

MAHATMA GANDHI UNIVERSITY

**PRIYADARSHINI HILLS P.O, KOTTAYAM
KOTTAYAM – 686560**

Website: www.mgu.ac.in



RESTRUCTURED REGULATIONS, SCHEME & SYLLABUS

UNDER CREDIT AND SEMESTER SYSTEM

FOR

POST-GRADUATE PROGRAM

IN

M.Sc. ACTUARIAL SCIENCE

JUNE 2012

MAHATMA GANDHI UNIVERSITY, KOTTAYAM

M.Sc. ACTUARIAL SCIENCE

REGULATIONS FOR CREDIT AND SEMESTER SYSTEM

Duration

The duration of PG program shall be 4 semesters. The duration of each semester shall be 90 working days. Odd semesters extend from June to October and even semesters from December to April. There will be one month semester breaks each in November and May. A student may be permitted to complete the program, on valid reasons, within a period of 8 continuous semesters from the date of commencement of the first semester of the programs.

Program Structure

The program includes two types of courses namely Program Core courses and Program Elective Courses. There shall also be a Program Project with dissertation to be undertaken by all students. Every Program conducted under Credit Semester System shall be monitored by the College Council.

Viva Voce

Comprehensive Viva-voce shall be conducted at the end of the fourth semester of the program and it shall cover questions from all courses in the program.

Project work

Project work shall be completed by working outside the regular teaching hours under the supervision of a teacher in the concerned department in a reputed insurance company or industry/Research Institute. There should be an internal assessment and external assessment for the project work. The external evaluation of the Project work is followed by presentation of work including dissertation and Viva-Voce.

Examinations

There shall be University examination at the end of each semester. Project evaluation and Viva -Voce shall be conducted at the end of the program only. Project evaluation and Viva-Voce shall be conducted by two external examiners and one internal examiner.

There shall be one end-semester examination of 3 hours duration in each lecture based course and practical course. The examinations for which computers are essential should be conducted in the computer lab supervised by an external examiner appointed by the university.

Evaluation and Grading

Evaluation: The evaluation scheme for each course shall contain two parts; (a) internal evaluation and (b) external evaluation. 25% weightage shall be given to internal evaluation and the remaining 75% to external evaluation and the ratio and weightage between internal and external is 1:3. Both internal and external evaluation shall be carried out using direct grading system.

Internal evaluation: The internal evaluation shall be based on predetermined transparent system involving periodic written tests, assignments, seminars and attendance in respect of theory courses and based on written tests, lab skill/records/viva and attendance in respect of practical courses. The weightages assigned to various components for internal evaluation are as follows.

Components of Internal Evaluation

Component	Weight age
i) Assignment	1
ii) Seminar	1
iii) Attendance	1
iv) Two Test papers	2

<u>Letter Grade</u>	<u>Performance</u>	<u>Grade Point(G)</u>	<u>Grade Range</u>
A	Excellent	4	3.5 to 4.00
B	Very Good	3	2.5 to 3.49
C	Good	2	1.5 to 2.49
D	Average	1	0.5 to 1.49
E	Poor	0	0.0 to 0.49

Grades for Attendance

<u>% of attendance</u>	<u>Grade</u>
>90%	A
Between 85 and 90	B

Between 80 and below 85	C
Between 75 and below 80	D
< 75	E

To ensure transparency of the evaluation process, the internal assessment grade awarded to the students in each course in a semester shall be published on the notice board at least one week before the commencement of external examination. There shall not be any chance for improvement for internal grade.

A separate minimum of C Grade for internal and external are required for a pass for a course. For a pass in a program a separate minimum grade C is required for all the courses and must score a minimum CGPA of 1.50 or an overall grade of C and above. Each course is evaluated by assigning a letter grade (A, B, C, D or E) to that course by the method of direct grading. The internal (weightage =1) and external (weightage =3) components of a course are separately graded and then combined to get the grade of the course after taking into account their weightages.

A student who fails to secure a minimum grade for a pass in a course will be permitted to write the examination along with the next batch. There will be no supplementary examination.

Assignments:

Every student shall submit one assignment as an internal component for every course. The Topic for the assignment shall be allotted within the 6th week of instruction.

Seminar Lectures

Every PG student shall deliver one seminar lecture as an internal component for every course. The seminar lecture is expected to train the students in self-study, collection of relevant matter from the books and Internet resources, editing, document writing, typing and presentation.

Class Tests

Every student shall undergo at least two class tests as an internal component for every course. The weighted average shall be taken for awarding the grade for class tests.

Attendance

The attendance of students for each course shall be another component of internal assessment. The minimum requirement of aggregate attendance during a semester for appearing the end semester examination shall be 75%. Condonation of shortage of attendance to a maximum of 10 days in a semester subject to a maximum of two times during the whole period of post graduate program may be granted by the University.

If a student represents his/her institution, University, State or Nation in Sports, NCC, NSS or Cultural or any other officially sponsored activities such as college union / university union activities, he/she shall be eligible to claim the attendance for the actual number of days participated subject to a maximum of 10 days in a Semester based on the specific recommendations of the Head of the Department and Principal of the College

concerned. A student who does not satisfy the requirements of attendance shall not be permitted to take the end Semester examinations.

Mahatma Gandhi University, Kottayam

M.Sc. ACTUARIAL SCIENCE: SCHEME AND SYLLABUS 2012 (UNDER CREDIT AND SEMESTER SYSTEM)

Semester I (Total credits-20)

Course Code	Course Title	Credits	Teaching Hours
ACTS 101	Probability and Mathematical Statistics-I	4	5
ACTS 102	Financial Mathematics – I	4	5
ACTS 103	Business Economics – I	4	5
ACTS 104	Stochastic Models	4	5
ACTS 105	Elective I - Business Awareness Module	4	5

Semester II (Total credits-20)

Course Code	Course Title	Credits	Teaching Hours
ACTS 201	Probability and Mathematical Statistics -II	4	5
ACTS 202	Financial Mathematics – II	4	5
ACTS 203	Actuarial Modeling	4	5
ACTS 204	Elective II - Group Insurance and Retirement Benefit	4	5
ACTS 205	Practicals in Actuaries	4	5

Each student has to carry out a mini project work relating to insurance/actuary during the second semester vacation and submit the project report to the course coordinator.

Semester III (Total credits-20)

Course Code	Course Title	Credits	Teaching Hours
ACTS 301	Business Economics -II	4	5
ACTS 302	Life and Health Contingencies	4	5
ACTS 303	Statistical Methods –I	4	5
ACTS 304	Finance and Financial Reporting –I	4	5
ACTS 305	Elective III - Actuarial Risk Management – I	4	5

Semester IV (Total credits-20)

Course Code	Course Title	Credits	Teaching Hours
ACTS 401	Life and Health Contingencies -II	3	5
ACTS 402	Statistical Methods – II	3	5
ACTS 403	Finance and Financial Reporting -II	3	5
ACTS 404	Elective IV- Actuarial Risk Management - II	3	5
ACTS 405	Marketing of services	3	5
ACTS 406	Project Work and Report (in a reputed industry / Research Institute)	3	

ACTS 407	Viva-voce	2	
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SYLLABI OF COURSES OFFERED IN SEMESTER - I

ACTS 101 PROBABILITY AND MATHEMATICAL STATISTICS –I

Unit I

Grouped Frequency Distribution – Stem and Leaf Diagrams - Line Plots - Cumulative Frequency tables Measures of Location- The Mean - The Median - The Mode - Measures of Spread – The Standard Deviation- Moments – The Range – The Interquartile Range – Symmetry and Skewness (Bowley’s Pearson’s & moments)- Box Plots- Probability- definition- Basic Properties – addition rule for probability – conditional probability definition – derivation of baye’s theorem for events – probabilities for situations involving independence.

Unit II

Random Variables : Discrete Random Variables- Random Variables – Probabilities – Probability Functions – Cumulative Distribution Functions – Continuous Random Variables- Definition- Probability Density Function – Cumulative Distribution Function- Expect Values – Mean- Variance and Standard Deviation – Linear Functions of X- Moments- Important Discrete Distributions – Uniform Distribution – Bernoulli Distribution- Binomial Distribution- Geometric Distribution – Negative Binomial Distribution – Hyper Geometric Distribution – Poisson Distribution-Important Continuous Distributions – Uniform Distribution- Exponential Distribution – Gamma Distribution – Beta Distribution- Normal Distribution – Functions of a Random Variables – Discrete Random Variables – Continuous Random Variables.

Unit III

Generating Functions : Probability Generating Functions – General Formula – Important Examples - Evaluating Moments – Moment Generating Functions - General Formula – Finding Moments - Uses of Moment Generating Functions – Important Examples .
 Joint Distributions: Joint Probability (Density) Functions – Discrete Case – Continuous Case-Marginal Probability (Density) Functions – Discrete Case – Continuous Case- Conditional Probability (Density) Functions – Continuous Case – Independence of

Random Variables – Discrete Case- Continuous Case – Functions of Random Variables – Expectations of Functions of Two Variables- Expectations- Expectation of a Sum- Expectation of a Product – Covariance and Correlation Coefficient – Useful Results on Handling Covariance – Variance of a Sum –Using Generating Functions to Derive Distributions of Linear Combinations of Independent Random Variables - Probability Generating Functions –Moment Generating Functions

Unit IV

Conditional Expectation: The Conditional Expectations $E [Y/X]$ - The Random Variables $E [Y/X]$ - The Random Variables $V[Y/X]$ and the “ $E[V]+V[E]$ ” . Result- Moment Generating Functions – Compound Distributions – Moments of Compound Distributions – Generating Functions of Compound Distributions – The Central Limit Theorem and its applications – Definitions – Practical Uses – Normal Approximation for Binomial Distribution, Poisson Distribution, Gamma Distribution – The Continuity Correction- Examples.

TEXT

1. ActEd Study Material : Subject – CT3 (<http://www.acted.co.uk>)

REFERENECE

1. Mathematical Statistics; Freund, John E.F.-6th ed. – Prentice Hall International, 1999 xii, 624 pages. ISBN: 0 13 974155 0.

ACTS 102 FINANCIAL MATHEMATICS – I

Unit I:

Cash flow Models : Cash Flow Process- Examples of Cash Flow Scenarios – Zero Coupon Bond , Fixed Interest Securities, Index Linked Securities, Cash on Deposit, Equity, Annuity, An Interest Only Loan, Repayment Loan, The Time Value of Money : Simple Interest, Compound Interest, Present Values Simple Discount , Investing Over a Period.

Interest Rates : Nominal Rate of Interest – Accumulation Factors – Principles of Consistency, The Force of Interest- Present Values – The Basic Compound Interest

Functions – Interest Payable pthly. Real and Money rates of interest: Definition of real and money interest rates – Deflationary conditions - Usefulness of real and money interest rates.

Unit II

Discounting and Accumulation: Present Values of Cash flows- Discrete Cash Flows, Continuous Cash Flows – Valuing Cash Flows – Constant Interest Rates, Sudden Changes in Interest Rates – Interest Income.

Level Annuities: Present Values – Payments Made in Arrear, Payment Made in Advance- Accumulations – Perpetuities – Continuously Payable Annuities- Annuities Payable pthly: Present Values, Accumulations, Perpetuities- Annuities Payable pthly where p is less than 1 – Non Integer value of n .

Unit III

Deferred and Increasing Annuities: Deferred Annuities- Annual Payments - Continuously payable Annuities, Annuities Payable pthly , Non Integer Values of n - Varying Annuities- Annual Payments- Continuously Payable Annuities Relationship – Decreasing Annuities – Special Cases- irregular Payments – Sudden Changes in Interest Rates.

Equation of Value : The Equation of Value and the Yield on the Transaction – The Theory – Solving for an Unknown Quantity – Uncertain Payment or Receipt – Probability of Cash flows, Higher Discount rate, Loan Schedules : Calculating the Capital Outstanding – Introduction, the Theory and the retrospective Loan Calculation – Calculating the Interest and Capital Elements – The Loan Schedule- Installment Payable More Frequently than Annually- Consumer Credit : Flat Rates and APRs.

Unit IV

Investments : Introduction – fixed interest government borrowings – fixed interest government bonds, cash flows, variations, tax, security, marketability and return – government bills- fixed interest borrowings by other bodies- characteristics of corporate debt, debentures, unsecured loan stocks, Eurobonds, Certificates of Deposit- convertibles – property – derivatives- future, range of Futures, clearing house, margin, bond futures, short interest futures, stock index futures- options, swaps- interest rate swaps, Currency swaps.

TEXT

1. ActEd Study Material : Subject- CT1 (<http://www.acted.co.uk>)

REFERENCE:

1. Actuarial Mathematics. Bowers, Newton L et al – 2nd ed. – Society of actuaries, 1997.xxvi, 753 pages. ISBN : 0 938959 46 8
2. An Introduction to the mathematics of finance. McCutcheon, John J; Scott,William F. London : Heinemann, 1986, 463 pages, ISBN : 0 434 91228 x
3. Mathematics of compound interest. Butcher, M.V; Nesbitt, Cecil J. Ulrich's Books 1971. 324 pages
4. Theory of financial decision making. Ingersoll, Jonathan E. Rowman & Littlefield, 1987. 475 pages, ISBN: 0 8476 7359 6.
5. The theory of Interest. Kellison, Stephen G. 2nd ed. Irwin, 1991. 446 pages. ISBN : 0 256 09150 1.

ACTS 103 BUSINESS ECONOMICS -I

Unit I

Economics concepts: What Economists study – Business economics – The Microeconomic Environment – Business Economics – Microeconomics Choices.

Demand and Supply: Demand – Supply – Price and Output Determination – Business in a Competitive Market.

Elasticity and Uncertainty : Price Elasticity of Demand- The importance of PED to Business Decision Making – Other Elasticity – The time Dimension of Market Adjustment - Dealing with Uncertainty.

Unit -II

Consumer demand and Uncertainty: Marginal Utility Theory – Demand under condition of risk and uncertainty – utility and insurance

Production and Cost : The meaning of cost – production in the short run – cost in the short run- production in the long run – cost in long run.

Revenue and Profit : Revenue – Profit Maximization.

Unit III

Perfect competition and monopoly : Alternative market structures – perfect competition – monopoly – Comparing monopoly with perfect competition.

Imperfect competition: Monopolistic competition – comparing monopolistic competition with other market structures – oligopoly- collusive oligopoly - Non – collusive oligopoly- game theory.

Unit –IV

Products, marketing and advertising: Product differentiation – Marketing- Advertising.

Pricing strategies: Pricing and market structure – alternative pricing strategies – price discrimination – multiple product pricing – transfer pricing

TEST

1. ActEd study material : CT7 (<http://www.acted.co.uk>)

REFERENCE:

1. Economics, David Begg , Stanley Fisher and Rudiger Dorn Busch, 5th Edition, Mc Graw Hill
2. Economics Analysis by Dr. S. Sankaran
3. Economics- Samuelson, Paul A; Nordhaus, William D, 17th Ed. – McGraw – Hill, 2001 – xxiv 792 pages- ISBN : 0 07 115064 8
4. Economics – Wonnacott, Paul ; Wonnacott, Ronald J. 4th Ed, - John Wiley , 1990- xxix, 804 pages, -ISBN : 0 471 51737 2
5. Principles of Economics – Lipsey, Richard G; Chrystal, K Alec. 9th Ed. –Oxford University Press, 1999- xvi , 640 pages – ISBN : 0 19 877588 1.

ACTS 104 STOCHASTIC MODELS

Unit I (Problem only)

Introduction on Stochastic Processes: Markov chains, A model of a no claims discount policy- transition probability matrix, classification of states- transient, recurrent, ergodic - ergodic theorems. The long - term distribution of a Markov Chain – The Stationary probability distribution and applications

Unit II

Survival Models : A simple model of survival (Model I) – Future lifetime – Probabilities of death and survival The force of mortality – Survival probabilities – The

probability density function of T_x – Initial rates and central rates of mortality – complete and curate expectation of life - Complete expectation of life - Curate expectation of life - The relationship between and ex- future lifetime – variance – Uses of the expectation of life – Some important formulae- A formula for tP_x – Simple laws of mortality – Gompertz’ and Makeham’s Laws – Calculating the parameter values – Survival probabilities.

Unit III (Problem only)

Estimating the Life Time Distribution Function $F_x(t)$: The Kaplan – Meier and Nelson – Aalen models – The Kaplan – Meier estimate – Nelson – Aalen estimate – Relationship between the Kaplan – Meier and Nelson – Aalen estimates .

Unit IV (Problem only)

The Cox Regression Model : Fully parametric models – parametric models for the hazard function – Covariates – The Cox Model – Introduction – Hazards of Different lives – The utility of the Cox model – Estimating the regression parameters

TEXT

1. ActEd Study Material : Subject CT4 (<http://www.acted.co.uk>)

REFERENCE:

1. Basic stochastic processes ; A course through exercises – *Brzezniak, Zdzislaw ; Zastawniak, Tomasz.*- Springer, 1998 –x,225 pages – ISBN : 3 540 76175 6
Avilable from the Publication Unit.
2. Introduction to actuarial modeling - *Hickman, James C.* North Americal Actuarial Journal (1997) 1 (3) 1-5
URL : http://www.soa.org/boostore/naaj_archieve.html
3. Modeling, analysis, design and control of stochastic systems – *Kulkarni, Vidyadhar G* Springer, 1999-xiv,.374 pages- ISBN : 0 387 98725 8.
4. Probability and random processes – *Grimmett, Geoffery; Srizaker, David* – 3rd ed.
Oxford University Press,2001 – xii, 596 pages – ISBN : 0 19 857222 0.
5. Stochastic Processes, J. Medhi, John Wiley, 2nd edition, 1994.

ACTS 105 BUSINESS AWARENESS MODULE

Unit I

Financial system : Financial environment :- Real Assets Vs Financial Assets – Role of Financial System- Market Structure – Recent Trends :- Globalization – Securitization – Financial Engineering – Computer Networks – Derivatives – ADRs and GDRs – GDRs :- Advantage for Issuers- Benefit for Investors - Securitization – Jargons – Features of securitization – Jargons – Features of securitization – Current securitization activity in India

Unit II

Financial Markets & Instruments – Financial Markets – Functions of Financial Markets – Organization of Financial Markets – Types of Financial Markets : - Primary & Secondary Markets – Short term (money) and Long Term (Capital) Market : - Money Market Instruments : Call money – Repos - Collateralized Lending and Borrowing – treasury Bills – Commercial paper – certificate of Deposit - Commercial Bills – Capital Market Instruments :- Central Government Securities – State Government securities and Public Sector bonds- Corporate bonds and debentures – Equity Shares- Preference shares – Warrants- Spot & Deferred Delivery Market – Derivative Products : Forwards – Futures Options – Regulation of Financial Markets, Primary & Secondary Markets : Introduction – Primary Markets :- Classifications of Issue :- On the basis of Price - On the basis of subscribers – A Preferential Issue – Issue to the existing shareholders - Pricing of an Issue – Book Building process – Auction of T – bills and GOI securities –Offer Document - steps involved in Public & Rights Issue – Listing and delisting – Secondary Market : Trading on Stock Exchanges : Screen Based Trading – Contract Note – depository - Settlement – Custodian – Technology in trading and settlement – Trading on Over the Counter / Dealer Market –Stock Market Indices- Index Construction – Equity Indices – BSE Indices- NSE Indices – Debt Market Indices.

Unit III

Macro Economy & Financial Service Industry : Aspects of Global Economy and Politics – Economic factors - National Income – Gross National Product (GNP) - Gross Domestic Product (GDP)- Per Capita Income – Savings as a % of GDP- Inflation and Recession – Monetary & Fiscal Policy – Life Insurance – General Insurance – Challenges and Issue : Challenges facing Insurance Industry- Issues in Insurance Industry

Unit IV

Actuarial Profession – Overview – Introduction to profession and professionalism – Evolution of Actuarial profession – Characteristics of the ideal profession – Characteristics of the Actuarial profession. Actuary in Financial Services Industry : - Role of Actuaries :- Insurance Business - valuation of liabilities- profit distribution- product design and product pricing – profit testing – Assessment of solvency - Investigation of investment policy- investigation of new business risks – General Insurance : - Premium rating – Estimation of liabilities – collecting and presentation of information – Reinsurance requirements – Health insurance – Investment policies – Financial supervision – Role of an appointed Actuary – Role of an Actuary – other areas- Skills required for the Actuary – Acquiring Knowledge about the Aspects of the Company where Actuary is employed.

TEXT

1. ActEd Study Material : SubjectCT9 (<http://www.acted.co.uk>)

REFERENCE:

1. Actuarial Mathematics – *Bowers, Newton L; Gerber, Hans U; Hickman , James, C; Jones, Donald A; Nesbitt, Cecil J* – 2nd ed. – Society of Actuaries 1997-xxvi, 753 pages-ISBN : 0 938959 46 8
2. Actuarial Models for disability insurance – *Haberman , Steven; Pitacco, Ermanno* – Hapman & Hall, 1999- xviii , 280 pages- ISBN : 0 8493 0389
3. Analyzing survival data from clinical trials and observational studies – *Marubini Ettore Valsecchi, Maria Grazia.*-John Wiley,1995- xvi 414 pages – ISBN : 0 47193987 0.
4. Life contingencies – *Neill, Alistair.* - Heinemann, 1977- vii, 452 pages- ISBN : 0434 91440 1.
5. Life insurance mathematics.-*Gerber, HansU.* – 3rd ed.- Springer. Swiss Association of Actuaries, 1997.-217 pages.-ISBN: 3 540 62242 X
6. Mortality studies – *Scott, Willaim F.* – Department of Mathematical Sciences, University of Aberdeen, 2000- 147 pages
7. Survival models and data analysis – *Elandt- Johnson , Regina C, Johnson, Norman L.* assics Library ed.- John Wiley & Sons, 1999- xvi, 457 pages – ISBN : 0 47134992 5.

SYLLABI OF COURSES OFFERED IN SEMESTER - II

ACTS 201 PROBABILITY AND MATHEMATICAL STATISTICS –II

Unit I

Sampling and statistical inferences : Sample inference – Population inference – Statistical inference - statistic and its sampling distribution – Mean and variance of sample mean – Use of t – statistic for random samples from a normal distribution – using F distribution for the ratio of two sample variances from normal distributions (definitions and applications only without derivations for F and t distribution)

Point estimation: Constructing estimators of population parameters using method of moments – Method of Maximum likelihood – unbiasedness- means square error of an estimator – asymptotic distribution of maximum likelihood estimators.

Unit II

Hypothesis Testing : null and alternative hypothesis – simple and composite hypothesis- type I error type II error – likelihood ratio- level of significance – Probability value and power of test- basic tests for one sample and two sample situations – Chi- squared test – contingency table. Confidence Intervals : Deriving confidence intervals for mean and

variance of normal distribution – for binomial and Poisson – for two sample distribution – confidence interval for a difference between two means from paired data.

Unit III

Correlation and Regression : scatter plots for bivariate data – calculation of correlation coefficient of bivariat data – performing statistical inference – response and explanatory variables- simple regression model- least squares estimate – statistical inference on slope parameter—calculation of R² coefficient of determination – predict a mean or individual response – multiple linear regression method.

Unit IV

Analysis of Variance – one way analysis of variance – the model - estimation of the parameters - partitioning the variability – checking the model -examining the treatment means – confidence intervals for a single treatment means – confidence intervals for a pair of treatment means – analyzing likement means using a least significant difference approach.

TEXT

1. Acted Study Material: Subject – CT3 (<http://www.acted.co.uk>)

REFERENCE

1. Mathematical statistics. Freund, John Ef-6th ed. Prentice Hall International, 1999.xii, 624 pages. ISBN :0 13 974155 0.

ACTS 202 FINANCIAL MATHEMATICS – II

Unit I

Project Appraisal: Introduction – Estimating cash flows – fixed interest rates- accumulated value, net present value, internal rate of return, the comparison of two investment projects – different interest rates for lending and borrowing – payback period- other considerations – measurement of investment performance –money weighted rate or return, time weighted rate of return, linked internal rate of return .

Unit II

Simple compound Interest Problems : Fixed Interest Securities – Calculating the price, allowing for income tax perpetuities, calculating yields- the effect of the term to redemption on the yield - part loan purchases – optional redemption dates – deferred income tax- uncertain income securities – equities – property- real rate of interest – inflation adjusted cash flows – calculating real yield using an inflation index – calculating real yields given constant inflation assumption – payments related to the rate of inflation – the effects of inflation – index linked bonds – capital gains tax- valuing a loan with allowance for capital gains tax – finding the yield when there is capital gains tax – optional redemption rates- offsetting capital losses against capital gains – the indexation of capital gains.

Unit III

Arbitrage and Forward Contracts : The no arbitrage assumption – why do we assume no arbitrage - forward contracts – calculating the forward price for a security with no income – calculating the forward price for a security with fixed cash income – calculating the forward price for a security with drawn dividend yield – hedging – the value of a forward contract – fixed cash income.

Unit IV

Time structure of interest rates: discrete time – discrete time spot rates- discrete time forward rates – continuous time rates –continuous time spot rates – continuing time forward rates – instantaneous forward rates – theories of time – term structure of interest rates – why interest rates vary over time - theories – yield curve – yields to maturity – par yields – duration – convexity and immunization - interest rate risk- effective duration – duration – convexity – immunization. Stochastic interest rate models : simple models – preliminary remarks – fixed interest rate model - carrying interest rate model –moment of S_n –moments of an – log normal distribution.

TEXT

1. ActEd Study Material : Subject – CT1 (<http://www.acted.co.uk>)

REFERENCE

1. Actuarial mathematics. Bowers, Newton : Let al. – 2nd ed. Society of Actuaries , 1997, xxvi, 753 pages, ISBN : 0 938959 46 8
2. An introduction to the mathematics of finance . McCutcheon, John J; Scott, William F. London : Heinemann, 1986, 463 pages, ISBN : 0 434 91228 x.

3. Mathematics of compound interest , Butcher, M.V; Nesbitt, Cecil J. Ulrich's Books, 1971 324 pages
 4. Theory of financial decision making . Ingersoll, Johathan E. Rowman & Little field, 1987 . 474 pages. ISBN : 0 8476 7359 6.
 5. The theory of interest, Kellison, Stephen G 2nd ed. Irwin, 1991. 446 pages. ISBN: 0 256 09150
1. Available from the publications unit.

ASTS 203 ACTUARIAL MODELING

Unit I

Binominal and Poisson Models : Binominal – type models – The binomial models – Estimating q_x from the data- Generalization of the model – Maximizing the likelihood – The actuarial estimate – Findings a simple estimate for q_x – Strengths and weakness of the binomial model- The Poisson model – Estimating the underlying force of mortality.

Exposed to Risk (Problem Only) : Calculating the exposed to risk – Exact calculating of Central exposed to risk census approximations to Central exposed to risk.

Unit II

Graduation and Statistical Tests : Introduction – Graduation of Observed Mortality Rates – The Underlying Assumptions – Comparison with other Tables – Standard tables Graduation – The need for Graduation – Reasons for Graduation – The Theoretical Argument- The practical Argument – Desirable Features of a Graduation – Smoothness Versus Adherence to Data – Suitability for purpose in Hand – Testing the Smoothness of a Graduation – Smooth Graduation

UNIT III (Problem only)

Graduation and Statistical Tests : Chi- Square Test – Standardized Deviations Test – Signs Test Cumulative Deviations- Grouping of Sign Test- Serial Corrections Tests- Testing Actual Versus Expected Rates.

UNIT IV

Methods of Graduation : Graduation by Parametric Formula – The Graduation Process- Graphical Graduation – The Graphical Graduation Process – Comparison of Different method- Graduation by Parametric Formula – Graduation by Reference to a Standard

Table Statistical Tests of a Graduation- Testing a Graduation – The Effect of Duplicate Policies.

TEXT

1. ActED Study Material: Subject CT4 (<http://www.acted.co.uk>)

REFERENCE:

1. Basic stochastic processes ; A course through exercises – *Brzezniak, Zdzislaw ; Zastawniak, Tomasz.*- Springer, 1998 –x,225 pages – ISBN : 3 540 76175 6
Available from the Publication Unit.
2. Introduction to actuarial modeling - *Hickman, James C.* North American Actuarial Journal (1997) 1 (3) 1-5
URL : http://www.soa.org/bookstore/naaj_archive.html
3. Modeling, analysis, design and control of stochastic systems – *Kulkarni, Vidyadhar G* Springer, 1999-xiv,.374 pages- ISBN : 0 387 98725 8.
4. Probability and random processes – *Grimmett, Geoffery ; Stizaker, David* – 3rd ed. Oxford University Press,2001 – xii, 596 pages – ISBN : 0 19 857222 0.
5. Stochastic Processes, J. Medhi, John Wiley, 2nd edition, 1994.

ACTS 204 GROUP INSURANCE & RETIREMENT BENEFIT

Unit 1:

Module I : Special Legal / other Features of Group Insurance / Superannuation Schemes-

Module II` : Group Insurance Schemes – EDLI and Non- EDLI.

Module III : Group Gratuity Schemes : - Payment of Gratuity Act, 1972

Unit 2

Module IV : Other Group Insurance Schemes : a) Fixed or graded cover schemes on the lives of employees b) Creditor – Debtor Group Insurance Schemes for Housing Loans, Vehicle Loans etc.

Module V : Superannuation Schemes – Pension Schemes

Unit 3 :

Module VI : Group Savings Linked Insurance Schemes

Module VII : a) Weaker section Schemes – b) Rural Schemes

Unit 4:

Module VIII : Accounting Standards – Indian AS- 15, US GAAP, International Accounting Standards – Actuarial Valuation of Retirement benefits.

Module IX : Taxation Aspects

Text Book :

1. 83 of Insurance Institute of India

(<http://www.insuranceinstituteofindia.com/web/guest/purchase-online>)

REFERENCE:

1. Actuarial Mathematics – *Bowers, Newton L; Gerber, Hans U; Hickman , James, C; Jones Donald A; Nesbitt, Cecil J* – 2nd ed. – Society of Actuaries 1997-xxvi, 753 pages-ISBN : 0 938959 46 8
2. Actuarial Models for disability insurance – *Haberman , Steven; Pitacco, Ermanno* – Hapman & Hall, 1999- xviii , 280 pages- ISBN : 0 8493 0389
3. Analyzing survival data from clinical trials and observational studies – *Marubini Ettore; Valsecchi, Maria Grazia.*-John Wiley,1995- xvi 414 pages – ISBN : 0 47193987 0.
4. Life contingencies – *Neill, Alistair.* - Heinemann, 1977- vii, 452 pages- ISBN : 0434 91440 1
5. Life insurance mathematics.-*Gerber, HansU.* – 3rd ed.- Springer. Swiss Association of Actuaries, 1997.-217 pages.-ISBN: 3 540 62242 X
6. Mortality studies – *Scott, Willaim F.* – Department of Mathematical Sciences, University of Aberdeen, 2000- 147 pages
7. Survival models and data analysis – *Elandt- Johnson , Regina C, Johnson, Norman L.* - assics Library ed.- John Wiley & Sons, 1999- xvi, 457 pages – ISBN : 0 47134992 5.

ACTS 205 PRACTICALS IN ACTUARIES

This paper will consist of numerical problems based on all the papers during Semester 1 and Semester 2.

SYLLABI OF COURSES OFFERED IN SEMESTER - III

ACTS 301 BUSINESS ECONOMICS– II

Unit – I

Growth strategy and globalization : Growth and profitability – constraints on growth alternative growth strategies – internal growth – external growth through merger – external growth through strategic alliance – explaining external growth – a transaction cost approach- globalization.

Government intervention in markets: The objectives of government intervention – types of market failure – types of Government intervention – the case for less Government intervention.

Unit –II

Government and the firm:competition policy- policies towards research and development. Supply – side policy: the supply – side problems – market – oriented supply – side policies - industrial policy.

International trade : trading patterns – the advantages of trade – arguments for restricting trade – the world trading system and the WTO.

Unit –III

Balance of payments and exchange rates : the balance of payments account – the exchange rate- exchange rates and balance of payments – fixed versus floating exchange rate .

The macro economics environment: macro economics objectives – the circular flow of income – the measurements of national income- the determination national income – economics growth – unemployment – inflation.

Unit – IV

Money and interest rates : the functions and meaning of money – the financial system- the supply of money – the demand for money – equilibrium in the money market- the effect of a change in the money supply.

Business activity, unemployment and inflation: unemployment and inflation - the disappearance of the Phillips curve – business cycles.

Demand side macroeconomics policy: fiscal policy – monetary policy – demand management general- current demand side policy in the UK- the supply side problems.

TEXT :

1. ActEd. Study Material : Subject CT7 (<http://www.acted.co.uk>)

REFERENCE :

1. Economics, David Begg, Stanley Fisher and Rudiger Dorn Busch, 5th Edition, McGraw Hill
2. Economic Analysis by Dr. S Sankaran
3. Economics – Samuelson, Paul ; Nordhaus, William D. - 17th ed. - McGraw- Hill. 2001 –xxiv, 792 pages – ISBN : 0 07 118064 8
4. Economics – Wonnacott, Pauls; Wonnacott, Ronald J. – 4th ed. – John Wiley , 1990 xxix , 804 pages, ISBN : 0 471 51 737 2
5. Principles of economics ; - Lipsey, Richard G; Chrystal , K Alec – 9th ed. Oxford University Press, 1999 –xvi., 640 pages - ISBN ; 0 19 877588 1

ACTS 302 LIFE AND HEALTH CONTIGENCIES -I

Unit I

The life table : Constructing a life table – Using the life table – The pattern of human mortality -Life table functions at non - integer ages – Method I – uniform distribution of

deaths (UDD)- Methods 2- constant force of mortality (CFM)- The general patterns of mortality- Mortality characteristics – The shape of q_x , l_x , dx – Using the life table to evaluate means and variances - Evaluating means and variances without use of the life table – Select mortality – Displaying select rates – Constructing select and ultimate life tables- Using tabulated select life table functions – Evaluating means and variances using select mortality.

Unit II

Life assurance contracts : Pricing of life insurance contracts – Equations of value- Allowance for investment income – Present value random variables – Expected present value – Variance of the present value random variables for life assurance contracts-Life assurance benefits payable immediately on death- Claim acceleration approximation . Life annuity contracts immediate annuity- Present value random variable – Expected present value – Variance of the present value random variables- Annuity-due – Temporary annuity – Temporary annuity-due – Deferred annuities – Deferred annuities-due – continuous annuities.

Evaluation of assurance and annuities : Evaluating assurance benefits – Evaluating annuity benefits – Premium conversion equations – Discrete version – Continuous version – Variance of benefits – Expected present values of annuities payable m times each year – Retrospective accumulations – Pure endowment – Term assurance – Annuity.

Unit III

Net premium and provisions : Premiums – Frequency of payment – the net premium definition – Notation – The insurer's loss random variables – Provisions – Prospective provision- retrospective provision- Conditions for equality of prospective and retrospective Provisions - Provision conventions – Net premium provisions – definition – Some notation and results for net premium provisions – Whole life policies – Continuous functions- Non-annual premiums - term assurances – Other contracts – Recursive calculation of provisions – conditions for recursive calculations – Net premium provisions at successive durations.

The Equations of equilibrium for a whole life assurance - General reasoning – Mortality profit Dead stain at risk (DSAR) – Expected death strain (EDS)- Actual death strain (ADS) - Mortality Profit – Mortality profit on a portfolio of policies – Allowing for survival benefits annuities – Thiele's differential equation.

Unit IV

Variable benefits and with – profit policies : Variable payments – Payments varying at a constant compound rate – Payments changing by a constant monetary amount – Whole life assurance – Term assurance- Whole life annuity payable annually in arrears- Whole life annuity payable annually in advance – Temporary annuities – With-profit contracts – Types of bonus – Calculating net premiums and net premium provisions for with - profit contracts – Net future loss random variables – Net premiums – Net premium provisions.

Gross premiums and provisions for fixed and variables benefit contract : Types of expenses incurred in writing a life insurance Contract- Measuring and allocating costs – charging for expenses – The influence of inflation on expenses – Gross future loss random variables for standard Contracts- determining gross premium using the equivalence principle – Annual premium contracts – With – Profit contract- Premiums payable m times per year- Gross premium using simple criteria other than the equivalence principle – Gross premium prospective and retrospective provision — Equality of gross premium prospective and retrospective provisions – Recursive relationship between provisions for annual premium contracts.

TEXT

1. ActEd Study Material : Subject CT5 (<http://www.acted.co.uk>)

REFERENCE

1. Actuarial mathematics. Bowers, Newton L et al. 2nd ed. Society of Actuaries, 1997. xxvi, 753 pages , ISBN : 0 93895946 8.
2. The analysis of mortality and other actuarial statistic. Benjamin, Bernard; Pollard, John H – 3rd ed. – Faculty and Institute of Actuaries , 19993, 519 pages ISBN0 90106626 5.
3. Life Contingencies. Neill, Alistair. – Heinemann, 1977, vii 452 pages ISBN 0 43491440 1
4. Life insurance Mathematics Gerber, Hans U, - 3rd Springer. Swiss Association of Actuaries, 1997. 217 pages ISBN 3 540 62242 X
5. Modern actuarial theory and practice . Booth Philip M et al-Chapman & Hall, 1999. xiii 716 pages. ISBN 0 8493 0388 5.

ACTS 303 STATISTICAL METHODS - I

Unit I

Decision theory : Introduction – zero – sum two player games – domination – the minimum criterion – saddle points – randomized strategies – statistical - The Bayes criterion Bayesian Statistics : Bayesian theorem prior and posterior distribution : Notation – determination the posterior density – continuous prior distribution – conjugate priors –improper prior distribution. The loss function: quadratic loss absolute error loss- all- or- nothing loss.

Unit II

Loss distributions: the exponential distribution – the gamma distribution – normal distribution – pareto and generalized Pareto distribution – lognormal distribution – the weibull distribution the burr distribution. Estimation – the method of moment –MLE for gamma, exponential distribution.

Reinsurance: Introduction – proportional reinsurance arrangements – excess of loss reinsurance for prior and reinsurer- proportional reinsurance lognormal distribution and examples –normal distribution and examples – inflation – estimation – policy excess.

Unit III :

Risk model (i) : The basic model – discussion of the simplification in the basic model – notation and assumption. The collective risk model : - the collective risk model – distribution function and convolution- Moments of compound distribution – the compound Poisson distribution – the compound binominal distribution – the compound negative binomial distribution . Risk model (2) : aggregate claim distribution order proportional and excess of loss reinsurance : proportional reinsurance – excess of loss reinsurance. The individual risk model parameter variability /uncertainty:- introduction – variability in heterogeneous portfolio- variability in homogeneous portfolio – variability in claim Numbers and claim amounts and parameter uncertainty.

Unit IV

Credibility theory: Introduction – credibility: the credibility premium formula the credibility prior. Bayesian credibility: introduction – the Poisson / gamma model – numerical illustrations of the Poisson / gamma model – the normal / normal model – dissuasion of the Bayesian approach to credibility.

TEXT

1. ActEd Study Material : Subject CT6 (<http://www.acted.co.uk>)

REFERENCE:

1. An introduction to statistical modeling – Dobson, Annette J- Chapman & Hall, 1983 viii, 125 pages – ISBN : 0 412 24860 3
2. Introductory statistics with applications in general insurance- Hossack,Ian B; Pollard, John H; Zehnwirth, Benjamin – 2nd ed. – Cambridge University Press , 1999. xi, 282, pages – ISBN : 0 521 65534 X.
3. Loss models : from data to decisions . – Klugman, Stuart A; Panjer, Harry H; Willmot, Gordon E; Venter, Gary G.- John Wiley & Sons , 1998 – xiii, 644 pages ISBN : 0 471 23884 8
4. Paractical risk theory for actuaries – Daykin, Chris D; Pentikainen, Teivo; Pesonen, Martti- Chapman & Hall, 1994 – 545 pages,- ISBN : 0 412 42850 4.

ACTS 304 FINANCE AND FINANCIAL REPORTING – I

Unit I

Key principles of finance : Introduction to finance – finance and real resources of an organization- finance and the organization objectives- responsibilities for financial decisions – the importance of capital budgeting – financial analysis – business objectives – the stakeholder – conflicting objective provides of finance – ways of managing conflicts- business objectives – a re- statement -the maximization of shareholders wealth – the goal of the financial managers- the opportunity cost of capital – the capital markets. Company ownership : types of business entity – sole trader – partnership limited companies – limited liability partnerships – private & public limited companies – pros & cons of limited companies – medium term finance – hire purchase – credit sale – leasing – bank loans – short term finance – bank overdrafts – trade credit – factoring- bills of exchange – commercial paper.

Unit II

Financial instruments : loan capital – introduction – debenture stock – unsecured loan stock - subordinate debt- Eurobond loan capital – floating rate notes – share capital – ordinary shares – preference capital – convertibles – warrants – options issued by companies – winding up of a company. Issue of shares : obtaining stock exchange quotation – reasons for quotation – methods to obtain quotation – offer for sale at fixed

price – offer for sale by tender – concessionary methods – offer for subscription – placing – introduction – role of underwriting – Issue made by companies already quoted right issue – purpose – impact – theoretical price – scrip issue – purpose – impact – scrip dividend

Unit III

Taxation: Introduction – personal taxation – considerations – taxable income – tax rates – corporation of- accounting profits & taxable profits – rates of tax – uses of corporation tax system- capital gain of- chargeable gains – indexation allowance – taper relief – capital losses – rates of tax- other taxes – stamp duty – inheritance taxes – property taxes – sales tax – custom and excise duties – double taxation relief. Use of derivatives: introduction – financial futures – bond futures- short interest rate future - work index futures –options –meaning –margins & premium – types – put option- call option – uses of option –interest & currency swaps – pricing – risk – uses of swaps.

Unit IV

Capital structure and dividend policy : Introduction – capital structure – components of capital structure – asset structure and business –degree of acceptable gearing – the market and capital structure – high growth company that is highly geared – cyclical industry – an industry facing decline - “ people ” businesses – company in high growth but high risk industries – taxation and capital structure- dividends – share holder’s reward – fundamentals of dividend policy – factors influencing dividend policy – other methods of reward – scrip and stock dividends – effects on companies and share holders – share buyback – the market and dividends. Weighted average cost of capital : introduction – the importance of the discount rate- defining the weighted average cost of capital- Modigliani and miller - their view- CAPM – cost of equity – CAPM and risk – systematic risk – beta as a measure of systematic risk – measuring beta – market derived real discount rate – cost of debt marginal or average cost- determinants – calculation of WACC. Capital project appraisal : definition of a capital project – definition of project – evaluation of cash flows - methods of project evaluation – net present value – internal rate of return – annual capital charge- other methods- payback period – nominal returns – strategic fit – opportunity cost - hurdle rates evaluation of risky projects – simulation- sensitivity analysis – scenario testing – Monte Carlo stimulation – probability trees – certainty equivalents – results of the evaluation – allowing for systematic risk –

calculation of required rate of return for a project – WACC- CAPM based approach - factors influencing beta practice – practical experience – other factors – risk analysis and dealing with risks – identification of risk – risk matrices – causes of risk – analysis of risk – financial consequences of risk – obtaining a distribution of NPVs – scenario analysis –stochastic modeling – relative merits of the two approaches – unfavorable NPVs – risk mitigation –ways of mitigating risk – financial consequences of risk mitigation – the investment submission.

TEXT :

1. ActEd Study Material – CT2 (<http://www.acted.co.uk>)

REFERENCES :

1. Financial statement analysis in Europe- Samuels , J.M; Brayshaw, RE; Carner, J.M. Chapman & Hall, 1995. 454 pages - ISBN : 0 412 5445 04
2. Fundamentals of financial management – Brigham, Eugene F; Houston, Joel F. 9th ed – Harcourt Brace , 2000. 959 pages ISBN 0 03 031461 5
3. How to read the financial pages – Brett, M. 2nd ed Random House Business Books, 2003 . 430 pages ISBN : 0712662596
4. Interpreting company reports and accounts – Holmes, Geoffrey ; Sugden , Alan ; Gee, Paul – 8th ed, Pearson Education, 2002 , 298 pages – ISBN : 0 273 65592 2
5. Principles of corporate finance : Bradley Richard A; Myers, Stewart C.- 7th ed. Mc Graw Hill. 2003, 1004 + appendices pages – ISBN : 0 07115144 3.

ACTS 305 ACTUARIAL RISK MANAGEMENT - I

Units I

Cash flows of simple products :- introduction to cash flows (cash flow matching , cash flow process)- examples of cash flow scenarios (annuity, term assurance, endowment assurance, an interest only loan, repayment loan (mortgage), motor insurance) contract design :- introduction – parties involved in contract design (customer needs and interests, characteristics of other stakeholders involved in contract design) – deciding on the benefits to offer (the level and form of benefits, option and guarantees, discretionary benefits, benefits taken early/ discontinuance terms, contract conditions) commercial

considerations (profitability, marketability, competitiveness, statutory/ regulatory requirements) financing considerations (financing requirements, method of financing the benefits to be provided, risk characteristics)- premiums, contributions and charges (premium/ contribution pattern, charges vs. expenses, extent of cross – subsidies, consistency with other contracts)- administrative and accounting issues (administration system, accounting implications)- summary (good contract design, interaction of contract design factors, core reading examples) considering all eventualities (stochastic modeling , key scenarios)

Unit II

Project management:- participating in a successful project (introduction, characteristics of well run projects, written strategy documents, project management team) capital project appraisal :- introduction – capital projects and capital project appraisal (definition of a capital project, key stages in capital project)- methods of initial appraisal – methods of detailed appraisal (definition of project, evaluation of cash flows) – choice of risk discount rate (general considerations, systematic risk and specific risk, choosing the discount rate for projects with a normal degree of systematic risk, choosing the discount rate for projects with a higher than normal degree of systematic risk, other factors to consider)- risk identification – analysis of risks (distribution of NPVS , core reading examples).

Unit III

Relationship between returns on asset classes: expected and required returns (required returns , suspected return, requires vs. expected return, determining whether an asset seems cheap)- analyzing historical returns (introduction, equities, conventional bonds, index – linked, cash, earnings) historical figures for the UK. Valuation of asset classes and portfolios:- analysis of expected returns from different assets (introduction, two definitions, the analysis, conventional government bonds , corporate loan stocks, equities, property) comparisons between investment sectors (yield gap and reverse yield gap, dividend yields vs. real yields, property vs. other sectors, corporate bonds vs. government bonds, overseas investments)- other methods (yields “ norms ” index levels and price charts, yield ratios)- relationship between the assets and liabilities (consistency of valuation, consistency of method, consistency of bases)- allowing for the variability of the asset prices – notional portfolios(method, choosing the notional portfolio)

Unit IV

Relationship between assets and liabilities : - the principles of investment – asset – liability matching requirements of liabilities (nature of the liabilities, benefit, payments, expense outgo, premium / contribution income) – asset – liability matching requirements of assets (selecting assets appropriate to the liabilities, guaranteed in money terms, guaranteed in terms of the prices index or similar ,discretionary benefits, investment linked) - other considerations (currency, free assets / surplus, regulatory fame work, core reading example)

Asset Management: - portfolio construction (strategic benchmarks and tactical asset allocation) risk budgeting – measuring risk (tracking error , active money, value at risk, stress testing)- liability hedging (definition, unit- linked liabilities)

TEXT

1. Subject CAI (Actuarial risk management) material of institute of actuaries, London

SYLLABI OF COURSES OFFERED IN SEMESTER - IV

ACTS 401 LIFE AND HEALTH CONTIGENCIES –II

Units I

Simple annuities and assurances involving two lives : Random variables to describe joint life functions – Joint lifetime variables and joint life table functions – Last survivor lifetime random variables – Determining simple probabilities involving two lives – Evaluating probabilities of death or survival of either or both of two lives- evaluating last survivor functions – determining present values involving two lives – Present values of joint life and last survivor assurances – Present values of joint life and last survivor annuities.

Contingent and reversionary benefits : Contingent probabilities of death - Present values of contingent assurances –Present values of reversionary annuities – Present values of functions with specified terms. Expected present values of last survivor assurances and annuities that also depend upon terms – Expected present values of reversionary annuities that depend upon terms – Expected present values of contingent assurances that depend upon terms – expected present value of annuities payable m times a year – Premium conversion relationships

Profit testing : Unit – linked contracts – Evaluating expected cash flows – Multiple decrement tables- Evaluating expected cash flows for conventional whole life assurance, Disability insurance with waiver of premium.

Unit II

Unit- linked endowment assurance - Profit tests for annual premium contracts summary measures of profit – Choosing the risk discount rate – Determining premiums using a profit test- Profit criterion. Determining provisions using profit testing : Pricing and provisioning bases- Determining provisions for a unit – linked policy using cash flow techniques – Zeroising negative cash flows – Determining provisions for a conventional policy using cash flow techniques – Effect of pricing used provisioning bases on a profit test.

Competing risk : Multiple state modeling – Notation – Kolmogorov forward equations – Valuing benefits that are contingent upon competing risk –Multiple state approach multiple decrement tables – deriving department probabilities from transition intensities – Deriving the independent probabilities from the dependent probabilities.

Multiple decrement tables: Multiple decrement service table for pension calculations – updating a service table- Associated single decrement tables – Relationship between single and multiple decrement tables – Obtaining the underlying single decrement tables from the multiple decrement tables – construction of multiple decrement tables from underlying single decrement tables – How to obtain multiple decrement tables rates – Alternative method for determining underlying single decrement rates – Consistency with the multiple state approach.

Unit III

Pension Funds : Salary scale - Salary related pension benefits and contributions, Age retirement benefits, III health retirement benefits , death in service benefits, Scheme contributions , Expected cash flows generated by pension and contributions – classifications of benefits, Determining expected cash flows expected amount payable- Probability of payments – Expected cash flows using commutation functions to value salary related benefits and contributions – death benefits – Members contributions Benefits and options available to an individual leaving a pension scheme – return of contribution – A Referred pension – Immediate pension – Transfer of cash equivalent .

Unit IV

Mortality, selection and standardization; Principal factors contributing to variation in mortality and morbidity- Occupation – Nutrition – Housing – Climate and geographical location- Education – Genetics – Selection- Temporary initial selection – Class selection Time Selection- Adverse Selection – Spurious selection – Selection in life assurance and pensions business- Life assurance – Pension funds –Why it is necessary to have different mortality tables for different classes of lives – How decrements can have a selective effect risk classification in life insurance – Single figure indices – Crude mortality rate – Directly standardized mortality rate indirectly standardized mortality rate – Standardized mortality ratio.

TEXT

1. Act Ed Study Material : Subject CT5 (<http://www.acted.co.uk>)

REFERENCE

1. Actuarial mathematics. Bowers, Newton L et al. – 2nd ed. Society of Actuaries , 1997 xxvi 753 pages ISBN : 0 938959 468
2. The analysis of mortality and other actuarial statistics. Benjamin, Bernard Pelland, 3rd ed.-Faculty and Institute of Actuaries , 1993, 519 pages ISBN 0 90106626 5
3. Life contingencies ,Neill, Alistair – Heinemann, 1977, VII, 452 pages, ISBN 0 434914401
4. Life insurance mathematics Gerber, Gerber, Hans U – 3rd ed. – Springer. Swiss Association of Actuaries , 1997, 217 pages ISBN 3 540 62242 X
5. Modern actuarial theory and practice, Booth, Philip M et. al – Chapman & hall, 1999 xiii, 716 pages ISBN 0 8493 0388 5

ACTS 402 ADVANCED STATISTICAL METHODS - II

Unit I

Empirical Bayes credibility theory: Models - I – Empirical bayes credibility theory
Models II

Ruin Theory: basic concepts notation - The surplus process the probability of ruin in continuous time – the probability of ruin in short term.

Unit II

Run – off triangles: introduction – the origins of run-off triangles – types of reserves – presentations of claims data – estimating future claims . Projections using development factors : run – off triangles – the chain ladder method – model checking – other methods of deriving development factors assumptions underlying the method. Adjusting for inflation: The inflation adjusted chain ladder method. The average cost per claim method description of method application of the method – assumptions underlying the method. Loss ratios the bornhuetter Ferguson method: concept of bornhuetter Ferguson method – description of the method – application of the method – assumptions underlying the method – grossing up factors versus development factors.

Unit III

Generalized linear models: Introduction – exponential families: Normal distribution – Poisson distribution – Binomial distribution – gamma distribution. Link functions and linear predictor link functions – linear predictor . Deviance of model fitting residuals analysis and assessment of model fit.

Unit IV:

Time series (1) :- Introduction – Properties of a univariate time series – stationary random series main linear model of time series : introduction- backwards shift operator, B and difference operator – the first order autoregressive model AR (1) – the autoregressive model AR (p) – the first – order moving average. Model MA (1) the moving average MA(q) the autoregressive moving average process ARMA (p, q) modeling non stationary processes : the ARIMA model .

TEXT :

1. ActEd study Material : Subject CT6 (<http://www.acted.co.uk>)

REFERENCE:

1. An introduction to statistical modeling – Dobson, Annette J Chapman & Hall, 1983 viii 125 pages –ISBN : 0 412 24860 3
2. Introductory statistics with applications in general insurance :- Hossack, Ian B. Pollard, John H; Zehnwirth, Benjamin – 2nd ed.- Cambridge University Press , 1999 xi, 282 pages – ISBN :0 521 65534 X

3. Loss models : from data to decisions - Klugman , Stuart A; Panjer, Harry H;Willmot Gordon E; Venter, Gary G- John Wiley & Sons , 1998 – xiii, 644 pages ISBN 0471 23884 8
2. Practical risk theory for actuaries. – Daykin , Cris D ; Pentikarinen, Teivo; Personen, Martti – Chapman & Hall , 1994 – 545 pages – ISBN ; 0 412 42850 4

ACTS 403 FINANCE AND FINANCIAL REPORTING –II

Unit I

Introduction to accounts the accounting framework-users sources of regulation statutory requirements – directors report – accounting standards – contents of annual report – auditor’s report accounting concepts – cost concepts – money measurements concepts – business entity concept – realization concept – accrual concept – dual aspect concept – materiality – prudence – going on concept- consistency – bringing the concepts together.

The main accounts – the balance sheet – format – fixed assets – tangible assets and intangible assets – revaluation – current assets – liabilities – long term – liabilities – current liabilities – provisions and charges –provisions for taxation and dividends – pensions – contingent liability –capital – profit and loss account – format – cost of sales – expenses – categories of profit – taxation – dividends and retained profits – earnings per share – cash flow statement – format – purpose of cash flow statement –notes to accounts

Unit II

Depreciation and reserves –introduction – purpose – methods – straight-line methods - reducing balance method – capital and reserves – share capital and share premium – revaluation reserve –profit and loss account .

Generating accounts – the trial balance – construction and preparation of financial statement – profit and loss account and balance sheet – awkward items in the trial balance – depreciation – profit and loss reserve – stock- adjustment in the accrual concept

preparation of cash flow statement - limitations of accounts – shortcoming of historical cost accounting – valuation of stock – depreciation interest payments – consistency over time – limitations in the interpretation of accounts – subjectivity appropriateness – comparison between firms – some limitations of ratio analysis -accuracy of figures.

Unit III

Group accounts and insurance company accounts – introduction – consolidated financial statements subsidiary companies – consolidated balance sheet – goodwill on consolidation – minority interest associated companies – consolidated balance sheet – good will on consolidation –minority interest associated companies –interpretation of consolidated financial statements – insurance companies introduction – estimation of liabilities and timing of profit – profit and loss account – technical accounts non-technical accounts – balance sheet –assets – liabilities – shareholders fund.

Unit IV

Interpretations of accounts – security of loan capital – introduction –measuring risk associated with loan capital – loan capital – income cover and income priority percentages – asset cover and asset priority percentages – asset gearing – income gearing – shareholder analysis- earnings per share basic and diluted – earnings and dividend ratios – price earnings ratio- dividend yield – dividend cover – payout ratio- EBITDA-net asset value per share – other accounting ratios – profitability ratios – return on capital employed – profit margin- liquidity ratios – current ratio- quick ratio efficiency ratios – stock turnover ratio – debtors turnover ratio – creditors turnover ratio.

TEXT :

1. ActEd. Study Materials – CT2 (<http://www.acted.co.uk>)

REFERENCE:

1. Financial statement analysis in Europe - Samules, J.M. Brayshaw, R.E; Carner , J.M. - Chapman & Hall, 1995 , 454 pages – ISBN ; 0 412 544504
2. Fundamentals of financial management – Bridham , Eugene F Houston, Joel F 9thed – Harcourt Brace,2000, 959 pages – ISBN : 0 03 031461 5
3. How to read the financial pages ; Btett , M 2nd ed. Random House Business Books, 2003 . 430 pages ISBN : 0712662596
4. Interpreting company reports and accounts – Holmes , Geoffrey : Sugden, Alan Gee Paul – 8th ed. – Pearson Education, 2002. 298 pages – ISBN ; 0 273 65592 2

5. Principles of corporate finance – Brealey, Richard A , Myers, Stewart C. 7th ed. McGraw – Hill, 2003. 1004 + appendices pages - ISBN ; 0 07 115144 3

ACTS 404 ACTUARIAL RISK MANAGEMENT - II

Units I

Introduction to financial products and customer needs :- introduction – financial products (insurance contracts, pension schemes, investment schemes, derivatives, reinsurances contracts) bringing together customer needs and financial products (logical or emotional needs, current or future needs, designing products to meet the need, core reading examples) – pension schemes (defined benefit pension schemes, defined contribution scheme, hybrid schemes)

Risk in benefit schemes : - risk and uncertainties (risks to the beneficiary, risks to the sponsor, risks to the state) – benefit risks (benefit risks in defined benefit schemes, benefits risks in defined contribution schemes, benefit risks in both defined benefit and defined contribution schemes) – contribution / premium risks (contribution /premium risks in a defined contribution scheme, contribution /premium risks in a defined benefit scheme, contribution risks in both defined benefit and defined contribution schemes) – investment risks (income, capital proceeds, reinvestment, default, tax and expenses, appreciation of benefits by recipients, opportunity cost of the capital) -overall security risks in benefits schemes (security , strength of the sponsor / provider promise)

Risks in insurance : categories of risk – financial risks (market risks, credit risks, business risk) –non financial risks (operational risk, external risk, core reading examples) risk classification (core reading examples)

Unit II

The risk management process- introduction the risk faced (risks identification, risks measurement, risk control, risk financing, risk monitoring) adoption of control measures (introduction, reducing the total cost of a risk , reducing the probability of catastrophic loss , ensuring survival while minimizing the cost of risk management, core reading examples) risk as an opportunity not a constraint

Risk management tools – I : issues surrounding the management of risk –tools that can be used to aid the management of risks – reinsurance terminology- reinsurance contracts (facultative reinsurance , treaty reinsurance)- types of reinsurance (proportional reinsurance, non- proportional reinsurance) proportional reinsurance (quota share, surplus, reinsurance premiums under proportional arrangements) non – proportional reinsurance (excess of loss reinsurance, risk excess of loss, aggregate excess of loss, catastrophe excess of loss, stop loss, use of non- proportional reinsurance) financial reinsurance - reinsurance as a risk management tool (the benefits of reinsurance, the cost of reinsurance , cost vs. benefits, the effectiveness of reinsurance, core reading examples)

Unit III

Risk management Tools 2: Introduction – diversification – underwriting (what is underwriting, under writing as a risk management tools, life insurance underwriting , core reading examples)- alternative risk transfer (discounted covers, integrated risk covers, securitization , post loss funding, insurance derivatives, swaps, summary of art) - management control systems – managing the risk associated with options and guarantees

Unit IV

Capital and capital management :- Introduction – introduction of capital (types of capital (economic and regulatory), the regulatory environment, modeling capital requirements) -capital needs (individuals, companies , providers of financial services products , banks, the state) sources of capital (proprietary companies , mutual companies, sponsors of benefit schemes, the state)- capital management tools (reinsurance, financial reinsurance, securitization, subordinated debt, banking products, derivatives, equity capital, internal sources of capital)

Insolvency and Closure: insurance companies – sponsored benefit schemes (level of benefits, provision of benefits)

TEXT

Subject CA1 (actuarial risk management) material of institute of actuaries, London.

ACTS 405 MARKETING OF SERVICES

Unit I

Services – characteristics & categories – major differences between services & goods classification of different types of services – contribution of services sector to the economy- consumer behavior - Evaluation of service Alternatives – customer satisfaction.

Unit II

Marketing mix elements for services – Targeting, segmentation & positioning – Problem areas of segmentation– Importance of pricing– Advertising & sales promotion in services - Role of distribution in services.

Unit III

Role of people in services marketing – services provider employee – services recipient customer - service quality – measurement of service quality – delivery of quality service. Management of services – performance measurement – enhancement & control

Unit IV

Customer encounter management- obligation & duties of service provider. Marketing strategies for service firms – marketing of health care service – customer relationship management – New service opportunities.

TEXT

1. Service Marketing : Govind Apte, Oxford University Press , Delhi, 2004

RREFERENCE

1. Marketing & Sale management : D.C Kapoor, S chand 2004
2. Relationship marketing: S Sajahan Tata Megraw Hill, Delhi 2004