of ultimate or select mortality, of net premiums and net premium provisions for increasing and decreasing benefits and annuities
5. Calculation of gross premiums and provisions of assurance and annuity contracts

6. Defination of functions involving two lives
7. Methods used to model cashflows contingent upon competing risks
8. Technique of discounted emerging costs, pricing, reserving and assessing profitability
9. Principal forms of heterogeneity within a population and the ways in which selection can occur

Reference Books:

1. UK Institute of Actuaries Core Reading for subject CT5 Contingences
2. Bowers, Newton L et al., Actuarial Mathematics 2nd ed. Society of Actuaries, 1997
3. Neill, Alistair, Life contingencies. Heinemann, 1977
4. Gerber, H. U., Life insurance mathematics 3rd ed. Springer, Swiss Association of Actuaries, 1997
5. Benjamin, Bernard and Pollard, John H., The analysis of mortality and other actuarial statistics. 3rd ed. Institute of Actuaries and Faculty of Actuaries, 1993
6. Haberman, S. and Pitacco, E., Actuarial models for disability insurance Chapman & Hall, 1999
7. Booth, P.M et al., Modern actuarial theory and practice, Chapman & Hall, 1999

PAPER VI : STATISTICAL METHODS

1. Concept of decision theory
2. Probabilities and moments of loss distributions both with and without limits and risk-sharing arrangements
3. Risk models involving frequency and severity distributions, calculation of the moment generating function and the moments for the risk models both with and without simple reinsurance arrangements
4. Concept of ruin for a risk model
5. The fundamental concepts of Bayesian statistics
6. The fundamental concepts of rating
7. Techniques for analyzing a delay (or run-off) triangle and projecting the ultimate position
8. The fundamental concepts of a generalized linear model
9. The main concepts underlying the analysis of time series models
10. Concepts of “ Monte Carlo ” simulation

Reference Books:

1. UK Institute of Actuaries core reading for subject CTVI statistical methods
2. Box G.E.P and Jenkin's: Time series analysis forecasting and control. Holden Day 1970.
3. Degroof M.H. Optimal Statistical decision

4. Berjer J; Statistical Decision theory and Bayesian analysis
5. Searler S.R. Linear Models, John Wiley & Sons, 1971
6. Ross S. M. Introduction to Probability Models- 7th Edition
Academic Press/Harcourt 2000.
7. Morgan B.J.T. Elements of simulation, Chapman & Hall, 1995.

PAPER VII - STATISTICAL MODELS

1. Principles of actuarial modelling
2. General principles of stochastic processes, their classification into different types
3. Markov chain
4. Markov process
5. Concept of survival models
6. Estimation procedures for lifetime distributions
7. Statistical models of transfer between multiple states
8. Maximum likelihood estimators for the transition intensities
9. Binomial model of mortality, maximum likelihood estimator for the probability of death
10. Estimation of transition intensities depending on age
11. Crude estimates for consistency with a standard table or a set of graduated estimates and the process of graduation.

Reference Books:

1. UK Institute of Actuaries core leading for subject CTIV Statistical models
2. Kleinbaum D.G. Survival analysis, A self-learning text, Springer, 1994.
3. Lee E.T. Statistical methods for survival data analysis
Wadsworth, Belnout, CA. 1980.
4. Basic stochastic processes: a course through exercises.
Springer 1998.
5. Karlin, Samuel and Taylor A second course in stochastic processes,
Howard M. Academic Press 1981
6. Kulkarni, Vidyadhar Modeling and analysis of stochastic systems,
G.Thomson Science and Professional, 1995
7. Medhi, Jyotiprasad, Stochastic Processes, Wiley Estern Limited, 2nd ed.
1994
8. Cox D.R. and Miller H.D. The theory of stochastic processes,
Methuen and co. Ltd. 1964

PAPER VIII - FINANCIAL AND STATISTICAL ECONOMICS

1. Advantages and disadvantages of different measures of investment risk
2. The assumptions of mean-variance portfolio theory and its principal results

3. The properties of single and multifactor models of asset returns
4. Asset pricing models, assumptions and the limitations of such models
5. The various forms of the Efficient Markets Hypothesis and the evidence for and against the hypothesis
6. Stochastic models of the behavior of security prices
7. Concepts of Brownian motion
8. The properties of option prices, valuation methods and hedging techniques
9. Models of the term structure of interest rates

Reference Books:

1. Institute of Actuaries core reading for the subject CT8 Finance Economics.
2. Hall John C. Options, Futures and Other derivatives 3rd ed. Prentice Hall of India Private Ltd., New Delhi, 1997.
3. Seal H. L. Stochastic Theory of risk business, John Wiley, 1969.
4. Oksendal B. Stochastic Differential Equation, An introduction with applications Springer; 2003.

Standard of Passing:

1. A candidate securing a minimum of 50% marks in each paper consisting of internal and external examination taken together will be declared to have passed in that paper and will be exempted from that paper.
2. A candidate will be declared to have passed the examination if he/she passes In all papers.
3. A candidate will be awarded the following Grades on the basis of percentage of total marks obtained by the candidate in one or more attempt(s).

Percentage	Grade
50 – below 60	C
60 – below 70	B
70 – below 80	A
80 – 100	A ⁺
4. A registration of the candidate is valid only for three years for the course. After the three years he/she will have to register again.