

University of Mumbai



No. AAMS_UGS/ICC/2023-24/11

CIRCULAR:-

Attention of the Principals of the Affiliated Colleges and Directors of the Recognized Institutions in Faculty of Commerce & Management is invited to this office circular No. UG/237 of 2017-18 dated 29th September, 2017 relating to the syllabus as per the (CBCS) for the B.Com. (Actuarial Studies) Three Year Integrated Program (Sem. I to VI).

They are hereby informed that the recommendations made by the Board of Studies in **Commerce** at its meeting held on 07th August, 2022 and subsequently passed by the Board of Deans at its meeting held on 08th December, 2022 **vide** item No. 7.8 (R) have been accepted by the Academic Council at its meeting held on 06th April, 2023 **vide** item No. 7.6 (R) and that in accordance therewith, **the revised syllabus of S.Y.B.Com (CBCS) (Actuarial Studies) (Sem. III to IV)** has been brought into force with effect from the academic year 2022-23. (The same is available on the University's website www.mu.ac.in).

MUMBAI – 400 032

21st June, 2023

(Prof. Sunil Bhirud)
I/c. REGISTRAR

To

The Principals of the Affiliated Colleges and Directors of the Recognized Institutions in Faculty of Commerce & Management.

A.C/7.6 (R) /06/04/2023

Copy forwarded with Compliments for information to:-

- 1) The Dean, Faculty of Commerce & Management,
- 2) The Chairman, Board of Studies Commerce,
- 3) The Director, Board of Examinations and Evaluation,
- 4) The Director, Board of Students Development,
- 5) The Director, Department of Information & Communication Technology,
- 6) The Co-ordinator, MKCL.

Copy for information and necessary action :-

1. The Deputy Registrar, College Affiliations & Development Department (CAD),
2. College Teachers Approval Unit (CTA),
3. The Deputy Registrar, (Admissions, Enrolment, Eligibility and Migration Department (AEM),
4. The Deputy Registrar, Academic Appointments & Quality Assurance (AAQA)
5. The Deputy Registrar, Research Administration & Promotion Cell (RAPC),
6. The Deputy Registrar, Executive Authorities Section (EA)
He is requested to treat this as action taken report on the concerned resolution adopted by the Academic Council referred to the above circular.
7. The Deputy Registrar, PRO, Fort, (Publication Section),
8. The Deputy Registrar, Special Cell,
9. The Deputy Registrar, Fort Administration Department (FAD) Record Section,
10. The Deputy Registrar, Vidyanagari Administration Department (VAD),

Copy for information :-

1. The Director, Dept. of Information and Communication Technology (DICT), Vidyanagari,
He is requested to upload the Circular University Website
2. The Director of Department of Student Development (DSD),
3. The Director, Institute of Distance and Open Learning (IDOL Admin), Vidyanagari,
4. All Deputy Registrar, Examination House,
5. The Deputy Registrars, Finance & Accounts Section,
6. The Assistant Registrar, Administrative sub-Campus Thane,
7. The Assistant Registrar, School of Engg. & Applied Sciences, Kalyan,
8. The Assistant Registrar, Ratnagiri sub-centre, Ratnagiri,
9. P.A to Hon'ble Vice-Chancellor,
10. P.A to Pro-Vice-Chancellor,
11. P.A to Registrar,
12. P.A to All Deans of all Faculties,
13. P.A to Finance & Account Officers, (F & A.O),
14. P.A to Director, Board of Examinations and Evaluation,
15. P.A to Director, Innovation, Incubation and Linkages,
16. P.A to Director, Department of Lifelong Learning and Extension (DLLE),
17. The Receptionist,
18. The Telephone Operator,

Copy with compliments for information to :-

19. The Secretary, MUASA
20. The Secretary, BUCTU.

University of Mumbai



Revised Syllabus for
S.Y.B.Com. (Actuarial Studies)
(Sem. III & IV)
(Choice Based Credit System)

(With effect from the academic year 2022-23)

UNIVERSITY OF MUMBAI



Syllabus for Approval

Sr. No.	Heading	Particulars
1	Title of the Course	S.Y.B.Com. (Actuarial Studies)
2	Eligibility for Admission	H.S.C. with Mathematics as one of the subject
3	Passing Marks	As per norms of University of Mumbai for under graduate programme
4	Ordinances / Regulations (if any)	As per norms
5	No. of Years /Semesters	3 years (6 semesters)
6	Level	P.G. / U.G./ Diploma / Certificate (Strike out which is not applicable)
7	Pattern	Yearly / Semester (Strike out which is not applicable)
8	Status	New / Revised (Strike out which is not applicable)
9	To be implemented from Academic Year	From Academic Year 2022-2023

Dr. Ajay Bhamre
Chairman,
Board of Studies in
Commerce

Prof. Kavita Laghate,
I/c Associate Dean,
Faculty of Commerce
and Management

Dr. Ajay Bhamre
I/c Dean,
Faculty of Commerce
and Management

S.Y.B.Com. (Actuarial)

(To be implemented from Academic Year- 2022-2023)

No. of Courses	Semester III	Credits	No. of Courses	Semester IV	Credits
1	Elective Courses (EC)		1	Elective Courses (EC)	
1,2 & 3	*Any three courses from the following list of the courses	09	1,2 & 3	*Any three courses from the following list of the courses	09
2	Ability Enhancement Courses (AEC)		2	Ability Enhancement Courses (AEC)	
4	Information Technology in service sector – Paper I	03	4	Information Technology in insurance – Paper II	03
3	Core Courses (CC)		3	Core Courses (CC)	
5	Management (Functions & Challenges) – Paper I	02	5	Management (Production & Finance) - Paper II	02
6	Insurance Laws and Regulation –Paper I	03	6	Insurance Laws and Regulation –Paper II	03
7	Mathematical modeling (Survival Models)- Paper I	03	7	Mathematical modelling- (Stochastic Models) Paper II	03
Total Credits		20	Total Credits		20

*List of Discipline Related Elective(DRE) Courses for Semester III (Any One)		*List of DisciplineRelated Elective(DRE) Courses for Semester IV (Any One)	
1	Actuarial Risk Management-Paper I	1	Actuarial Risk Management-Paper II
2	Pricing and Valuation in Insurance Paper I	2	Pricing and Valuation in Insurance Paper II
3	Auditing (Techniques of Auditing and Audit Procedures)- Paper I	3	Auditing (Techniques of Auditing and Audit Procedures)- Paper II
4	Documentation ,Analysis and Reporting Paper I	4	Documentation,Analysis and Reporting Paper II
5	Innovations in insurance sector (Relating to Climate insurance, Crop insurance, Micro Insurance, Deposit insurance etc.,)Paper I	5	Innovations in insurance sector (Relating to Climate insurance, Crop insurance, Micro Insurance, Deposit insurance etc.,) Paper II
Note: Course/ Subject selected in Semester III will continue in Semester IV			

Elective Courses (EC)

1. Actuarial Risk Management – Paper I

Semester III

Instructional Objectives:

1. To recognize and understand various terms used in financial market services.
2. To understand the special features of the job of an actuary.
3. To identify the risk factors (micro and macro) in insurance business.
4. To acquire skills for mitigating or avoiding the risk elements.
5. To enable the learner to estimate, compute and quantify the risk elements.
6. To be aware of the features of the Indian Insurance Market.

Modules at a Glance

Actuarial Risk Management – Paper I		
Sr. No.	Modules	No. of Lectures
I	Introduction to Actuarial Risk Management	15
II	Environmental Aspects in Actuarial Risk Management - I	15
III	Environmental Aspects in Actuarial Risk Management - II	15
IV	Contract Design	15
Total No. of Lectures		60

Elective Courses (EC)

Semester III

Actuarial Risk Management – Paper I		
Topic		
Module I	Introduction to Actuarial Risk Management	Learning Outcome
	<ul style="list-style-type: none"> • Actuarial Stakeholders and their requirements • Actuarial Services to various Stakeholders and their Importance • Duties and Responsibilities of an Actuary in carrying out his professional job – highlighting the responsibility of giving advice and for taking decisions. • Financial and other products, schemes, contracts and other arrangements (Contingent). • Financial services: Pricing, Reserving/ Provisioning and Capital Modeling and linkages. 	<ul style="list-style-type: none"> • The student understands the importance of actuarial services to the clients.
Module II	Environmental Aspects in Actuarial Risk Management - I	Learning Outcomes
	<ul style="list-style-type: none"> • Business Environment for an actuary and the various components • Risk Environment – Financial Risks and Business - Concept of Systematic, Diversifiable risk and Risk Adjusted Returns in Systematic Risk. • Concept of Risk Appetite and Attainment of Risk Efficiency • Dealing with Risks: Risk Avoidance, Risk Mitigation, Risk Transfer and Risk Retention. • Portfolio approach to the overall management of risk, including Proportionality for respective stakeholders. 	<ul style="list-style-type: none"> • The student is acquainted with various types of risks. • The student learns how to deal with risks. • The student understands the risk environment.

III	Environmental Aspects in Actuarial Risk Management - II	Learning Outcome
	<ul style="list-style-type: none"> • Regulatory Environment • Investment Environment • Demographic and Social Environment • Capital Environment • Enterprise Risk Management: An Introduction. 	<ul style="list-style-type: none"> • The student understands the components of business environment.
IV	Contract Design	Learning Outcomes
	<ul style="list-style-type: none"> • Factors determining a suitable design for financial structures e.g. products, schemes, contracts or other arrangements • Nature of service e.g. Asset based (Bank Lending) and Liability based (Insurance, Deposits, Asset Management) • Use of Actuarial Techniques • Data requirement for contract designing – Problems in gathering data – Grouping of Data 	<ul style="list-style-type: none"> • The student identifies the factors determining a suitable design for financial structure. • The student learns about the importance of data requirement

Elective Courses (EC)

1. Actuarial Risk Management – Paper II

Semester IV

Instructional Objectives:

1. To explain the various components of Actuarial Control Cycle.
2. To understand multiple applications and Limitations of Actuarial Control Cycle.
3. To identify components of and different tools used in Risk Management.
4. To be acquainted with the Methods of Risk Evaluation.
5. To understand Approaches to Problem Definition and Ways to Developing Solution
6. To be acquainted with the implementation of Actuarial Models and Monitoring.
7. To appreciate the framework of Institute of Actuaries of India, Faculty of Actuaries and the financial Reporting Councils

Modules at a Glance

Actuarial Risk Management – Paper II		
Sr. No.	Modules	No. of Lectures
I	Actuarial Control Cycle	15
II	Risk Management	15
III	Defining the Problem and Developing a Solution	15
IV	Implementation of Actuarial Models and Monitoring	15
Total No. of Lectures		60

Semester IV

Actuarial Risk Management Paper – II		
Topic		
Module I	Actuarial Control Cycle	Learning Outcome
	<ul style="list-style-type: none"> • Meaning and Definition. • Process of Actuarial Control Cycle. • Essential information for Actuarial Control Mechanism. • Multiple Application of Actuarial Control Cycle – Situations and Events. • Practical Limitations of Actuarial Control Cycle. 	<ul style="list-style-type: none"> • The student acquaints himself with the Actuarial Control Cycle.
Module II	Risk Management	Learning Outcome
	<ul style="list-style-type: none"> • Components of Risk Management. • Different tools used in Risk Management. • Methods of Risk Measurement used by the main providers of benefits on contingent events. • Management of Risks with low likelihood but high impact. • Risk Evaluation using scenario analysis, stress testing and stochastic modeling. 	<ul style="list-style-type: none"> • The student understands various aspects of risk management.
Module III	Defining the Problem and Developing the solution	Learning Outcome
	<ul style="list-style-type: none"> • Approaches to Problem Definition. • Use of Actuarial Models and Suitability Analysis. • Assumption Setting and Provisioning. • Testing the Solution. 	<ul style="list-style-type: none"> • The student learns the various stages in producing the solution.
Module IV	Implementation of Actuarial Models and Monitoring	Learning Outcomes
	<ul style="list-style-type: none"> • Principles of Profitability and Surplus 	<ul style="list-style-type: none"> • The student learns

	Management. <ul style="list-style-type: none"> • Principles of Asset Management and Allocation. • Principles of Capital Management. • Monitoring the Process. • Principles of Actuarial Code. 	to control and manage the cost of payments arising on contingent events. <ul style="list-style-type: none"> • The student becomes aware of monitoring assessment of actuarial experience.
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REFERENCE BOOKS

- 1) Financial Risk Manager Handbook: FRM Part I / Part II + Test Bank (Wiley Finance) by Philippe Jorion
- 2) Value at Risk, 3rd Ed. by Philippe Jorion
- 3) Managing Investment Portfolios: A Dynamic Process (CFA Institute Investment Series) by John L. Maginn
- 4) Pension Fund Risk Management: Financial and Actuarial Modeling (Chapman & Hall/Crc Finance Series) by Marco Micocci
- 5) Actuarial Finance: Derivatives, Quantitative Models and Risk Management by Mathieu Boudreault
- 6) Financial Enterprise Risk Management (International Series on Actuarial Science) by_Paul Sweeting
- 7) Financial Enterprise Risk Management (International Series on Actuarial Science) 1st Edition by Paul Sweeting (Author)
- 8) Understanding Actuarial Management: The Actuarial Control Cycle, Sccond Edition , Clare Bellis, Richard Lyon, Stuart Klugman and John Shepherd, Editors. 2010. Co-published by the Society of Actuaries and the Institute of Actuaries of Australia.
- 9) Insurance Industry Mergers & Acquisitions Tom Herget and Jim Toole, Editors. 2005.
- 10) General Insurance Financial Reporting Topics, Fourth Edition ,Society of Actuaries. 2019.
- 11) Fundamentals of General Insurance Actuarial Analysis , Jacqueline Friedland. 2013.
- 12) A Comprehensive Guide to Measuring and Managing Life Insurance Company Expenses, Sam Guterman. 2007.
- 13) Life Insurance Products and Finance, D.B. Atkinson and J.W. Dallas. 2000.
- 14) Life Insurance Products and Finance, D.B. Atkinson and J.W. Dallas. 2000.

Elective Courses (EC)

2. Auditing (Techniques of Auditing and Audit Procedures) Paper I

Semester III

Objectives

- To be acquainted with scope of audit
- To be aware of the risk and its assessment in insurance industry.
- To know RBI regulations relating to audit of NBFCs.
- To be able to prepare an audit plan
- To understand audit framework for BFSI.
- To understand the rules and regulations governing insurance sector in India

Modules at a Glance

Auditing (Techniques of Auditing and Audit Procedures) Paper I		
Sr. No.	Modules	No. of Lectures
1	General Audit consideration	15
2	Understanding Entity , Its Environment and Internal Control	15
3	Audit Framework for BFSI	15
4	Professional guidance for audit of BFSI	15
Total No. of Lectures		60

Elective Courses (EC)

Semester III

Auditing (Techniques of Auditing and Audit Procedures) Paper I		
Topics		
Module I	General Audit Consideration	Learning Outcomes
	<ul style="list-style-type: none">• Introduction.• Scope of Audit Engagement.• Auditors' independence and Professional Ethics.• Audit Planning	<ul style="list-style-type: none">• The learner identifies the scope of audit.• The learner appreciates the importance of audit planning.
Module II	Understanding Entity, Its Environment and Internal Control	Learning Outcomes
	<ul style="list-style-type: none">• Common Industry Ratio and Performance Indicator.• Risk Indicators in Insurance Industry.• Identifying and Assessing Risks of Material mis-statement.• RBI Regulations relating to Audit of NBFCs.	<ul style="list-style-type: none">• The learner get to know the industry.• The learner understands the risks of material mis-statement.
Module III	Audit Framework for BFSI	Learning Outcomes
	<ul style="list-style-type: none">• Preparation of a Detailed Audit Plan.• Use of Information Technology.• Preparation of Entity-specific Checklist for Compliance.• Collection of Audit Evidence and Documentation.	<ul style="list-style-type: none">• The learner prepares an audit plan.• The learner gets to understand audit procedure.
Module IV	Professional Guidance for Audit of BSFI	Learning Outcome
	<ul style="list-style-type: none">• ICAI guidance note on audit of banks.• ICAI guidance note on audit of General Insurance Companies.	<ul style="list-style-type: none">• The learner understands and appreciates the rules and regulations governing the insurance sector in India.

	<ul style="list-style-type: none"> • ECIIA key principles of internal audit of Insurance Companies. • ICAI Technical guide on review and certification of investment risk management systems and processes of Insurance Companies. • Society of Insurance Checklist on audit of insurance premiums. • ICAI Technical guide on audit of asset management companies/mutual funds. 	
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Elective Courses (EC)

Semester IV

2. Auditing (Techniques of Auditing and Audit Procedures) Paper II

Objectives

- To know the Financial Report framework
- To understand general audit consideration and audit planning and audit of risk factors
- To be acquainted with the provision of IFRS and GAAP
- To know duties and responsibilities of Auditor (Internal and External)

Modules at a Glance

Auditing (Techniques of Auditing and Audit Procedures) Paper II		
Sr. No.	Modules	No. of Lectures
1	Financial Reporting Framework	15
2	Audit Consideration Chart	15
3	IFRS and GAAP	15
4	Duties and Responsibilities of Auditor (Internal and External)	15
Total No. of Lectures:		60

Elective Courses (EC)

Semester IV

Auditing (Techniques of Auditing and Audit Procedures) Paper I		
Topics		
Module I	Financial Reporting Framework	Learning Outcomes
	<ul style="list-style-type: none">• IRDAI preparation of Financial Statement and Auditors' Report in Insurance Companies (Regulation).• Internal Control Mechanism.• Revenue Recognition – Reserve Mechanism – Assessment of Risk.• Identifying the mis-statements leading to frauds and collecting information about the same.	<ul style="list-style-type: none">• The learner gets to know the special features for preparing audit report.• The learner identifies troublesome areas
Module II	Audit Consideration Chart	Learning Outcomes
	<ul style="list-style-type: none">• Scope of Audit Engagement – General Consideration, Audit Planning – Audit of Risk Factor.• Identification of adverse financial conditions – communication with the Management and Finance Committee.• Reporting of Long Term Liabilities in Insurance Companies – Liabilities for Future Policy benefits and Other Contract Liabilities.• Listing fraud risk factors in BFSI and Practice of Professional Skepticism.	<ul style="list-style-type: none">• The learner gets trained to look out for risk factors.• The learner becomes cautious with respect to fraud.
Module III	IFRS and GAAP	Learning Outcome
	<ul style="list-style-type: none">• Statutory Accounting Principles governing insurance companies in India.• GAAP – select provisions such as Audit Procedure, Audit Consideration Chart.• IFRS – select provisions.	<ul style="list-style-type: none">• The learner understands and applies the provision of International Rules and Regulations.

	<ul style="list-style-type: none"> • Taxation of insurance entities in India – Regulation of Premium Rate, Tax on Premium and Accounting Practices. 	
Module IV	Duties and Responsibilities of Auditor (Internal and External)	Learning Outcomes
	<ul style="list-style-type: none"> • Reporting of unremediated material weaknesses to regulators (Internal Audit). • Classification of Frauds and Reporting of the same to Regulators, namely RBI and IRDAI. • Highlight on cases of Attempted Frauds and Unreported Risk. • Filing of opinion of Actuary as an Expert about any gap in the books and reports. • Filing of the Auditor's Report in the given format. 	<ul style="list-style-type: none"> • The learner prepares a final report. • The learner prepares actuarial statement.

Teaching Pedagogy

Use of technology, Chalk and Talk method, Group discussions, case study analysis.

REFERENCE BOOKS

- Alvin A. Arens , Randal J. Elder, et al., Auditing and Assurance Services (16th Edition) Feb 1, 2016
- Karla M Johnstone-Zehms, Audrey A., Auditing: A Risk Based-Approach by Gramling, et al. | Feb 14, 2018
- Timothy Louwers, Allen Blay, et al, Auditing & Assurance Services (Auditing and Assurance Services) Feb 10, 2017)
- Ray Whittington and Kurt Pany GEN COMBO LL PRINCIPLES OF AUDITING & OTHER ASSURANCE SERVICES; CONNECT AC , May 4, 2018
- Jones Orumwense, Principles and Practice of Internal Auditing in the Banking Industry: A Training Guide in internal and Forensic Auditing in Banks and other financial institutions, Feb 26, 2013
- AICPA, Audit and Accounting Guide - Depository and Lending Institutions: Banks and Savings Institutions, Credit Unions, Finance Companies, and Mortgage Companies (AICPA Audit and Accounting Guide) Oct 23, 2018
- Saloni Ramakrishna, Enterprise Compliance Risk Management: An Essential Toolkit for Banks and Financial Services (Wiley Corporate F&A Book 641)

Elective Courses (EC)

3. Documentation Analysis and Reporting – I

Semester III

The learning outcomes expected from this course are

- Learners develop analytical skill
- Learners appreciate the rendering of collected data and information in structured manner.
- Learners acquire skills of arranging and sequencing the subject matter.
- Learners acquired skills for interpretation of data and information.
Learners form an opinion and express it verbally.

Semester-III

Modules at a Glance

Documentation Analysis and Reporting – I		
Sr. No.	Modules	No. of Lectures
1	Overview of documentation analysis and reporting	12
2	IRDAI Annual Report 2018-2019 (Introduction of the Report and discussion about the format and other aspects of the report)	12
3	Discussion on tables and graphs – interpretation thereof	12
4	Nuances of interpretation and reporting	09
Total No. of Lectures:		45

IRDAI Annual Report 2018-2019.

Modalities

1. All the learners will have to read the report
2. The faculty will engage the learners based on the coverage of the modules.
3. There shall be group discussion, question answer sessions and idea generation.
4. There shall be a class test for 20 marks on the art of report writing in general and nuances of organising a research report. This will purely evaluate the skills in report writing including language proficiency and expression.
5. The learners have to interpret at least four statistical tables (randomly picked by the faculty) and submit a report for 20 marks.
6. There shall be a Semester End Examination for 60 marks where the content of the report shall be tested. The examination will be an 'open book examination'.
7. The paper pattern for the same shall be five questions 15 marks each. There is no specification about the allocation of questions based on sequence of the report.
8. The passing minimum is common as applicable to other courses.

Elective Courses (EC)

3.Documentation Analysis and Reporting – II

Semester IV

Instructional Objectives :

- Learners develop analytical skill, appreciate the rendering of collected data and information in structured manner.
- They acquire skills of arranging and sequencing the subject matter
- They acquire skills for interpretation of data and information.
- They identify the words and terminologies used in the report.

Learning Outcomes :

- The learners are able to analyse the information in the IRDAI annual report
- The acquire knowledge required to arrange the subject matter in the report
- They are enabled to form an opinion and express it verbally
- They gain adequate vocabulary for professional report writing

Modules at a Glance

Documentation Analysis and Reporting – I		
Sr. No.	Modules	No. of Lectures
1	IRDAI Report - Analysis & Interpretation	12
2	RBI Ombudsman Scheme	12
3	RBI Annual report - Introduction of the Report and discussion about the format and other aspects of the report	12
4	RBI Annual report- Analysis & Interpretation	09
Total No. of Lectures:		45

The recommended report is RBI Ombudsman Schemes, Annual Report and IRDAI Annual Report.

Modalities

1. All the learners will have to read the report
2. The faculty will engage the learners based on the coverage of the modules.
3. There shall be group discussion, question answer sessions and idea generation.
4. There shall be a class test for 20 marks on the art of report writing in general and nuances of organizing a research report. This will purely evaluate the skills in report writing including language proficiency and expression.
5. The learners have to interpret at least four statistical tables (randomly picked by the faculty) and submit a report for 20 marks.
6. There shall be a Semester End Examination for 75 marks where the content of the report shall be tested. The examination will be an 'open book examination'.
7. The paper pattern for the same shall be five questions 15 marks each. There is no specification about the allocation of questions based on sequence of the report.
8. The passing minimum is common as applicable to other courses.

References :

1. IRDAI English Annual Report
2. Banking Ombudsman Report
3. Nestle India Annual Report

Ability Enhancement Courses (AEC)
4 Information Technology in BFSI Paper I
Semester III

Objectives:

- To lay a foundation in the usage of Information Technology (IT) in Banking, Financial Services and Insurance (BFSI).
- To understand Data Base System in BFSI.
- To appreciate the use of internet in IT.
- To learn use of office automation using MS Office.

Modules at a Glance

Information Technology in BFSI- paper I		
Sr. No.	Modules	No. of Lectures
1	Introduction to Information Technology	15
2	Data Base System in BFSI	15
3	Internet and Information Technology	15
4	Office Automation using MS Office	15
Total No. of Lectures:		60

Semester III

Information Technology in BFSI-Paper I		
Topics		
Module I	Introduction to Information Technology	Learning Outcomes
	<ul style="list-style-type: none"> • Concepts related to Information Technology: Data, Information, Data Base Information system. • Major components of Information System: Types and Levels of Information System – CBIS (Computer Based Information System) Office Automation system Management Information System, Transaction Processing System, Decision Support System, Executive Information system, CRM. • IT architecture in BFSI – Policy administration., G-Ledger, Fund accountability • Co-existence of various systems in BFSI 	<ul style="list-style-type: none"> • The student is aware of the various concepts related to IT • The student identifies/ understands the major components of information system • The student learns about IT architecture in BFSI
Module II	Data Base System in BFSI	Learning Outcomes
	<ul style="list-style-type: none"> • Data Base Management System (DBMS) and Role of DBMS as the interface between user and data base. • Data Base Management System: Structure and Features. • Meaning and purpose of Data Dictionary, File Manager, Role of Data Base Administer, Traditional File system v/s Data Base System. 	<ul style="list-style-type: none"> • The students is well-versed with the data base systems in BFSI • The student is aware of Finacle, Life Asia and others

	<ul style="list-style-type: none"> • Data Base Organization: Definition and major Characteristics of Flat File, Relational File, Hierarchical File, Network File and Object Oriented File. • Introduction to Finacle, life Asia and others 	
Module III	Internet and Information Technology	Learning Outcomes
	<ul style="list-style-type: none"> • Introduction to Internet. • Internet Utility Software based on Client Server Technology. • Internet Service Provider and Internet Protocol: Website, Webpage Construction, Web server, Web Browser (URL, HTML, History, Hyperlinks, Bookmark) – Basic knowledge of SMTP, POP, IMAP, FTP, HTTP, TCP, IP. • Security: Internet based frauds, Hacking of password, Viruses, Encryption & Decryption Keys, Firewall, Digital Signatures and Certificates, • E-commerce. 	<ul style="list-style-type: none"> • The student understands the role of internet in IT • The student understands importance of internet in e-commerce
Module IV	Office Automation using MS Office	Learning Outcomes
	<ul style="list-style-type: none"> • Creating and saving of word document: Editing and Formatting Features, Designing file page and preparing index. • Spread Sheet Application: Creating, saving and editing spread sheets and drawing charts. • Use of basic functions such as Text, Mathematical and Statistical, Financial and Logical. Use of advanced functions including use of V-lookup, H-lookup. • Data Analysis and validation, Sorting and 	<ul style="list-style-type: none"> • The student is aware of the office automation using MS Office

	<p>filtering of data, 'what if - ' analysis using data tables and scenarios, Creating subtotals and Grand Totals, Pivot tables/charts</p> <ul style="list-style-type: none"> • Presentation software: Creating presentation with minimum 20 slides with Script, Inserting pictures, Videos, Animation 	
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Ability Enhancement Courses (AEC)
4 Information Technology in BFSI-Paper II

Semester IV

Objectives:

- To become familiar with use of IT in Life Insurance
- To become familiar with use of IT in General Insurance
- To understand IGMS
- To understand role of TRAMBID

Modules at a Glance

Information Technology in Insurance Sector		
Sr. No.	Modules	No. of Lectures
1	Role of Information Technology in Life Insurance	15
2	Role of Information Technology in General Insurance	15
3	Integrated Grievance Management System (IGMS)	15
4	Future of Information Technology and Insurance Sector - TRAMBID	15
Total No. of Lectures:		60

SYLLABUS FOR SY BCOM (ACTUARIAL STUDIES)
SEMESTER IV

Information Technology in Insurance Sector- Paper II		
Topic		
Module I	Role of Information Technology in Life Insurance:	Learning Outcomes
	<ul style="list-style-type: none"> • Policy Administration System • Claims Management • Re-insurance and Risk Transfer • Financial Accounting System 	<ul style="list-style-type: none"> • The student understands and appreciates the use of Information Technology in Life Insurance
Module II	Role of Information Technology in General Insurance:	Learning Outcomes
	<ul style="list-style-type: none"> • Front Office Online System • Policy Management • Reinsurance and Claims • Accounting • Report Generation 	<ul style="list-style-type: none"> • The student understands and appreciates the use of Information Technology in General Insurance
Module III	Integrated Grievance Management System) (IGMS)	Learning Outcomes
	<ul style="list-style-type: none"> • Legacy Data • Data Security, Cyber Security • Grievance Redressal System • Investment System Challenges • IT challenges in Mergers and Acquisitions 	<ul style="list-style-type: none"> • The student becomes familiar with the functions performed by IGMS
Module IV	Future of Information Technology and Insurance Sector - TRAMBID	Learning Outcomes
	<ul style="list-style-type: none"> • Telematics and Robotics • Artificial Intelligence and Machine Learning • Block chain • Internet of Things and Data Analytics • System Hacking 	<ul style="list-style-type: none"> • The student learns about the future of TRAMBID

Reference Books

- E-Banking in India : Challenges and Opportunities – By Rimpi Jatana, R. K. Uppal
- Frontiers of E-Commerce – by Ravi Kalakota, Andrew B. Whinston – Pearson Education
- Frontiers of E-Commerce – by Ravi Kalakota, Andrew B. Whinston – Pearson Education
- Microsoft Office Professional 2013-Step by step by step
- By Beth Melton, Mark Dodge, Echo Swinford, Andrew Couch
- An Overview of Cyber Crime and Security – Volume 1-1st Edition by Akash Kamal Mishra
- Computers and Banking by Sony and Agarwal
- E-Commerce by David Whitely
- Sanjay Soni and Vinayak Aggarwal, Computers and Banking, M/s Sultan Chand and sons, New Delhi, 1993.
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- General Bank Management from Indian Institute of Banking and Finance by Macmillan
- Modern Banking Technology-by Firdos Temurasp Shroff – published by – Northern Book Center, New Delhi
- General Bank Management from Indian Institute of Banking and Finance by Macmillan
- Microsoft Office Professional 2013-Step by step
- By Beth Melton, Mark Dodge, Echo Swinford, Andrew Couch

Core Courses (CC)

5. Management: Functions and Challenges

Semester III

Objectives:

1. To make the learners aware of conceptual knowledge and evolution of Management.
2. To familiarize the learners with the functions of Management
3. To sensitize the learners about the actual work environment and how business managers have to deal with the challenges posed by the changing environment.

Modules at a Glance

Management: Functions and Challenges		
Sr. No.	Modules	No. of Lectures
1	Introduction to Management	15
2	Planning & Organizing	15
3	Directing & Controlling	15
4	Management Challenges in Changing Environment	15
Total No. of Lectures		60

Semester III

Management: Functions and Challenges		
Topic		
Module I	Introduction To Management	Learning Outcomes
	<ul style="list-style-type: none"> • Management Concept, Importance of Management, Functions of Management; Managerial Competencies Levels of Management Managerial roles based on Mitzberg's Theory. • Evolution of Management Thoughts Scientific Management by F.W.Taylor's, General Management Theory by Henri Fayol, Human Relations Approach by Elton Mayo - Hawthorne experiments. • Ancient and Modern Management Approach Chanakya 'Arthshastra' Management Practices by Indian Values Peter Drucker's Dimensions of Management. 	<ul style="list-style-type: none"> • The learner knows the meaning of management, evolution of management thoughts • The learner is able to compare ancient and modern management approach.
Module II	Planning & Organising	Learning Outcomes
	<ul style="list-style-type: none"> • Planning - Steps, Importance, Components; Coordination – Importance • M.B.O - Process, Advantages; Management by Exception- Advantages; Management Information System- Concept, Components. • Decision Making -Techniques, Essentials of a Sound Decision Making. • Organising - Organization Structures – Line & Staff Organization, Tall and Flat Organisation Matrix Organization, Virtual Organization, Formal/s Informal Organization. 	<ul style="list-style-type: none"> • The learner applies the process of Planning in day-to-day activities. • The learner is able to use Decision Making Techniques while making decisions.
Module III	Directing and Controlling	Learning Outcomes
	<ul style="list-style-type: none"> • Departmentation –Meaning, Bases; Span of Management- Factors -Graicunas formula Influencing Span of Management. • Delegation of Authority- Barriers to 	<ul style="list-style-type: none"> • The learner understands the bases of departmentation in various companies.

	<p>Delegation, Measures to overcome barriers.</p> <ul style="list-style-type: none"> • Motivation: Factors influencing Motivation. • Leadership: Styles and Qualities. • Controlling: Techniques of controlling. 	<ul style="list-style-type: none"> • The learner understands the importance of motivation and leadership with proper controls.
Module IV	Management Challenges in Changing Environment	Learning Outcomes
	<ul style="list-style-type: none"> • Mergers and Acquisitions – challenges of integrating corporate culture. • Turnaround– challenges for top management during turnaround process. • Closure – Procedural challenges of closing a business enterprise. • Change and Disruptions– challenges posed by technology gap. 	<ul style="list-style-type: none"> • The learner knows the challenges faced by managers in the changing environment

Core Courses (CC)

5. Management : Production and Finance

Semester IV

Objectives:

- 1) To acquaint the learners with the basic concepts of Production Management, Inventory Management & Quality Management.
- 2) To impart the basic orientation towards the institutional framework of the Indian Financial System.
- 3) To update the learners with the different markets and its players in the Indian Financial System and their relevance to India's Economy.
- 4) It will also orient them on how to invest in these financial markets.

Modules at a Glance

Management : Production and Finance		
Sr. No.	Modules	No. of Lectures
1	Production & Inventory Management	15
2	Quality Management	15
3	Indian Financial System-I Institutional Framework	15
4	Indian Financial System-II Markets and Players- Institutions and Individuals	15
Total No. of Lectures:		60

Core Courses (CC)
Semester IV

Management: Production and Finance		
Topic		
Module I	Production & Inventory Management	Learning Outcomes
	<ul style="list-style-type: none"> • Production Management: Meaning, Objectives, Scope. • Production Systems: Concept, Types - Continuous and Intermittent. • PPC : Concept and steps in PPC. • Productivity: Concept, Factors Influencing Productivity, Measures for improving Productivity, Productivity in different economies. • Inventory Management: Concept and Objectives. • Inventory Control: Techniques. 	<ul style="list-style-type: none"> • The learner is expected to understand the production process of industries and the inventory control techniques followed by them.
Module II	Quality Management	Learning Outcomes
	<ul style="list-style-type: none"> • Introduction to Quality: Dimensions of Quality. • Cost of Quality: Types – Internal Failure Cost, External Failure Cost, Appraisal Cost, Prevention Cost. • Quality Circle: Features. • Quality Management Tools: TQM – Importance, Six Sigma – Process, ISO 9000 Kaizen – Process. • Service Quality Management: Concept and Importance. • SERVQUAL Model: Measures to improve service quality. 	<ul style="list-style-type: none"> • The learner is expected to know the various Quality Management processes and techniques adopted by companies.
Module III	Indian Financial System-I Institutional Framework	Learning Outcomes
	<ul style="list-style-type: none"> • Structure of Indian Financial Market • Financial Institutions: (Banking and Non Banking) , Role of Financial Institutions in a developing country like India. 	<ul style="list-style-type: none"> • The learner is expected to have a complete understanding of

	<ul style="list-style-type: none"> • Financial Markets: Money market and its Instruments, Capital Market and its Participants. • Stock Exchange and Commodity Exchange: Functions. • Regulatory and Promotional Institutions: Understanding the Role of RBI, SEBI, IRDA, PFRDA. • Depositories in India – Role. 	all components of the Indian financial system.
Module IV	Indian Financial System-II Markets and Players - Institutions and Individuals	Learning Outcomes
	<ul style="list-style-type: none"> • Credit Rating Agencies in India - CRISIL, CARE, and ICRA and CIBIL. • Mutual Funds: Factors responsible for growth of mutual funds, related risks – Systematic Investment Plan. • Commodity Market and Commodity Boards: Concept and relevance in Indian Market. • Derivatives Market: Meaning and Risks. • Bond Market: Concepts and Types. • Micro Finance – Importance, Role of Self Help Groups. • Personal finance – Preparing Individual Savings, Investment and Pension (NPS)Plans. 	<ul style="list-style-type: none"> • The learner is expected to differentiate between different types of market players. • A desired outcome is that the learner is motivated to become more financially included by participating in financial markets.

References:

1. Gene Burton, ManabThakur . Management Today Principles& Practice-, Tata McGrawHill,PublishingCo.Ltd.
2. JamesA.F.Stoner .Management –, Prentice Hall, Inc .U.S.A.
3. Heinz Weihrich& Harold Koontz .Management: Global Prospective –, Tata McGraw- Hill, Publishing Co.Ltd.
4. AlexisLeon ,MathewsLeon Vijay Nicole .Essential of Database Management Systems -, Imprints Pvt Ltd.
5. Peter Drucker .Management –Task ,Responsibility , Practices – Truman Talley Books / E.P. Dutton / New York
6. Viswanathan Rajeesh . Principles Of Management : Concepts &Cases . - 1st ed . - Mumbai : Himalaya Publishing House , 2010
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8. Sane Vivek S . Principles & Practices of Management. Pune : Symbiosis Centre for Distance Learning ,
9. P.B Principles & Practices of Management Pune Symbiosis Centre for Distance Learning
10. Ramasamy T . Principles of Management. - Mumbai : Himalaya Publishing House , 2014
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13. VasishtNeeru ; Vasishtvibhuti . Taxmann’s Principles of Management: Text & Cases / 4th ed . - New Delhi :
14. Indian Financial System—Bharathi Pathiak, Pearson Publication.
15. Financial Institutions and Markets : Structure Growth& Innovations – L.M.Bhole , JitendraMahakad, Tata McGraw Hill.
16. The IndianFinancial System and Financial Market Operator-VasantDesai, Himalaya Publishing.
17. Indian Financial System – M.Y.Khan, Tata McGraw –Hill.
18. Production and Operations Management –Anandkumar Sharma, Anmol Publication.
19. Mutual Funds in India: Emerging Issues-NaliniPravaTripathy, Excel Books New Delhi.
20. Bhole, L.M., Financial Markets and Institutions. Tata McGraw Hill Publishing.
21. Khan, M.Y., Indian Financial System-Theory and Practice. New Delhi: Vikas Publishing House.
22. Sharma, G.L., and Y.P. Singh eds. Contemporary Issues in Finance and Taxation. Academic Foundation, Delhi.
23. Khan and Jain, Financial Services, Tata McGraw Hill.
24. Singh, J.K., Venture Capital Financing in India. DhanpatRai and Company, New Delhi.
25. Horne, Van; James C., John Wachowicz, Fundamentals of Financial Management,Pearson Education
26. Sharma, G.L., and Y.P. Singh. Contemporary issues in Finance and Taxation. Academic Foundation Delhi

C **Core Courses (CC)**
60 **Insurance Laws and Regulations Paper I**
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e **Semester III**

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- To familiarize the student with the various common business laws applicable to insurance business.
- To make the student aware of the evolution and legal framework of insurance business in India.

Modules at a Glance

Business Laws and Insurance Specific Laws		
Sr. No.	Modules	No. of Lectures
1	Introduction to Business Laws-I	15
2	Introduction to Business Laws-II	15
3	Evolution of Insurance Laws in India	15
4	Regulatory Framework of Insurance Business in India	15
Total No. of Lectures		60

Semester III

Insurance Laws and Regulations- Paper I		
Topics		
Module I	Introduction to Business Laws - I	Learning Outcome
	<ul style="list-style-type: none"> • India Contract Act 1872 • Definition of Contract and Agreement • Essentials of a Valid Contract – Capacity to Contract, offer, Acceptance and Consideration with respect to Insurance Contract • Communication and Revocation of offer and acceptance, Misrepresentation, Fraud and Void Agreement, E-Contract. • Negotiable Instruments Act, 1881 : Introduction and Relevance • Concept, Characteristics and Classification of Negotiable Instruments • Promissory Note, Bill of Exchange and Cheques- Features, Types and Points of Distinction • Limitation Act and RTI Act 	<ul style="list-style-type: none"> • The student acquires a fairly good idea of the basic provisions of various business laws. • The student is acquainted with the important changes made in the provisions of various business laws
Module II	Introduction to Business Laws - II	Learning Outcome
	<ul style="list-style-type: none"> • Indian Partnership Act, 1932 Introduction, Relevance, Partnership deed, Rights and Duties of Partners, Partnership with Ltd. Liabilities (LLP) • Setting up of a Company under Indian Company's Act, 2013 • Consumer Protection Act, 1986 Concept, Objects, Definition of Consumer, Consumer Disputes, Complaints, Complainant Rights of Consumer, Consumer Protection Council and Redressal Agencies 	<ul style="list-style-type: none"> • The student acquires a fairly good idea of the basic provisions of various business laws. • The student is acquainted with the important changes made in the provisions of various business laws

Module III	Evolution of Insurance Laws in India	Learning Outcome
	<ul style="list-style-type: none"> • Legal, Framework of Insurance business in India- • Evolution of Insurance Laws in India • Insurance Act, 1938 • LIC of 1956 • General Insurance Related Laws- Fire, Marine and Property • General Insurance Business (Nationalisation) Act :1972 	<ul style="list-style-type: none"> • The student understands the legal framework of Insurance business in India. • The student is well acquainted with the various insurance laws.
Module IV	Regulatory Framework of Insurance Business in India	Learning Outcome
	<ul style="list-style-type: none"> • Fundamental Principles of Financial Regulation- establishment of IRDAI • Investment Regulations in India • Institutional Structure of Insurance Regulation and Supervision • Registration of India Insurance Company, 2000 • IRDAI appointed Actuary Regulation , 2017 	<ul style="list-style-type: none"> • The student understands and appreciates the regulatory framework of insurance business in India.

References:

1. IRDAI Appointed Actuary Regulations, 2017
https://www.irdai.gov.in/ADMINCMS/cms/frmGeneral_Layout.aspx?page=PageNo3155&flag=1
2. IRDAI Investment Regulations, 2016
https://www.irdai.gov.in/ADMINCMS/cms/frmGeneral_Layout.aspx?page=PageNo2934&flag=1

Core Courses (CC)
6. Insurance Laws and Regulations Paper II

Semester IV

Objectives:

- To understand the provisions of various insurance specific laws
- To appreciate the role of IRDAI with respect to insurance industry

Modules at a Glance

Insurance Laws and Regulations Paper II		
Sr. No.	Modules	No. of Lectures
1	Life Insurance and Health Insurance	15
2	General Insurance I	15
3	General Insurance II	15
4	Regulation of Intermediaries in the Insurance Industry	15
Total No. of Lectures		60

Core Courses (CC)

6. Insurance Laws and Regulations Paper II Semester IV

Insurance Laws and Regulations Paper II		
Topics		
Module I	Life Insurance and Health Insurance	Learning Outcome
	<ul style="list-style-type: none"> • Status of Life and Health Insurance in India • IRDAI Life Insurance/ Re-insurance 2013 • IRDAI Assets liabilities and solvency of Life Insurance Business, 2013 • IRDAI Expenses of Management of Insurers transaction, Life insurance Business, 2016 • IRDAI Health Insurance Regulation, 2016 • IRDAI Third Party Administrators- Health Services, 2016 • IRDAI Actuarial Report & Abstract for Life Insurance Business, 2016 	<ul style="list-style-type: none"> • The student knows the current status of Life and Health Insurance in India. • The student understands the role of IRDAI as a regulatory body with respect to Life and Health Insurance Business in India
Module II	General Insurance (I)	Learning Outcome
	<ul style="list-style-type: none"> • Need and Status of General Insurance in India • IRDAI General Insurance/ Re-insurance, 2016 • IRDAI Asset Liability and Solvency of General Insurance Business, 2016 • IRDAI Expenses of Management of Insurance transactions General / Health Insurance Business, 2016 • IRDAI (Issuers of Capital by Indian Insurance Company other than Life Insurance Business) Regulation 2015 • IRDAI General Insurance/ Re-insurance, 2018 	<ul style="list-style-type: none"> • The student knows the current status of General Insurance in India. • The student understands the needs for General Insurance in India • The student understands the role of IRDAI as a regulatory body with respect to General Insurance Business in India

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Module III	General Insurance (II)	Learning Outcome
	<ul style="list-style-type: none"> • Need and Status of Fire Insurance, Marine Insurance and Motor Insurance in India • Fire Insurance Act, (Current, as amended) • Marine Insurance Act, (Current, as amended) • Motor Insurance Act (Current, as amended) • IRDAI Obligations of Insurer in respect of Third party Insurance Business 2016 	<ul style="list-style-type: none"> • The student knows the current status of Fire, Marine and Motor Insurance in India. • The students understands the need for Fire, Marine and Motor Insurance in India. • The student is aware of the latest amendments in Fire, Marine and Motor Insurance in India.
Module IV	Regulation of Intermediaries in the Insurance Industry	Learning Outcome
	<ul style="list-style-type: none"> • IRDAI Linked Insurance Products, 2013 • IRDAI Non Linked Insurance Products, 2013 • IRDAI Licensing of Banks as Insurance Brokers, 2013 • IRDAI Insurance Web Aggregators, 2017 • IRDAI Registration of Insurance Marketing Firms, 2016 • IRDAI Insurance Brokers, 2018 • IRDAI Licensing of Corporates , 2002 • IRDAI Protection of Policy Holders Interest, 2017 • IRDAI Obligation of Insurance to Rural Sectors, 2015 • IRDAI Micro Insurance Regulations, 2015 	<ul style="list-style-type: none"> • The student is acquainted with various laws explaining the role of IRDAI as a regulatory body in the Insurance industry in India.

References:

- 1 IRDAI Actuarial Report and Abstract for Life Insurance Business, 2016
https://www.irdai.gov.in/ADMINCMS/cms/frmGeneral_Layout.aspx?page=PageNo2848&flag=1
- 2 IRDAI General Insurance – Reinsurance, 2016
https://www.irdai.gov.in/ADMINCMS/cms/frmGeneral_Layout.aspx?page=PageNo2865&flag=1
- 3 IRDAI Life Insurance-Reinsurance, 2013
https://www.irdai.gov.in/ADMINCMS/cms/frmGeneral_Layout.aspx?page=PageNo1971&flag=1
- 4 IRDAI Reinsurance Regulations, 2018
https://www.irdai.gov.in/ADMINCMS/cms/frmGeneral_Layout.aspx?page=PageNo3685&flag=1
- 5 IRDAI Assets, Liabilities and Solvency Margin of Life Insurance Business, 2016
https://www.irdai.gov.in/ADMINCMS/cms/frmGeneral_Layout.aspx?page=PageNo2847&flag=1
- 6 IRDAI Assets, Liabilities and Solvency Margin of General Insurance Business, 2016
https://www.irdai.gov.in/ADMINCMS/cms/frmGeneral_Layout.aspx?page=PageNo2845&flag=1
- 7 IRDAI Expenses of Management of Insurers Transacting Life Insurance Business, 2016
https://www.irdai.gov.in/ADMINCMS/cms/frmGeneral_Layout.aspx?page=PageNo2864&flag=1
- 8 IRDAI Expenses of Management of Insurers Transacting General or Health Insurance Business, 2016
https://www.irdai.gov.in/ADMINCMS/cms/frmGeneral_Layout.aspx?page=PageNo2850&flag=1
- 9 IRDAI Preparation of Financial Statements and Auditor’s Report of Insurance Companies, 2002
https://www.irdai.gov.in/ADMINCMS/cms/frmGeneral_Layout.aspx?page=PageNo3632&flag=1

Core Courses (CC)
7.Mathematical Modeling (Survival Models)-Paper I

Objective:

- 1) To introduce basic concepts of mathematics and statistics that are of relevance to survival models and stochastic models in Actuarial studies.

Outcomes: Students will be able to

- 1) Find the probabilities of different types of events.
- 2) Find the probabilities of random variable in case of continuous and discrete distributions.
- 3) Apply the test of hypothesis to solve the problems.
- 4) Construct and analysis Kaplan Meier curves.

Semester III

Modules at a Glance

Mathematical Modeling (Survival Models & Stochastic Models)-Paper I		
Sr. No.	Modules	No. of Lectures
1	Elementary Probability Theory	15
2	Probability Distributions	15
3	Sampling Theory	15
4	Non Parametric Distributions	15
Total No. of Lectures:		60

Semester III

Mathematical Modeling (Survival Models)-Paper I	
Topic	
Module I	Elementary Probability Theory
	<p>Probability Theory: Concept of random experiment/trial and possible outcomes; Sample Space and Discrete Sample Space; Events their types, Algebra of Events, Mutually Exclusive and Exhaustive Events, Complimentary events. Classical definition of Probability, Addition theorem (without proof), conditional probability, Baye's Theorem. Independence of Events: $P(A \cap B) = P(A)P(B)$. Simple examples.</p>
Module II	Probability Distributions
	<ul style="list-style-type: none"> • Random Variables: Discrete and Continuous, Expectation and Variance of Discrete and Continuous Random Variables. • Discrete Probability Distributions: Binomial Distribution, Poisson Distribution, Uniform Distribution. • Continuous Probability Distributions: Normal Distribution.
Module III	Sampling Theory
	<p>The concepts of random sampling, statistical inference and sampling distribution, the central limit theorem, mean and variance of sample mean, basic sampling distributions for the sample mean and sample variance. Confidence intervals for unknown parameters of binomial and normal distributions. Testing of Hypothesis, Null hypothesis, Alternative hypothesis, level of significance, basic tests for one-sample and two- sample situations involving binomial and normal distributions. Introduction to ANOVA.</p>
Module IV	Non Parametric Distributions
	<p>Kaplan Meier: Naive estimator, hazard function, maximum likelihood estimator. Kaplan Meier Analysis: Construction of Kaplan Meier curves, Analysis of Kaplan Meier curves.</p>

Core Courses (CC)

7. Mathematical Modeling Stochastic Models)-Paper II

Semester IV

Objective: To provide basic knowledge in the mathematical & statistical techniques which can be used to model and value cash flows dependent on death, survival, or other uncertain risks arising in pensions and life.

Outcomes: Students will be able to

- 1) Predict the value of unknown variable using the known variable.
- 2) Understand the techniques of actuarial models and stochastic processes
- 3) Compare random lifetime Survival model with Markov jump process survival model.
- 4) Understand the annuity factors, mortality table and their uses.

Modules at a Glance

Mathematical Modeling (Stochastic Models)-Paper II		
Sr. No.	Modules	No. of Lectures
1	Regression Analysis and Time Series	15
2	Actuarial Modeling	15
3	Markov Chain Processes	15
4	Simple Assurance & Annuity Contracts	15
Total No. of Lectures:		60

Semester IV

Mathematical Modeling (Stochastic Models)-Paper II	
Topic	
Module I	Regression Analysis and Time Series
	<p>Regression Analysis: Concept of Regression equations, Slope of the Regression Line and its interpretation. Regression Coefficients, Coefficient of Determination, Finding the equations of Regression lines by method of Least Squares.</p> <p>Time Series: Concepts and components of a time series. Representation of trend by Freehand Curve Method, Estimation of Trend using Moving Average Method and Least Squares Method (Linear Trend only). Estimation of Seasonal Component using Simple Arithmetic Mean for Additive Model and Multiplicative Model (For Trend free data only). Concept of Forecasting using Least Squares Method.</p>
Module II	ACTUARIAL MODELING
	<p>Actuarial Modeling: The principles of Actuarial modeling; Reasons and techniques of using actuarial models; Benefits and limitations of modeling; Difference between a stochastic and deterministic model, its advantages and disadvantages; Suitability of a model for any particular application; Difference between the short run and long run properties of a model; Analysis of potential output from a model and choice of model; Process of sensitivity testing of assumptions and its importance; Factors in communicating the results of the application of a model.</p> <p>Stochastic Processes: Definition of stochastic process and counting process; The general principles of stochastic processes, classification of stochastic processes, Stochastic interest rate models; Stochastic process in continuous or discrete time; continuous or a discrete state space and in mixed type; Application of mixed processes; Meaning of Markov Property in the context of a stochastic process; Concept of stochastic interest rate model and distinction between this and a deterministic model; Algebraically derivation of annual rates of return.</p>

Module III	Markov Chain Processes and Markov Jump Processes
	Features of a time homogeneous Markov chain model; Calculation of the stationary distribution for a Markov chain model in simple cases; System of frequency based experience rating in terms of a Markov chain model and simple applications; Use of Markov chains as a tool for modelling; The Markov Processes; Poisson process, two state survival model, sickness models and examples, jump chain model associated with a Markov jump process model and application. Markov jump processes as a tool for modeling. The random life time survival model: Consistency condition between the random variable representing lifetimes from different ages; random future lifetime, the survival function, the force of mortality or hazard rate, and their relationships; Definitions of the actuarial symbols and integral formulae; curtate future lifetime and the probability function; comparison of the random lifetime survival model with the two state Markov jump process survival model
Module IV	Simple Assurance & Annuity Contracts
	Simple assurance contracts, formulae for the mean and variance of the present value of payments, (assuming deterministic interest), Definition: whole life assurance, Term assurance, Pure endowment, Endowment assurance, Deferred Whole Life and Deferred Term Assurance, relevant probabilities with their select equivalents, Determination of expressions in the form of sums for the expected present value of benefit payments under each of the above contracts, assuming that death benefits are payable at the end of the year of death. Simplification of these expressions, Application of the annuity factors, Different types of mortality table and their use including ways in which future improvements can be allowed for. Life table functions and their select equivalents, Definition of life table probabilities.

References:

1. Probability and Stochastic Processes with a View Toward Applications by Breiman, L. Boston: Houghton Mifflin, 1969.
2. Introduction to Stochastic Processes by Cinlar, E. Englewood Cliffs, N.J.: Prentice-Hall, 1975.
3. The Theory of Stochastic Processes by Cox, D. R., and H. D. Miller. New York: John Wiley & Sons, 1965.
4. Introduction to Stochastic Processes by Hoel, R. G., S. C. Port, and C. J. Stone. Boston: Houghton Mifflin, 1972.
5. Finite Markov Chains by Kemeny, J. G., and J. L. Snell. New York: Van Nostrand Reinhold, 1960.
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7. An Introduction to Probability Theory and Its Applications by Feller, W. 2 vols. New York: John Wiley & Sons, 1966 (vol. 2), 1968 (vol. 1, 3rd ed.).
8. A First Course in Stochastic Processes by Karlin, S., and H. M. Taylor. New York: Academic Press, 1975.
9. An Introduction to Stochastic Modeling by H.M. Taylor, and Samuel Karlin. New York: Academic Press, 3rd Edition.
10. Mathematics for Economics and Finance Methods and Modelling by Martin Anthony and Norman Biggs, Cambridge University Press, Cambridge low-priced edition, 2000, Chapters 1, 2, 4, 6 to 9 & 10.
11. Applied Calculus: By Stephen Waner and Steven Constenoble, Brooks/Cole Thomson Learning, second edition, Chapter 1 to 5.
12. Business Mathematics By D. C. Sancheti and V. K. Kapoor, Sultan Chand & Sons, 2006, Chapter 1, 5, 7, 9 & 10.
13. Mathematics for Business Economics: By J. D. Gupta, P. K. Gupta and Man Mohan, Tata Mc-Graw Hill Publishing Co. Ltd., 1987, Chapters 9 to 11 & 16.
14. Quantitative Methods-Part-I By S. Saha and S. Mukerji, New Central Book Agency, 1996, Chapters 7 & 12.
15. Mathematical Basis of Life Insurance By S.P. Dixit, C.S. Modi and R.V. Joshi, Insurance Institute of India, Chapters 1 and 2
16. STATISTICS by Schaum Series.

- 17.** Fundamentals of Statistics - D. N. Elhance.
- 18.** Statistics for Management - Lovin R. Rubin D.S. (Prentice Hall of India)
- 19.** Statistics - Theory, Method & Applications D.S.Sancheti& V. K. Kapoor.
- 20.** Modern Business Statistics - (Revised)-B. Pearles& C. Sullivan –Prentice Hall of India.
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- 22.** Business Mathematics : D C Sancheti& V K Kapoor, Sultan Chand & Sons.
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- 30.** Stochastic Population Models in Ecology and Epidemiology by Bartlett, M. S. NewYork: John
Wiley & Sons, 1960.
- 31.** Business Mathematics, J.K. Singh, 2009,Himalaya PublishingHouse.
- 32.** Mathematics of Finance 2nd Edition Schaum’s Outline Series Peter Zima, Robert BrowsTata
McGraw-Hill Publishing Company Ltd.

Evaluation scheme

I Continuous Assessment (C.A.)– 25 Marks

- 1) Internal Assessment (20 Marks)
- 2) Overall Conduct (5 Marks)

II .Semester End Examination - 75 Marks

Question Paper Pattern for Semester End Examination

(Practical Courses)

Maximum Marks: 75

Questions to be set: 05

Duration: 2.5 Hrs.

All Questions are Compulsory Carrying 15 Marks each.

Question No	Particular	Marks
Q-1	Objective Questions A) Sub Questions to be asked 10 and to be answered any 8 B) Sub Questions to be asked 10 and to be answered any 7 (*Multiple choice / True or False / Match the columns/Fill in the blanks)	15 Marks
Q-2	Full Length Practical Question OR	15 Marks
Q-2	Full Length Practical Question	15 Marks
Q-3	Full Length Practical Question OR	15 Marks
Q-3	Full Length Practical Question	15 Marks
Q-4	Full Length Practical Question OR	15 Marks
Q-4	Full Length Practical Question	15 Marks
Q-5	A) Theory questions B) Theory questions OR	8 Marks 7 Marks
Q-5	Short Notes To be asked 05 To be answered 03	15 Marks

Note:

Practical question of 15 marks may be divided into two sub questions of 7/8 and 10/5Marks.

Question Paper Pattern for Semester End Examination

(Theoretical Courses)

Maximum Marks: 75

Questions to be set: 05

Duration: 2.5 Hrs.

All Questions are Compulsory Carrying 15 Marks each.

Question No	Particular	Marks
Q-1	Objective Questions A) Sub Questions to be asked 10 and to be answered any 8 B) Sub Questions to be asked 10 and to be answered any 7 (*Multiple choice / True or False / Match the columns/Fill in the blanks)	15 Marks
Q-2	Full Length Question OR	15 Marks
Q-2	Full Length Question	15 Marks
Q-3	Full Length Question OR	15 Marks
Q-3	Full Length Question	15 Marks
Q-4	Full Length Question OR	15 Marks
Q-4	Full Length Question	15 Marks
Q-5	A) Theory questions B) Theory questions OR	8 Marks 7 Marks
Q-5	Short Notes To be asked 05 To be answered 03	15 Marks

Note:

Theory question of 15 marks may be divided into two sub questions of 7/8 and 10/5Marks.



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