

DEPARTMENT OF ACTUARIAL SCIENCE  
SCHOOL OF MATHEMATICAL SCIENCES  
NORTH MAHARASHTRA UNIVERSITY  
JALGAON - 425001, INDIA



**SYLLABUS FOR**

**First Year of B.Sc.(Actuarial Science)**

**Under**

**Three-year course**

**B.Sc.(Actuarial Science)**

**WITH EFFECT FROM ACADEMIC YEAR**

**2018-2019**

**UNDER**

**FACULTY OF SCIENCE & TECHNOLOGY**

**Department of Actuarial Science  
School of Mathematical Sciences  
North Maharashtra University, Jalgaon, India**

**Syllabus Structure for First Year B.Sc.(Actuarial Science)**

**Under**

**Three-year course  
B.Sc.(Actuarial Science)**

**Semester-I**

Course Code	Title of the Course	Contact Clock Hours/week			Distribution of Marks for Examination						Credits
					Internal		External		Total		
		Th(L)	Pr	Total	Th	Pr	Th	Pr	Th	Pr	
AS-101	Calculus	04	--	04	40	--	60	--	100	--	04
AS-102	Linear Algebra	04	--	04	40	--	60	--	100	--	04
AS-103	Descriptive Statistics	04	--	04	40	--	60	--	100	--	04
AS-104	Probability Distributions-I	04	--	04	40	--	60	--	100	--	04
AS-105	Practicals- I	--	06	06	--	40	--	60	--	100	03
AS-106	Effective Communication in English	03	--	03	40	--	60	--	100	--	03

**Semester-II**

Course Code	Title of the Course	Contact Clock Hours / week			Distribution of Marks for Examination						Credits
					Internal		External		Total		
		Th(L)	Pr	Total	Th	Pr	Th	Pr	Th	Pr	
AS-201	Mathematical Analysis	04	--	04	40	--	60	--	100	--	04
AS-202	Probability Distributions-II	04	--	04	40	--	60	--	100	--	04
AS-203	Principles of Microeconomics	04	--	04	40	--	60	--	100	--	04
AS-204	Principles and Practices in Insurance	04	--	04	40	--	60	--	100	--	04
AS-205	Practicals-II	--	06	06	--	40	--	60	--	100	03
AS-206	Environment Studies	03	--	03	40	--	60	--	100	--	03

**Note:** Syllabus structure of complete Three-year course B.Sc.(Actuarial Science) is given separately.

**Examination and Declaration of result:** Internal and External Examinations will be conducted by the Department of Actuarial Science under Academic flexibility and results will be declared by University's Examination section based on CGPA system.

## Detailed Syllabi for F.Y.B.Sc.(Actuarial Science)

### AS-101: Calculus

#### UNIT I (18 L)

Differential Calculus: Limits of function, continuous functions, properties of continuous functions, partial differentiation and total differentiation. Indeterminate forms: L-Hospital's rule, Leibnitz rule for successive differentiation. Euler's theorem on homogeneous functions. Maxima and minima of functions of one and two variables, constrained optimization techniques (with Lagrange multiplier) along with some problems. Jacobian, concavity and convexity, points of inflexion of function, singular points.

#### UNIT II (18L)

Integral Calculus: Review of integration and definite integral. Differentiation under integral sign, double integral, change of order of integration, transformation of variables. Beta and Gamma functions: properties and relationship between them.

#### UNIT III(18L)

Differential Equations: Exact differential equations, Integrating factors, change of variables, Total differential equations, Differential equations of first order and first degree, Differential equations of first order but not of first degree, Equations solvable for x, y, q, Equations of the first degree in x and y, Clairaut's equations. Higher Order Differential Equations: Linear differential equations of order n, Homogeneous and non-homogeneous linear differential equations of order n with constant coefficients, Different forms of particular integrals, Linear differential equations with non-constant coefficients, Reduction of order method, The Cauchy-Euler's equation of order n, Legendre's linear equation.

#### UNIT IV(6L)

Formation and solution of a partial differential equations. Equations easily integrable. Linear partial differential equations of first order.

#### SUGGESTED READINGS

1. Gorakh Prasad, Differential Calculus, Pothishala Private Ltd, Allahabad
2. Shanti Narayan, Differential Calculus, S. Chand and company, Delhi.
3. Ayres F. Jr.: Calculus, Schaum Outline Series, McGraw Hill 1981.
4. Gorakh Prasad: Differential Calculus, Pothishala Pvt. Ltd., Allahabad (14th Edition - 1997).
5. Gorakh Prasad: Integral Calculus, Pothishala Pvt. Ltd., Allahabad (14th Edition 2000).
6. Zafar Ahsan: Differential Equations and their Applications, Prentice-Hall of India Pvt. Ltd., New Delhi (2nd Edition -2004).
7. Piskunov, N: Differential and Integral Calculus, Peace Publishers, Moscow.
8. Murray R. Spiegel, Theory and Problems of Advanced Calculus, Schaum Outline Series, Schaum Publishing co., New York.

## AS-102: Linear Algebra

### UNIT I (6L)

Vector spaces, Subspaces, sum of subspaces, Span of a set, Linear dependence and independence, dimension and basis, dimension theorem.

### UNIT II (18L)

Algebra of matrices - A review, theorems related to triangular, symmetric and skew symmetric matrices, idempotent matrices, Hermitian and skew Hermitian matrices, orthogonal matrices, singular and non-singular matrices and their properties. Trace of a matrix, unitary, involutory and nilpotent matrices. Adjoint and inverse of a matrix and related properties.

### UNIT III (18L)

Determinants of Matrices: Definition, properties and applications of determinants for 3rd and higher orders, evaluation of determinants of order 3 and more using transformations. Symmetric and Skew symmetric determinants, Circulant determinants and Vandermonde determinants for nth order, Jacobi's Theorem, product of determinants. Use of determinants in solution to the system of linear equations, row reduction and echelon forms, the matrix equations  $AX=B$ , solution sets of linear equations, linear independence, Applications of linear equations, inverse of a matrix.

### UNIT IV (18L)

Rank of a matrix, row-rank, column-rank, standard theorems on ranks, rank of the sum and the product of two matrices. Generalized inverse(concept with illustrations). Partitioning of matrices and simple properties. Characteristic roots and Characteristic vector, Properties of characteristic roots, Cayley Hamilton theorem, Quadratic forms, Linear orthogonal transformation and their digitalization.

### SUGGESTED READINGS

1. Lay David C.: Linear Algebra and its Applications, Addison Wesley, 2000.
2. Schaum's Outlines : Linear Algebra, Tata McGraw-Hill Edition, 3rd Edition, 2006.
3. Krishnamurthy V., Mainra V.P. and Arora J.L.: An Introduction to Linear Algebra (II, III, IV, V) 1976.
4. Jain P.K. and Khalil Ahmad: Metric Spaces, Narosa Publishing House, New Delhi, 1973
5. Biswas, S. (1997): A Textbook of Matrix Algebra, New Age International, 1997.
6. Gupta S.C.: An Introduction to Matrices (Reprint). Sultan Chand & Sons, 2008.
7. Artin M.: Algebra. Prentice Hall of India, 1994.
8. Datta K.B.: Matrix and Linear Algebra. Prentice Hall of India Pvt. Ltd., 2002.
9. Hadley G.: Linear Algebra. Narosa Publishing House (Reprint), 2002.
10. Searle S.R.: Matrix Algebra Useful for Statistics. John Wiley & Sons., 1982
11. A. Ramachandra Rao and P. Bhimasankaram (2000), Linear Algebra, Hindustan Book Agency, Delhi.

## AS-103: Descriptive Statistics

### UNIT I (15L)

Statistical Methods: Definition and scope of Statistics, concepts of statistical population and sample. Data: quantitative and qualitative, attributes, variables, scales of measurement nominal, ordinal, interval and ratio. Presentation: tabular and graphical, including histogram and ogives, consistency and independence of data with special reference to attributes.

### UNIT II (15L)

Measures of Central Tendency: mathematical and positional. Measures of Dispersion: range, quartile deviation, mean deviation, standard deviation, coefficient of variation, Moments, absolute moments, factorial moments, skewness and kurtosis, Sheppard's corrections. Measures of inequality: Gini's coefficient and Lorenz Curve.

### UNIT III (15L)

Bivariate data: Definition, scatter diagram, simple, partial and multiple correlation (3 variables only), rank correlation. Simple linear regression, principle of least squares and fitting of polynomials and exponential curves.

### UNIT IV (15L)

Index Numbers: Definition, construction of index numbers and problems thereof for weighted and unweighted index numbers including Laspeyre's, Paasche's, Edgeworth-Marshall and Fisher's. Chain index numbers, conversion of fixed based to chain based index numbers and vice-versa. Consumer price index numbers.

### SUGGESTED READINGS

1. Agarwal, B. L. (2003). Programmed Statistics, Second Edition, New Age International Publishers, New Delhi.
2. Bhat B.R, Srivenkatramana T and Rao Madhava K.S. (1996): Statistics: A Beginner's Text, Vol. I, New Age International (P) Ltd.
3. Goon, A. M., Gupta, M. K. and Dasgupta, B. (2002). Fundamentals of Statistics, Vol. I and II, 8th Edition, the World Press Pvt. Ltd., Kolkata.
4. Gupta, S. C. and Kapoor, V. K. (1983). Fundamentals of Mathematical Statistics, Eighth Edition, Sultan Chand and Sons Publishers, New Delhi.
5. Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.
6. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Edn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.
7. Sarma, K. V. S. (2001). Statistics Made it Simple: Do it yourself on PC. Prentice Hall of India, New Delhi.
8. Snedecor G. W. and Cochran W. G.(1989). Statistical Methods, Eighth Ed. East-West Press.

### AS-104: Probability Distributions-I

- Random experiment: trial, sample point and sample space, event, Operations of Events, concepts of mutually exclusive and exhaustive events. (6L)
- Definition of probability: classical and relative frequency approach. Discrete probability space, Properties of probability, Independence of events, Conditional probability, total and compound probability rules, Bayes' theorem and its applications. (12L)
- Discrete random variable (rv): its probability mass function (pmf) and cumulative distribution function (cdf). Joint pmf of several discrete rvs. Marginal and conditional pmfs. Independence of rvs. Expectation of a rv and its properties. Moments, measures of location and dispersion of a rv. Probability generating function (pgf) and moment generating function (mgf) of a rv, their properties and uses. (10L)
- Standard univariate discrete distributions: degenerate, Bernoulli, discrete uniform, binomial, hypergeometric, Poisson, geometric and negative binomial distributions, reproductive property of standard distributions. (15L)
- Bivariate discrete distributions: Bivariate Binomial, Bivariate Poisson, Bivariate Negative Binomial, Marginal and conditional distributions. (12L)
- Distributions of functions of discrete random variables. (5L)

#### SUGGESTED READINGS

1. Chung, K. L. (1979). Elementary Probability Theory with Stochastic Processes, Springer International Student Edition.
2. David Stirzaker (1994). Elementary Probability, Cambridge University Press.
3. Feller, W. (1968). An Introduction to Probability Theory and Its Applications, Wiley.
4. Hogg, Robert V. & Craig Allen T. (2008). Introduction to Mathematical Statistics, Pearson Education.
5. Mukhopadhyay, P. (1996). Mathematical Statistics, New Central Book Agency, Calcutta.
6. Parzen, E. (1960). Modern Probability Theory and Its Applications, Wiley Eastern.
7. Pitman, Jim (1993). Probability, Narosa Publishing House.

**AS-105: Practicals- I (On PC using Software)**

- A. Practicals based on AS-101 (Calculus) (15 Hrs)**
1. Checking monotonicity of a given function.
  2. Curve sketching and checking the convexity/concavity of a function.
  3. Evaluation of logarithmic, exponential and trigonometric functions.
  4. Integration and differentiation of a given function.
  5. Differentiating given function by chain rule.
  6. Verification of Extreme value and Mean value theorem.
  7. Demonstrating occurrence of maxima and minima of a given function.
  8. Approximation for the function of two and three variables.
  9. Finding the extreme values of a function of two or more variables.
  10. Line integral and double integration of a function.
  11. Triple integration of a function.
- B. Practicals based on AS-102 (Linear Algebra) (23 Hrs)**
1. Checking linearly dependence/independence of set of vectors.
  2. Getting vectors in row/column space and null space of the given matrix.
  3. Verification of properties of determinant of the matrix.
  4. Checking various characterizations of the matrix such as: rank, singularity/nonsingularity, orthogonality, symmetry, definiteness, idempotency etc.
  5. Gram-Schmidt orthonormalization and forming an orthogonal matrix of specified order using Gram-Schmidt orthogonalization.
  6. Calculating eigen values and eigen vectors of a given matrix.
  7. Quadratic forms and their definiteness.
- C. Practicals based on AS-103 (Descriptive Statistics) (30 Hrs)**
1. Graphical and tabular presentation of data of various types.
  2. Classification, tabulation of a given data in one way/multi-way table.
  3. Preparing frequency distribution, frequency polygon and ogives.
  4. Exploratory data analysis: Bar graphs, histogram, Stem-and- Leaf plots, Box plots, dot plots, multiple bar graphs, Pie chart, Scatter diagram etc.
  5. Calculating various measures of central tendency and dispersion.
  6. Calculation of correlation coefficient.
  7. Calculation of Gini's Coefficient and plotting of Lorenz curve.
  8. Any other problems solving.
- D. Practicals based on Introduction to Computer and AS-104 (Probability Distributions-I) (22 Hrs)**
1. Simulation of some random experiments.
  2. Calculation of *pmf*, *CDF*, expectation and variance of the given discrete distribution.
  3. Plotting of *pmf* and *CDF* (step function).
  4. Generating random samples from given discrete distribution.
  5. Generating random samples from standard discrete distributions such as Binomial, Negative Binomial, Poisson, Hypergeometric etc.
  6. Finding marginal and conditional distribution from the given joint distribution.
  7. Generating random samples from joint and conditional distributions.

## AS-106: Effective Communication in English

### *Effective Oral Communication*

1. Theory of Communication (10L)
  - Verbal, Nonverbal Communication
  - Functions of Communication
  - Models of Communication
  - Effective Communication
  - Miscommunication
  
2. The Phonology of English (8L)
  - Physiology of Speech
  - Difficulties of Indian learners regarding Vowels,
  - Diphthongs, Consonants
  - Phonemes, Allophones, Syllabic Consonants
  - Assimilation and Elisions
  - Word Accent, Stress, Intonation
  - Varieties of English
  - Phonemic and Phonetic Transcription
  
3. Conversation Skills (5L)
  - Formal, Informal
  - English for Situations
  - Interviews
  - Meetings
  
4. Public Speaking, Presentations & Group Discussions (2L)

### *Effective Written Communication*

1. Academic & Analytical Writing (7L)
  - Resumes and CVs
  - Project Proposals
  - Research Articles
  - Referencing
  
2. Writing for the Media (6L)
  - Difference between print and electronic media
  - Different kinds of writing like news writing, feature writing, investigative reports, current news, human interest stories, subediting, proof-reading symbols.
  - Script writing for radio and television.



### 3. Technical Writing

(7L)

- Technology in communication
- Effective use of available technology
- Writing instructions
- Technical description
- Writing for the web
- Instructions manuals

### SUGGESTED READINGS

1. Gerson, J. Sharori Technical writing, process and product, Pearson Education Reprint-2004.
2. Betty Kirkpatrick: The concise Oxford Thesaurus. OUP, 24<sup>th</sup> Impression 2003.
3. Arnold, G.F. & Gimson, A.C., 'English Pronunciation Practice', London: Hodder and Stoughton.
4. Bansal, R.K., 'The Intelligibility of Indian English', Orient Longman.
5. Bolinger, D. 'Aspects of Language', New York, Harcourt, Brace and World Inc., 1968.
6. Miller, George A., 'Language and Communication', New York: Mc Graw Hill.
7. Booher, Dianna E-writing, 21<sup>st</sup> -century tools for effective communication, Macmillan India Ltd Reprint-2008.
8. Mohan, Krishna & Banerji, Meera Developing Communication Skills, Macmillan India Ltd Reprint-2007.
9. Vilanilam, J. V. More Effective Communication (A Manual for Professionals), Response Books, New Delhi (2003).
10. *Fluency in English* - Part II, Oxford University Press, 2006.
11. *Business English*, Pearson, 2008.
12. *Language, Literature and Creativity*, Orient Blackswan, 2013.
13. *Language through Literature* by Gauri Mishra, Ranjana Kaul and Brati Biswas.

## AS-201: Mathematical Analysis

### UNIT-I (24L)

Real Analysis: Representation of real numbers as points on the line and the set of real numbers as complete ordered field. Bounded and unbounded sets, neighborhoods and limit points, Superimum and infimum, derived sets, open and closed sets, sequences and their convergence, limits of some special sequences such as  $r^n$ ,  $\left(1 + \frac{1}{n}\right)^n$  and  $n^{\frac{1}{n}}$  Cauchy's general principle of convergence, Cauchy's first theorem on limits, monotonic sequences, limit superior and limit inferior of a bounded sequence.

### UNIT-II (24L)

Infinite series, positive termed series and their convergence, Comparison test, D'Alembert's ratio test, Cauchy's  $n^{\text{th}}$  root test, Raabe's test. Gauss test, Cauchy's condensation test and integral test (Statements and Examples only). Absolute convergence of series, Leibnitz's test for the convergence of alternating series, Conditional convergence. Indeterminate form, L' Hospital's rule.

### UNIT-III (12L)

Review of limit, continuity and differentiability, uniform Continuity and boundedness of a function. Rolle's and Lagrange's Mean Value theorems. Taylor's theorem with Lagrange's and Cauchy's form of remainder (without proof). Taylor's and Maclaurin's series expansions of  $\sin(x)$ ,  $\cos(x)$ ,  $e^x$ ,  $(1 + x)^n$ ,  $\log(1+x)$ .

### SUGGESTED READINGS

1. Malik S.C. and Savita Arora: Mathematical Analysis, Second Edition, Wiley Eastern Limited, New Age International Limited, New Delhi, 1994.
2. Somasundram D. and Chaudhary B.: A First Course in Mathematical Analysis, Narosa Publishing House, New Delhi, 1987.
3. Gupta S.L. and Nisha Rani: Principles of Real Analysis, Vikas Publ. House Pvt. Ltd., New Delhi, 1995.
4. Appostol T.M.: Mathematical Analysis, Second Edition, Narosa Publishing House, New Delhi, 1987.
5. Shanti Narayan: A course of Mathematical Analysis, 12<sup>th</sup> revised Edition, S. Chand & Co. (Pvt.) Ltd., New Delhi, 1987.
6. Singal M.K. and Singal A.R.: A First Course in Real Analysis, 24<sup>th</sup> Edition, R. Chand & Co., New Delhi, 2003.
7. Bartle, R. G. and Sherbert, D. R. (2002): Introduction to Real Analysis(3rd Edition), John Wiley and Sons (Asia) Pte. Ltd., Singapore.
8. Ghorpade, Sudhir R. and Limaye, Balmohan V. (2006): A Course in Calculus and Real Analysis, Undergraduate Texts in Mathematics, Springer (SIE), Indian reprint.

## AS-202: Probability Distributions-II

- Review of discrete random variable and discrete probability distributions. (4L)
- Continuous random variable, probability density function and cumulative distribution function and cumulative distribution functions of continuous random variables. (4L)
- The Uniform, Normal distributions, gamma distribution and its special cases: the exponential and chi-square distributions, Expected values, variance and moment generating functions of continuous random variables, problems and examples. (16L)
- Other univariate continuous probability distribution: lognormal, Weibull, Laplace, Beta distributions. (16L)
- Relation between different distributions. (6L)
- Functions of Random Variables, including the method of transformation (Jacobian method) and the method of moment generating functions for more than one random variable, Order Statistics and their applications. (6L)
- Joint distribution of random variables, marginal, conditional distribution, conditional expectations etc. (6L)
- Limiting and approximations of distribution. (2L)

### SUGGESTED READINGS

1. Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.
2. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Edn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.
3. Ross S. (2002). A First Course in Probability, Sixth Edition, Pearson Education, Inc. & Dorling Kindersley Publishing, Inc.
4. Hogg, R.V., Tanis, E.A. and Rao J.M. (2009): Probability and Statistical Inference, Seventh Ed, Pearson Education, New Delhi.
5. Myer, P.L. (1970): Introductory Probability and Statistical Applications, Oxford & IBH Publishing, New Delhi.

## AS-203: Principles of Microeconomics

- Introduction: Nature and scope of economics; Methodology in economics; Choice as an economic problem; Production possibility frontier (curve); basic postulates; Role of price mechanism; Demand and supply; Basic framework — applications; Market equilibrium; Elasticity of demand- Price, income and cross; Consumer's surplus; Engel curve. (12L)
- Consumer's Behavior: Choice and Utility theory- Cardinal and ordinal approaches; Law of diminishing marginal utility; Indifference curve; Consumer's equilibrium (Hicks and Slutsky); Substitute and Income effect; Consumer and producer surplus and their application; Giffin goods; Compensated demand. (12L)
- Theory of Production and Costs: Production decisions; Production function; Average and marginal production; Iso-quant; Factor substitution; law of variable proportions; returns to scale; economies of scale; Different concepts of cost and their interrelation; Equilibrium of the firm; Expansion path; Empirical evidence on costs. (8L)
- Market Structure: Market forms — Perfect and imperfect markets; Equilibrium of a firm — Perfect competition, monopoly and price discrimination; Measure of monopoly power; Monopolistic competition; Duopoly, Oligopoly; Profit maximization condition; Taxation and equilibrium of a firm; Notion of controlled and administered prices. (8L)
- Factor Pricing: Marginal productivity theory of distribution; Theories of wage determination; Wages and collective bargaining; Wage differentials; Rent - Scarcity rent; Differential rent; Quasi rent; Interest-Classical and Keynesian theories; Profits - Innovation, risk and uncertainty theories. (10L)
- Investment Analysis: Payback period-average annual rate of return, Net present value, Internal rate of return criteria, price changes, risk and uncertainty, elements of social cost-benefit analysis. (5L)
- Welfare Economics: Problems in measuring welfare; Classical welfare economics; Pareto's criteria; Value judgment; Concept of a social welfare function; Compensation principle — Kaldor, Hicks. (5L)

### References

1. CT-7 Study material of Institute of Actuaries of India.
2. Henderson J. and R.E. Quandt (1980), Microeconomic Theory: A Mathematical Approach, McGraw Hill, New Delhi.
3. Heathfield and Wibe (1987), An Introduction to Cost and Production Functions, Macmillan, London.
4. Lipsey, R.G. and K.A. Chrystal (1999), Principles of Economics (9th Edition), Oxford University Press, Oxford.
5. Mansfield, E. (1997), Microeconomics (9th Edition), W.W. Norton and Company, New York.
6. Samuelson, P.A. and W.D. Nordhaus (1998), Economics, Tata McGraw Hill, New Delhi.
7. Stonier, A.W. and D.C. Hague (1972), A Textbook of Economic Theory, ELBS & Longman Group, London.
8. Varian, H.R. (2000), Intermediate Microeconomics: A Modern Approach (5th Edition), East-West Press, New Delhi.

## AS-204: Principles and Practices in Insurance

- Principles of Life Insurance: Nature of Insurance, Classification of Insurance Economic value of Earning Head of the Household, Basic Insurance Protection, Business use of Life Insurance, Basic elements of life insurance contracts, Insurable interest, Need for utmost good faith, disclosure of Material Facts, Warrant, Tax advantages of Certain Assurance, Wealth Tax. (12L)
- Selection and classification Risks, Objectives for selection and classification of risks, factors relating to Physical Hazard, Factors relating to occupational Hazards and Moral Hazard, Source of Information, Insurance of female lives, rating of female lives. (12L)
- Investment of life fund: Investment of LIC, Investment of life Insurance Fund, basic principles, statutory requirements of investments, people's money for peoples welfare valuation, purpose and types. (8L)
- Policy conditions and Privileges, calculation of paid up values, Surrender values, Loans, Foreclosure Alterations, Distribution of loans, Calculations of Vested bonus, Interim bonus, Final bonus, settlement of Claims, calculation of benefit payable on, Maturity claims, Death claims and adjustment for loans, unpaid premium and interest. (10L)
- General Insurance: Need for general insurance, Types of general insurance, Fire Insurance, Marine Insurance, Motor Insurance, Liability Insurance, Aviation Insurance, Engineering Insurance, Burglary Insurance, Mediclaim and project Insurance, Loss of profit Insurance. (10L)
- Principles of general Insurance, Privatization of Insurance in India, IRDAI and role of IRDAI. (8L)

### References

1. Kenneth Black Jr. and Harold D. Skipper (1999) Life and Health Insurance. (13<sup>th</sup> Ed.)
2. Principles and Practice of Life Insurance-Insurance Institute of India
3. Principles and General Insurance- Insurance Institute of India
4. Narang, Uma, Insurance Industry in India: Features, Reforms and Outlook, New Century Publications.
5. Periasamy P (2014) Principles and Practice of Insurance, Himalaya Publishing House.

## AS-205: Practicals- II (On PC Using Software)

- A. Practicals based on AS-202 (Probability Distributions-II) (45 Hrs)**
1. Fitting of binomial distributions for  $n$  and  $p = q = \frac{1}{2}$ .
  2. Fitting of binomial distributions for given  $n$  and  $p$ .
  3. Fitting of binomial distributions after computing mean and variance.
  4. Fitting of Poisson distributions for given value of  $\lambda$ .
  5. Fitting of Poisson distributions after computing mean.
  6. Fitting of negative binomial.
  7. Fitting of suitable distribution.
  8. Application problems based on binomial distribution.
  9. Application problems based on Poisson distribution.
  10. Application problems based on negative binomial distribution.
  11. Plotting of PDF and CDF of a continuous random variable.
  12. Problems based on area property of normal distribution.
  13. To find the ordinate for a given area for normal distribution.
  14. Application based problems using normal distribution.
  15. Fitting of normal distribution when parameters are given.
  16. Fitting of normal distribution when parameters are not given.
  17. Generating random sample from given continuous distribution.
  18. Generating random sample from standard distributions such as Normal, Uniform Gamma, exponential etc.
  19. Generating random sample from joint and conditional distribution.
  20. Computing various functions of sample observations based on random samples drawn from any continuous distribution.
  21. Finding marginal and conditional distribution from the given joint distribution.
  22. Generating random samples from joint and conditional distributions.
  23. Verification of approximation of distributions
- B. Practicals based on AS-103 (Descriptive Statistics) (30 Hrs)**
1. Fitting of linear and quadratic regression models.
  2. Fitting of polynomials by using transformations.
  3. Calculating of multiple and partial correlation coefficients.
  4. Intraclass correlation coefficient with equal and unequal group sizes.
  5. Fitting of multiple linear regression models.
  6. Testing independence of attributes.
  7. Analysis of categorical data using odds ratio.
  8. Other problems solving
- C. Practicals based on AS-203 (Principles of Microeconomics) (15 Hrs)**
1. Pareto criteria/analysis.
  2. Plotting of production possibility frontier (PPF)
  3. Plotting demand and supply curve and determination of equilibrium point.
  4. Computation of consumer and producer surplus.
  5. Calculation and sketching of total, marginal and average cost curve.
  6. Sketching of utility functions.
  7. Problems based on investments, variation in interest rates, risks etc.
  8. Solving Profit maximization problem under following market structures: Perfectly competitive, Monopoly, Oligopoly and Monopolistic.

## AS-206: Environment Studies

### Unit 1: Introduction to environmental studies (2L)

- Multidisciplinary nature of environmental studies;
- Scope and importance; Concept of sustainability and sustainable development.

### Unit 2: Ecosystems (6L)

- What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Case studies of the following ecosystems
  - a) Forest ecosystem
  - b) Grassland ecosystem
  - c) Desert ecosystem
  - d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

### Unit 3: Natural Resources : Renewable and Non-renewable Resources (8L)

- Land resources and land use change; Land degradation, soil erosion and desertification.
- Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations.
- Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state).
- Energy resources: Renewable and non renewable energy sources, use of alternate energy sources, growing energy needs, case studies. (8 lectures)

### Unit 4: Biodiversity and Conservation (8L)

- Levels of biological diversity: genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots.
- India as a mega-biodiversity nation; Endangered and endemic species of India
- Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts, biological invasions; Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.
- Ecosystem and biodiversity services: Ecological, economic, social, ethical, aesthetic and Informational value.

### Unit 5: Environmental Pollution (8L)

- Environmental pollution : types, causes, effects and controls; Air, water, soil and noise pollution
- Nuclear hazards and human health risks
- Solid waste management: Control measures of urban and industrial waste.
- Pollution case studies.

### Unit 6: Environmental Policies & Practices (7L)

- Climate change, global warming, ozone layer depletion, acid rain and impacts on human communities and agriculture.
- Environment Laws: Environment Protection Act; Air (Prevention & Control of Pollution) Act; Water (Prevention and control of Pollution) Act; Wildlife Protection

Act; Forest Conservation Act. International agreements: Montreal and Kyoto protocols and Convention on Biological Diversity (CBD).

- Nature reserves, tribal populations and rights, and human wildlife conflicts in Indian context.

### Unit 7: Human Communities and the Environment (6L)

- Human population growth: Impacts on environment, human health and welfare.
- Resettlement and rehabilitation of project affected persons; case studies.
- Disaster management: floods, earthquake, cyclones and landslides.
- Environmental movements: Chipko, Silent valley, Bishnois of Rajasthan.
- Environmental ethics: Role of Indian and other religions and cultures in environmental conservation.
- Environmental communication and public awareness, case studies (e.g., CNG vehicles in Delhi).

### Unit 8: Field work (Equal to 5 lectures)

- Visit to an area to document environmental assets: river/ forest/ flora/fauna, etc.
- Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.
- Study of common plants, insects, birds and basic principles of identification.
- Study of simple ecosystems-pond, river, Delhi Ridge, etc.

### Suggested Readings:

1. Carson, R. 2002. *Silent Spring*. Houghton Mifflin Harcourt.
2. Gadgil, M., & Guha, R. 1993. *This Fissured Land: An Ecological History of India*. Univ. of California Press.
3. Gleeson, B. and Low, N. (eds.) 1999. *Global Ethics and Environment*, London, Routledge.
4. Gleick, P. H. 1993. *Water in Crisis*. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Groom, Martha J., Gary K. Meffe, and Carl Ronald Carroll. *Principles of Conservation Biology*. Sunderland: Sinauer Associates, 2006.
6. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. *Science*, 339: 36---37.
7. McCully, P. 1996. *Rivers no more: the environmental effects of dams* (pp. 29---64). Zed Books.
8. McNeill, John R. 2000. *Something New Under the Sun: An Environmental History of the Twentieth Century*.
9. Odum, E.P., Odum, H.T. & Andrews, J. 1971. *Fundamentals of Ecology*. Philadelphia: Saunders.
10. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. *Environmental and Pollution Science*. Academic Press.
11. Rao, M.N. & Datta, A.K. 1987. *Waste Water Treatment*. Oxford and IBH Publishing Co. Pvt. Ltd.
12. Raven, P.H., Hassenzahl, D.M. & Berg, L.R. 2012. *Environment*. 8th edition. John Wiley & Sons.
13. Rosencranz, A., Divan, S., & Noble, M. L. 2001. *Environmental law and policy in India. Tripathi 1992*.
14. Sengupta, R. 2003. *Ecology and economics: An approach to sustainable development*. OUP.
15. Singh, J.S., Singh, S.P. and Gupta, S.R. 2014. *Ecology, Environmental Science and Conservation*. S. Chand Publishing, New Delhi.
16. Sodhi, N.S., Gibson, L. & Raven, P.H. (eds). 2013. *Conservation Biology: Voices from the Tropics*. John Wiley & Sons.
17. Thapar, V. 1998. *Land of the Tiger: A Natural History of the Indian Subcontinent*.
18. Warren, C. E. 1971. *Biology and Water Pollution Control*. WB Saunders.
19. Wilson, E. O. 2006. *The Creation: An appeal to save life on earth*. New York: Norton.
20. World Commission on Environment and Development. 1987. *Our Common Future*. Oxford University Press.