B.S. Abdur Rahman®
Crescent
Institute of Science & Technology
Deemed to be University u/s 3 of the UGC Act, 1956

# *Regulations 2025*
# *Curriculum and Syllabi*
## *(As approved by the 24th Academic Council)*
## *August - 2025*

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# M.Sc. (Actuarial Science)

B.S. Abdur Rahman® Crescent Institute of Science & Technology
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**REGULATIONS 2025**

**CURRICULUM AND SYLLABI**

**(As approved by 24th Academic Council)**

**August - 2025**

# M.SC. ACTUARIAL SCIENCE

# VISION AND MISSION OF THE INSTITUTION

## VISION

B.S. Abdur Rahman Crescent Institute of Science and Technology aspires to be a leader in Education, Training and Research in multidisciplinary areas of importance and to play a vital role in the Socio-Economic progress of the Country in a sustainable manner.

## MISSION

- To blossom into an internationally renowned Institute.
- To empower the youth through quality and value-based education.
- To promote professional leadership and entrepreneurship.
- To achieve excellence in all its endeavors to face global challenges.
- To provide excellent teaching and research ambience.
- To network with global Institutions of Excellence, Business, Industry and Research Organizations.
- To contribute to the knowledge base through Scientific enquiry, Applied Research and Innovation.

## DEPARTMENT OF MATHEMATICS AND ACTUARIAL SCIENCE

## VISION AND MISSION

### VISION

To be a leader in providing quality education and to carryout research in the field of Mathematics and Statistics and their applications in Science, Engineering and Technology

### MISSION

- To provide quality education in higher mathematics through well designed programs
- To provide quality mathematical foundation for all science and engineering programs
- To offer programs in specialized areas such as Actuarial Science to meet the needs of Insurance and other Industries
- To undertake fundamental, applied and interdisciplinary research

## PROGRAMME EDUCATIONAL OBJECTIVES AND OUTCOMES

## M.SC. ACTUARIAL SCIENCE

### PROGRAMME EDUCATIONAL OBJECTIVES

**PEO1:** To provide opportunities of higher studies in the professional area of Actuarial Science.

**PEO2:** To impart knowledge on various theoretical and practical aspects of Actuarial Science.

**PEO3:** To enable the students to apply their newly gained knowledge and skills in their workplace.

**PEO4:** To develop independent learning skills and transferable skills among the students.

**PEO5:** To help the students extend and develop their career plan and pursue their own professional development.

**PEO6:** To provide the students with a structured programme of study covering all Core Actuarial Science subject contents.

**PEO7:** To contribute to the education of academics, allowing the University to play an active role in the production of advanced studies in the areas of the Master in Actuarial Science

## PROGRAMME OUTCOMES

On successful completion of the programme, the graduates will be able to,

**PO1:** Understand the fundamental probability tools for quantitatively assessing risk and demonstrate an ability to apply these tools to problems encountered in Actuarial Science.

**PO2:** Use the fundamental concepts of Financial Mathematics and demonstrate an ability to use those concepts to calculate present and accumulated values for various streams of cash flows as a basis for future use.

.**PO3:** Demonstrate an understanding of the financial instruments, including derivatives, and the concept of no–arbitrage as it relates to financial mathematics.

.**PO4:** Understand the theoretical bases of certain Actuarial Models and Life Contingent models and can apply those models to insurance and other financial risks.

**PO5:** Understand the frequency and severity models and an ability to carry out the steps involved in the modelling process in solving Actuarial Science problems.

**PO6:** Demonstrate the ability to summarize and communicate, orally and in writing, Actuarial problems, and the ability to communicate solutions to Actuarial problems to specialized and non-specialized audiences.

**PO7:** Demonstrate highest standards of Actuarial ethical conduct and Professional Actuarial behaviour, critical, interpersonal and communication skills as well as a commitment to life-long learning.

# B.S. ABDUR RAHMAN CRESCENT INSTITUTE OF SCIENCE AND TECHNOLOGY, CHENNAI – 600 048.

## REGULATIONS 2025

## M.Tech. / MCA / M.Sc. / M.Com. / M.A. DEGREE PROGRAMMES

***(Under Choice Based Credit System)***

## 1.0 PRELIMINARY DEFINITIONS AND NOMENCLATURE

In these Regulations, unless the context otherwise requires:

i) **"Programme"** means post graduate degree programme (M.Tech. / MCA / M.Sc. / M.Com. / M.A.)

ii) **"Branch"** means specialization or discipline of programme like M.Tech. in Structural Engineering, Food Biotechnology etc., M.Sc. in Physics, Chemistry, Actuarial Science, Biotechnology etc.

iii) **"Course"** means a theory / practical / laboratory integrated theory / mini project / seminar / internship / project and any other subject that is normally studied in a semester like Advanced Concrete Technology, Electro Optic Systems, Financial Reporting and Accounting, Analytical Chemistry, etc.

iv) **"Institution"** means B.S. Abdur Rahman Crescent Institute of Science and Technology.

v) **“Academic Council”** means the Academic Council, which is the apex body on all academic matters of this Institute.

vi) **"Dean (Academic Affairs)"** means the Dean (Academic Affairs) of the Institution who is responsible for the implementation of relevant rules and regulations for all the academic activities.

vii) **"Dean (Student Affairs**)" means the Dean (Students Affairs) of the Institution who is responsible for activities related to student welfare, conduct of co-curricular, extra-curricular events and discipline in the campus.

viii) **"Controller of Examinations"** means the Controller of Examinations of the Institution who is responsible for the conduct of examinations and declaration of results.

ix) **“Dean of the School”** means the Dean of the School of the department concerned.

x) **"Head of the Department"** means the Head of the Department concerned.

## 2.0 ADMISSION REQUIREMENTS

**2.1** Students for admission to the first semester of the Master's Degree Programme shall be required to have passed the appropriate degree examination as specified in the clause 3.2 [Eligible entry qualifications for admission to programmes] of this Institution or any other University or authority accepted by this Institution.

**2.2** The other conditions for admission such as class obtained, number of attempts in the qualifying examination and physical fitness will be as prescribed by the Institution from time to time.

## 3.0 BRANCHES OF STUDY

**3.1** The various programmes and their mode of study are as follows:

| Degree | Mode of Study |
|---|---|
| M.Tech. | Full Time |
| MCA | |
| M.Sc. | |
| M.Com. | |
| M.A. | |

### 3.2 Programmes offered

| S. No. | Name of the Department | Programmes offered |
|---|---|---|
| 1. | Aeronautical Engineering | M.Tech. (Avionics) |
| 2. | Civil Engineering | M.Tech. (Structural Engineering) |
| | | M. Tech. (Construction Engineering and Project Management) |
| 3. | Mechanical Engineering | M.Tech. (CAD/CAM) |
| 4. | Electrical and Electronics Engineering | M.Tech. (Power Systems Engineering) |

| S. No. | Name of the Department | Programmes offered |
|---|---|---|
| 5. | Electronics and Communication Engineering | M.Tech. (VLSI and Embedded Systems) |
| 6. | Computer Science and Engineering | M.Tech. (Computer Science and Engineering) |
| | | M.Tech. (Artificial Intelligence and Data Science) |
| 7. | Information Technology | M.Tech. (Information Technology) |
| 8. | Computer Applications | MCA |
| 9. | Mathematics | M.Sc. (Actuarial Science) |
| 10. | Physics | M.Sc.(Physics) |
| 11. | Chemistry | M.Sc.(Chemistry) |
| 12. | Life Sciences | M.Sc. Biochemistry & Molecular Biology |
| | | M.Sc. Biotechnology |
| | | M.Sc. Microbiology |
| | | M.Sc. Stem Cell Technology |
| | | M.Sc. Clinical Embryology |
| | | M.Tech. Biotechnology |
| | | M.Tech. Food Biotechnology |
| 13. | Commerce | M.Com |
| 14. | Arabic and Islamic Studies | M.A. Islamic Studies |

## 3.3 Eligible entry qualifications for admission to programmes

| Sl. No. | Programme | Eligibility for Admission in M.Tech. / MCA / M.Sc. / M.Com. / MA Programmes |
|---|---|---|
| 1. | M.Tech. (Avionics) | B.E. / B.Tech. in Aeronautical Engineering / Aerospace Engineering / Mechanical Engineering / Mechatronics / EEE / ECE / EIE / or Equivalent degree in relevant field. |
| 2. | M.Tech. (Structural Engineering) | B.E. / B.Tech. in Civil Engineering / Structural Engineering or Equivalent degree in relevant |

| Sl. No. | Programme | Eligibility for Admission in M.Tech. / MCA / M.Sc. / M.Com. / MA Programmes |
|---|---|---|
| | | field. |
| | M. Tech. (Construction Engineering and Project Management) | B.Tech. in Mechanical / Civil / Electrical and Electronics / Geo Informatics / B Plan / B. Des, and B.Arch. |
| 3. | M.Tech. (CAD/CAM) | B.E. / B.Tech. in Mechanical / Automobile / Manufacturing / Production / Industrial / Mechatronics / Metallurgy / Aerospace / Aeronautical / Material Science / Polymer / Plastics / Marine Engineering or Equivalent degree in relevant field. |
| 4. | M.Tech. (Power Systems Engineering) | B.E. / B.Tech. in EEE / ECE / EIE / ICE / Electronics / Instrumentation Engineering or Equivalent degree in relevant field. |
| 5. | M.Tech. (VLSI and Embedded Systems) | B.E. / B.Tech. in ECE / EIE / ICE / EEE / IT or Equivalent degree in relevant field. |
| 6. | M.Tech. (Computer Science and Engineering) | B.E. / B.Tech. in CSE / IT / ECE / EEE / EIE / ICE / Electronics Engineering / MCA or Equivalent degree in relevant field. |
| | M.Tech. (Artificial Intelligence and Data Science) | B.E. / B.Tech. in CSE / IT / ECE / EEE / EIE / ICE / Electronics Engineering / MCA or Equivalent degree in relevant field. |
| 7. | M.Tech. (Information Technology) | B.E. / B.Tech. in IT / CSE / ECE / EEE / EIE / ICE / Electronics Engineering / MCA or Equivalent degree in relevant field. |
| 8. | MCA | BCA / B.Sc. Computer Science / B.E. / B.Tech. / B.Sc. Mathematics, B.Sc. Physics / Chemistry / B.Com. / BBA / B.A. with Mathematics at graduation level or at 10 + 2level or equivalent degree in relevant field. |
| 9. | M.Sc. (Actuarial Science) | Any under graduate degree with Mathematics / Statistics as one of the subjects of study at 10 + 2 level. |
| 10. | M.Sc.(Physics) | B.Sc. in Physics / Applied Science / |

| Sl. No. | Programme | Eligibility for Admission in M.Tech. / MCA / M.Sc. / M.Com. / MA Programmes |
|---|---|---|
| | | Electronics /Electronics Science / Electronics & Instrumentation or Equivalent degree in relevant field. |
| 11. | M.Sc.(Chemistry) | B.Sc. in Chemistry / Applied Science or Equivalent degree in relevant field. |
| 12. | M.Sc. Biochemistry & Molecular Biology | B.Sc. in Biotechnology / Biochemistry / Botany / Zoology / Microbiology / Molecular Biology / Genetics or Equivalent degree in relevant field. |
| | M.Sc. Biotechnology | B.Sc. in Biotechnology / Biochemistry / Botany / Zoology / Microbiology / Molecular Biology / Genetics or Equivalent degree in relevant field. |
| | M.Sc. Microbiology | B.Sc.in Biotechnology / Biochemistry / Botany / Zoology / Microbiology / Molecular Biology / Genetics or Equivalent degree in relevant field. |
| | M.Sc. Stem Cell Technology | B.Sc.in Biotechnology / Biochemistry / Botany / Zoology / Microbiology / Molecular Biology / Genetics or Equivalent degree in relevant field. |
| | M.Sc. Clinical Embryology | B.Sc.in Biotechnology / Biochemistry / Botany / Zoology / Microbiology / Molecular Biology / Genetics or Equivalent degree in relevant field. |
| | M.Tech. Biotechnology | B.Tech. / B.E. in Biotechnology or Equivalent degree in relevant field. |
| | M.Tech. Food Biotechnology | B.E. / B.Tech. in Biotechnology / Food Biotechnology / Chemical Engineering / Biochemical Engineering / Industrial Biotechnology or Equivalent degree in relevant field. |
| 13. . | M.Com | B.Com. / BBA |

| Sl. No. | Programme | Eligibility for Admission in M.Tech. / MCA / M.Sc. / M.Com. / MA Programmes |
|---|---|---|
| 14. . | M.A. Islamic Studies | B.A. in Islamic Studies / Arabic (or) Afzal-ul-Ulama (or)<br>Any under graduate degree with Part 1 Arabic (or)<br>Any under graduate degree with Aalim Sanad / Diploma / Certificate in Arabic or Islamic Studies. |

## 4.0. STRUCTURE OF THE PROGRAMME

**4.1.** The PG. programmes consist of the following components as prescribed in the respective curriculum:

i. Core courses
ii. Elective courses
iii. Laboratory integrated theory courses
iv. Project work
v. Laboratory courses
vi. Open elective courses
vii. Seminar
viii. Mini Project
ix. Industry Internship
x. MOOC courses (NPTEL- Swayam, Coursera etc.)
xi. Value added courses

**4.1.1.** The curriculum and syllabi of all programmes shall be approved by the Academic Council of this Institution.

**4.1.2.** For the award of the degree, the student has to earn a minimum total credits specified in the curriculum of the respective specialization of the programme.

**4.1.3.** The curriculum of programmes shall be so designed that the minimum prescribed credits required for the award of the degree shall be within the limits specified below:

| Programme | Range of credits |
|---|---|
| M.Tech. | 80 - 86 |

| | |
|---|---|
| MCA | 80 - 86 |
| M.Sc. | 80 - 85 |
| M.Com. | 80 - 88 |
| M.A. | 80 - 84 |

**4.1.4.** Credits will be assigned to the courses for all programmes as given below:

- ❖ One credit for one lecture period per week or 15 periods of lecture per semester.
- ❖ One credit for one tutorial period per week or 15 periods per semester.
- ❖ One credit each for seminar/practical session/project of two or three periods per week or 30 periods per semester.
- ❖ One credit for 160 hours of industry internship per semester for all programmes (except M.Com.)
- ❖ Four credits for 160 hours of industry internship per semester for M.Com.

**4.1.5.** The number of credits the student shall enroll in a non-project semester and project semester is as specified below to facilitate implementation of Choice Based Credit System.

| Programme | Non-project semester | Project semester |
|---|---|---|
| M.Tech. | 9 to 32 | 18 to 26 |
| MCA | 9 to 32 | 18 to 26 |
| M.Sc. | 9 to 32 | 10 to 26 |
| M.Com. | 9 to 32 | 16 to 28 |
| M.A. | 9 to 32 | NA |

**4.1.6** The student may choose a course prescribed in the curriculum from any department offering that course without affecting regular class schedule. The attendance will be maintained course wise only.

**4.1.7** The students shall choose the electives from the curriculum with the approval of the Head of the Department / Dean of School.

**4.1.8** Apart from the various elective courses listed in the curriculum for each specialization of programme, the student can choose a maximum of two electives from any other similar programmes across departments, alter to open electives, during the entire period of study, with approval of Head of the department offering the course and parent department.

**4.1.9. Online courses**

Students are permitted to undergo department approved online courses under SWAYAM up to 40% of credits of courses in a semester excluding project semester (in case of M.Tech. M.Sc. & MCA programmes) with the recommendation of the Head of the Department / Dean of School and with the prior approval of Dean Academic Affairs during his/ her period of study. The credits earned through online courses shall be transferred following the due approval procedures. The online courses can be considered in lieu of core courses and elective courses.

Students shall undergo project related online course on their own with the mentoring of the project supervisor.

**3.5 Project work**

**3.5.1** Project work shall be carried out by the student under the supervision of a faculty member in the department with similar specialization.

**3.5.2** A student may however, in certain cases, be permitted to work for the project in an Industry / Research organization, with the approval of the Head of the Department/ Dean of School. In such cases, the project work shall be jointly supervised by a faculty of the Department and an Engineer / Scientist / Competent authority from the organization and the student shall be instructed to meet the faculty periodically and to attend the review meetings for evaluating the progress.

**3.5.3** The timeline for submission of final project report / dissertation is within 30 calendar days from the last instructional day of the semester in which project is done.

**3.5.4** If a student does not comply with the submission of project report / dissertation on or before the specified timeline he / she is deemed to have not completed the project work and shall re-register in the subsequent semester.

## 5.0 DURATION OF THE PROGRAMME

**5.1**. The minimum and maximum period for completion of the programmes are given below:

| Programme | Min. No. of Semesters | Max. No. of Semesters |
|---|---|---|

| | | |
|---|---|---|
| M.Tech. | 4 | 8 |
| MCA | 4 | 8 |
| M.Sc. | 4 | 8 |
| M.Com. | 4 | 8 |
| M.A. | 4 | 8 |

**5.2** Each academic semester shall normally comprise of 90 working days. Semester end examinations shall follow within 10 days of the last Instructional day.

**5.3** Medium of instruction, examinations and project report shall be in English.

## 6.0 REGISTRATION AND ENROLLMENT

**6.1** The students of first semester shall register and enroll at the time of admission by paying the prescribed fees. For the subsequent semesters registration for the courses shall be done by the student one week before the last working day of the previous semester.

**6.2 Change of a Elective Course**

A student can change an enrolled elective course within 10 working days from the commencement of the course, with the approval of the Dean (Academic Affairs), on the recommendation of the Head of the Department of the student.

**6.3 Withdrawal from a Course**

A student can withdraw from an enrolled course at any time before the first continuous assessment test for genuine reasons, with the approval of the Dean (Academic Affairs), on the recommendation of the Head of the Department of the student.

**6.4** A student can enroll for a maximum of 36 credits during a semester including Redo / Predo courses.

## 7.0 BREAK OF STUDY FROM PROGRAMME

**7.1** A student may be allowed / enforced to take a break of study for two semesters from the programme with the approval of Dean (Academic Affairs) for the following reasons:

7.1.1 Medical or other valid grounds

7.1.2 Award of 'I' grade in all the courses in a semester due to lack of attendance

7.1.3 Debarred due to any act of indiscipline

**7.2** The total duration for completion of the programme shall not exceed the prescribed maximum number of semesters (vide clause 3.1).

**7.3** A student who has availed a break of study in the current semester (odd/even) can rejoin only in the subsequent corresponding (odd/even) semester in the next academic year on approval from the Dean (Academic affairs).

**7.4** During the break of study, the student shall not be allowed to attend any regular classes or participate in any activities of the Institution. However, he / she shall be permitted to enroll for the 'I' grade courses and appear for the arrear examinations.

## 8.0 CLASS ADVISOR AND FACULTY ADVISOR

### 8.1 CLASS ADVISOR

A faculty member shall be nominated by the HOD/ Dean of School as Class Advisor for the class throughout their period of study.

The class advisor shall be responsible for maintaining the academic, curricular and co-curricular records of students of the class throughout their period of study.

### 8.2 FACULTY ADVISOR

To help the students in planning their courses of study and for general counseling, the Head of the Department / Dean of School of the students shall attach a maximum of 20 students to a faculty member of the department who shall function as faculty advisor for the students throughout their period of study. Such faculty advisor shall guide the students in taking up the elective courses for registration and enrolment in every semester and also offer advice to the students on academic and related personal matters.

## 9.0 COURSE COMMITTEE

**9.1** Each common theory / laboratory course offered to more than one group of students shall have a "Course Committee" comprising all the teachers

handling the common course with one of them nominated as course coordinator. The nomination of the course coordinator shall be made by the Head of the Department / Dean (Academic Affairs) depending upon whether all the teachers handling the common course belong to a single department or from several departments. The Course Committee shall meet as often as possible to prepare a common question paper, scheme of evaluation and ensure uniform evaluation of the assessment tests and semester end examination.

## 10.0 CLASS COMMITTEE

**10.1** A class committee comprising faculty members handling the courses, student representatives and a senior faculty member not handling any courses for that class as chairman will be constituted in every semester:

**10.2** The composition of the class committee will be as follows:

i) One senior faculty member preferably not handling courses for the concerned semester, appointed as chairman by the Head of the Department
ii) Faculty members of all courses of the semester
iii) All the students of the class
iv) Faculty advisor and class advisor
v) Head of the Department – Ex officio member

**10.3** The class committee shall meet at least three times during the semester. The first meeting shall be held within two weeks from the date of commencement of classes, in which the nature of continuous assessment for various courses and the weightages for each component of assessment shall be decided for the first and second assessment. The second meeting shall be held within a week after the date of first assessment report, to review the students' performance and for follow up action.

**10.4** During these two meetings the student members, shall meaningfully interact and express opinions and suggestions to improve the effectiveness of the teaching-learning process, curriculum and syllabi of courses.

**10.5** The third meeting of the class committee, excluding the student members,

shall meet within 5 days from the last day of the semester end examination to analyze the performance of the students in all the components of assessments and decide their grades in each course. The grades for a common course shall be decided by the concerned course committee and shall be presented to the class committee(s) by the concerned course coordinator.

## 11.0 CREDIT REQUIREMENTS TO REGISTER FOR PROJECT WORK

**11.1** A student is permitted to register for project semester, if he/she has earned the minimum number of credits specified below:

| Programme | Minimum no. of credits to be earned to enroll for project semester |
|---|---|
| M.Tech. | 18 |
| MCA | 22 |
| M.Sc. | 18 |
| M.Com | NA |
| M.A. | NA |

**11.2** If the student has not earned minimum number of credits specified, he/she has to earn the required credits, at least to the extent of minimum credits specified in clause 9.1 and then register for the project semester.

## 12.0 ASSESSMENT PROCEDURE AND PERCENTAGE WEIGHTAGE OF MARKS

**12.1** Every theory course shall have a total of three assessments during a semester as given below:

| Assessments | Weightage of Marks |
|---|---|
| Continuous Assessment 1 | 25% |
| Continuous Assessment 2 | 25% |
| Semester End Examination | 50% |

**12.2 Theory Course**

Appearing for semester end theory examination for each course is mandatory and a student shall secure a minimum of 40% marks in each course in semester end examination for the successful completion of the course.

### 12.3 Laboratory Course

Every practical course shall have 75% weightage for continuous assessments and 25% for semester end examination. However, a student shall have secured a minimum of 50% marks in the semester end practical examination for the award of pass grade.

### 12.4 Laboratory Integrated Theory (LIT) Courses

For laboratory integrated theory courses, the theory and practical components shall be assessed separately for 100 marks each and consolidated by assigning a weightage of 75% for theory component and 25% for practical component (for a 4 credit LIT Course). Grading shall be done for this consolidated mark. Assessment of theory components shall have a total of three assessments with two continuous assessments carrying 25% weightage each and semester end examination carrying 50% weightage. The student shall secure a separate minimum of 40% in the semester end theory examination. The evaluation of practical components shall be through continuous assessment.

| Component | Maximum Marks | Weightage for Final Grade | Mode of Assessment |
|---|---|---|---|
| Theory Component | 100 | 75% | CAT1 (25%) + CAT2 (25%) + SEE (50%) |
| Practical Component | 100 | 25% | Continuous assessment only |
| Final Grade Basis | Consolidated | 100% | 75% Theory + 25% Practical |
| Pass Requirement | - | - | Minimum 40% in Semester-End Theory Exam (SEE) |

Note:

1. Proportionate weightage shall be assigned to LIT courses based on their

credit value, whether 2 or 3 credits.

2. In Lab-Integrated Professional Elective courses, the laboratory component shall be assessed by the course faculty.

**12.5** The components of continuous assessment for theory/practical/laboratory integrated theory courses shall be finalized in the first class committee meeting.

**12.6 Industry Internship**

In the case of industry internship, the student shall submit a report, which shall be evaluated along with an oral examination by a committee of faculty members constituted by the Head of the Department. The student shall also submit an internship completion certificate issued by the industry / research / academic organisation. The weightage of marks for industry internship report and viva voce examination shall be 60% and 40% respectively.

**12.7 Project Work**

**Mini project work**, shall be carried out individually or as a group activity involving a maximum of three students.

Each group shall identify a suitable topic within their domain, either disciplinary or interdisciplinary, based on the students' abilities and in consultation with the faculty mentor. The topic must lead to the development of a small-scale system or application.

The progress of the mini project shall be evaluated through three periodic reviews: two interim reviews and one final review. A project report shall be submitted by the end of the semester. The reviews shall be conducted by a committee of faculty members constituted by the Head of the Department / Dean of the School.

An oral examination (viva voce) shall be conducted as the semester-end examination by an internal examiner approved by the Controller of Examinations, based on the project report.

The weightage for assessment shall be as follows:

• Periodic Reviews: 50%

- 25% by the Project Guide
- 25% by the Review Committee

• Project Report: 20%

• Viva Voce Examination: 30%

**The Project** shall be carried out individually or as a group activity, involving a maximum of two or three students.

A committee of faculty members, constituted by the Head of the Department / Dean of the School, shall conduct three periodic reviews during the semester to monitor and assess the progress of the project.

At the end of the semester, students shall submit a project report, based on which a semester-end oral examination (viva voce) shall be conducted by an external examiner approved by the Controller of Examinations.

The assessment weightage shall be as follows:

• Periodic Reviews – 50%

- 25% by the Project Guide
- 25% by the Review Committee

• Project Report – 20%

• Viva Voce Examination – 30%

**12.8** The assessment of seminar course including its component and its weightage shall be decided by a committee of faculty members constituted by the Head of the Department. This committee shall ensure the conduct of assessment of components and award marks accordingly.

**12.9 For the first attempt of the arrear theory examination**, the internal assessment marks scored for a course during first appearance shall be used for grading along with the marks scored in the arrear examination. From the subsequent appearance onwards, full weightage shall be assigned to the marks scored in the semester end examination and the internal assessment marks secured during the course of study shall become invalid.

**In case of laboratory integrated theory courses**, after one regular and one arrear appearance, the internal mark of theory component is invalid and full weightage shall be assigned to the marks scored in the semester end examination for theory component. **There shall be no arrear or improvement examination for lab components**.

## 13.0 SUBSTITUTE EXAMINATIONS

**13.1** A student who is absent, for genuine reasons, may be permitted to write a substitute examination for any one of the two continuous assessment tests

of a course by paying the prescribed substitute examination fee. However, permission to take up a substitute examination will be given under exceptional circumstances, such as accidents, admission to a hospital due to illness, etc. by a committee constituted by the Head of the Department / Dean of School for that purpose. However, there is no substitute examination for semester end examination.

**13.2** A student shall apply for substitute exam in the prescribed form to the Head of the Department / Dean of School within a week from the date of assessment test. However, the substitute examination will be conducted only after the last working day of the semester and before the semester end examination.

## 14.0 ATTENDANCE REQUIREMENT AND SEMESTER / COURSE REPETITION

**14.1** A student shall earn 100% attendance in the scheduled contact hours (such as lectures, tutorials, labs, etc.) for that course. However, a relaxation of up to 25% in attendance may be granted to account for valid reasons such as medical emergencies, participation in co-curricular or extracurricular activities with prior approval, or other genuine circumstances.

If a student's attendance falls below 75% in a particular course, even after considering the permissible relaxation, they will not be allowed to appear for the semester-end examination in that course. Instead, the student will be awarded an “I” grade (Incomplete) for the course

**14.2** The faculty member of each course shall cumulate the attendance details for the semester and furnish the names of the students who have not earned the required attendance in the concerned course to the class advisor. The class advisor shall consolidate and furnish the list of students who have earned less than 75% attendance, in various courses, to the Dean (Academic Affairs) through the Head of the Department / Dean of the School. Thereupon, the Dean (Academic Affairs) shall officially notify the names of such students prevented from writing the semester end examination in each course.

**14.3** If a student’s attendance in any course falls between 65% and 75% due to medical reasons (e.g., hospitalization, illness) or participation in institution-

approved events, they may be granted exemption from the minimum attendance requirement and allowed to appear for the semester-end exam. The student must submit valid documents to the class advisor upon rejoining, with approval from the HoD/Dean. Final approval for **condonation** will be granted by the Vice Chancellor based on the Dean (Academic Affairs)'s recommendation.

**14.4** A student who has obtained an "I" grade in all the courses in a semester is not permitted to move to the next higher semester. Such students shall **repeat** all the courses of the semester in the subsequent academic year. However, he / she is permitted to redo the courses awarded with 'I' grade / arrear in previous semesters. They shall also be permitted to write arrear examinations by paying the prescribed fee.

**14.5** The student awarded "I" grade, shall enroll and repeat the course when it is offered next. In case of "I" grade in an elective course either the same elective course may be repeated or a new elective course may be taken with the approval of the Head of the Department / Dean of the School.

**14.6** A student who is awarded "U" grade in a course shall have the option to either write the semester end arrear examination at the end of the subsequent semesters, or to **redo** the course when the course is offered by the department. Marks scored in the continuous assessment in the redo course shall be considered for grading along with the marks scored in the semester end (redo) examination. If any student obtains "U" grade in the redo course, the marks scored in the continuous assessment test (redo) for that course shall be considered as internal mark for further appearance of arrear examination.

**14.7** If a student with "U" grade, who **prefers to redo** any particular course, fails to earn the minimum 75% attendance while doing that course, then he / she is not permitted to write the semester end examination and his / her earlier "U" grade and continuous assessment marks shall continue.

## 15.0 REDO / PRE-DO COURSES

**15.1** A student can register for a maximum of three redo courses per semester without affecting the regular semester classes, whenever such courses are offered by the concerned department, based on the availability of

faculty members and subject to a specified minimum number of students registering for each of such courses.

**15.2** The number of contact hours and the assessment procedure for any redo course shall be the same as regular courses, except there is **no provision for any substitute examination and withdrawal from a redo course**.

**15.3** A student shall be permitted to pre-do a course offered by the concerned department, provided it does not affect the regular semester class schedule. Such permission shall be granted based on the availability of faculty members, the maximum permissible credit limit of the semester, and the student's fulfillment of the necessary prerequisites for the course. The proposal shall be recommended by the Dean of the School and the Head of the Department, and shall require final approval from the Dean (Academic Affairs).

## 16.0 PASSING AND DECLARATION OF RESULTS AND GRADE SHEET

**16.1** All assessments of a course shall be made on absolute marks basis. The class committee without the student members shall meet to analyse the performance of students in all assessments of a course and award letter grades following the relative grading system. The letter grades and the corresponding grade points are as follows:

| Letter Grade | Grade Points |
|---|---|
| S | 10 |
| A | 9 |
| B | 8 |
| C | 7 |
| D | 6 |
| E | 5 |
| U | 0 |
| W | - |
| I | - |
| PA | - |
| FA | - |

**"W"-** denotes withdrawal from the course

**"I" -** denotes "Incomplete" ie. inadequate attendance in the course and prevention from appearance of semester end examination

**"U" -** denotes unsuccessful performance in the course.

**"PA" -** denotes the 'Pass' of the zero credit courses.

**"FA" -** denotes the 'Fail' of the zero credit courses.

**16.2** A student who earns a minimum of five grade points ('E' grade) in a course is declared to have successfully completed the course. Such a course cannot be **repeated by the student for improvement of grade**.

**16.3** Upon awarding grades, the results shall be endorsed by the chairman of the class committee and Head of the Department / Dean of the School. The Controller of Examinations shall further approve and declare the results.

**16.4** **Within one week** from the date of declaration of result, a student can apply for revaluation of his / her semester end theory examination answer scripts of one or more courses, on payment of prescribed fee, through proper application to the Controller of Examinations. Subsequently, the Head of the Department / Dean of the School offered the course shall constitute a revaluation committee consisting of chairman of the class committee as convener, the faculty member of the course and a senior faculty member having expertise in that course as members. The committee shall meet within a week to revalue the answer scripts and submit its report to the Controller of Examinations for consideration and decision.

**16.5** After results are declared, grade sheets shall be issued to each student, which contains the following details: a) list of courses enrolled during the semester including redo courses / arrear courses, if any; b) grades scored; c) Grade Point Average (GPA) for the semester and d) Cumulative Grade Point Average (CGPA) of all courses enrolled from the first semester onwards.

GPA is the ratio of the sum of the products of the number of credits of courses registered and the grade points corresponding to the grades scored in those courses, taken for all the courses, to the sum of the

number of credits of all the courses in the semester.

If $C_i$, is the number of credits assigned for the $i^{th}$ course and $GP_i$ is the

$$GPA = \frac{\sum_{i=1}^{n}(C_i)(GPi)}{\sum_{i=1}^{n} C_i}$$

Grade Point in the $i^{th}$ course,

Where n = number of courses

The Cumulative Grade Point Average (CGPA) is calculated in a similar manner, considering all the courses enrolled from first semester.

**"I", "W", "PA"** and **"FA"** grades are excluded for calculating GPA.

**"U", "I", "W", "PA"** and **"FA"** grades are excluded for calculating CGPA.

The formula for the conversion of CGPA to equivalent percentage of marks shall be as follows:

Percentage equivalent of marks = CGPA X 10

**16.6** After successful completion of the programme, the degree shall be awarded to the students with the following classifications based on CGPA.

| Classification | CGPA |
|---|---|
| First Class with Distinction | 8.50 and above and passing all the courses in first appearance and completing the programme within the prescribed period of 8 semesters for all students (except lateral entry students) and 6 semesters for lateral entry students |
| First Class | 6.50 and above and completing the programme within a maximum of 10 semesters for all students (except lateral entry students) and 8 semesters for lateral entry students |
| Second Class | Others |

**16.6.1 Eligibility for First Class with Distinction**

- A student should not have obtained 'U' or 'I' grade in any course during his/her study

- A student should have completed the UG programme within the minimum prescribed period of study (except clause 7.1.1)

**16.6.2 Eligibility for First Class**

- A student should have passed the examination in all the courses not more than two semesters beyond the minimum prescribed period of study (except clause 7.1.1)

**16.6.3** The students who do not satisfy clause 16.6.1 and clause 16.6.2 shall be classified as second class.

**16.6.4** The CGPA shall be rounded to two decimal places for the purpose of classification. The CGPA shall be considered up to three decimal places for the purpose of comparison of performance of students and ranking.

## 17.0 SUPPLEMENTARY EXAMINATION

**Final year students and passed out students** can apply for supplementary examination for a maximum of **three** courses thus providing an opportunity to complete their degree programme. Likewise, students with less credit can also apply for supplementary examination for a maximum of **three** courses to enable them to earn minimum credits to move to higher semester. The students can apply for supplementary examination within three weeks of the declaration of results in both odd and even semesters.

## 18.0 DISCIPLINE

**18.1** Every student is expected to observe discipline and decorum both inside and outside the campus and not to indulge in any activity which tends to affect the reputation of the Institution.

**18.2** Any act of indiscipline of a student, reported to the Dean (Student Affairs), through the Head of the Department / Dean of the School concerned shall be referred to a Discipline and Welfare Committee constituted by the Registrar for taking appropriate action.

## 19.0 MULTI ENTRY AND MULTI EXIT (MEME) FRAMEWORK *

In accordance with the provisions of the National Education Policy (NEP) 2020, the programme shall support a Multi Entry – Multi Exit (ME-ME)

framework to provide flexibility in the academic pathway of students.

*** At present (AY 2025-26), it is applicable only for all M.Tech. Programmes.**

### 19.1. Exit Option:

#### 19.1.1 Credit Requirement for Award of M.Tech. Degree

To qualify for the award of a M.Tech. degree from the Institute, a student must successfully complete the total credit requirements as prescribed in the approved curriculum of the respective programme. The specific credit requirements are determined by the programme curriculum.

#### 19.1.2 Provision for Multiple Exit

In alignment with NEP 2020 guidelines, the Institute provides students enrolled in postgraduate programmes with the option of multiple exits, subject to the following conditions:

a. Exit at the End of First Year

Students may choose to exit the programme at the end of the first year, provided they have fulfilled the prescribed academic requirements.

b. Application for Exit

A student intending to exit must submit a formal written application in the prescribed format at least **eight weeks prior to the scheduled end of the academic year.**

c. Departmental Recommendation

1. Upon receipt of the application, the concerned Department shall evaluate the academic record of the student and recommend the award of a **Post Graduate Diploma**, based on the credits earned.

2. In the case of arrear courses, the post graduate diploma will be conferred only after successful clearance of all pending arrears.

d. Notification of Completion

Once a student has fulfilled the requirements for the award of post graduate diploma, the Department shall notify the same to controller of examinations for further processing and issuance.

#### 19.1.3 Award of Qualifications under Multiple Exit Scheme

Post graduate diploma: Awarded after successful completion of the first year, subject to earning the prescribed cumulative credits as per the

respective programme curriculum (e.g., 44 credits from the first year) along with 3 credits of Skill Based Courses.

**19.1.4 Conditions Governing Exit**

1. The multiple exit facility is intended strictly for **genuine and exceptional circumstances,** such as prolonged illness, or securing an employment opportunity necessitating a temporary withdrawal from the programme.

2. Students opting for a temporary exit after the first year must obtain **prior approval from the Registrar through Dean (Academics),** based on the recommendation of the respective Head of the Department.

**19.1.5 Expectation of Programme Continuity**

While the option for multiple exits exists, it is generally expected that students admitted to a post graduate programme shall pursue their studies continuously until completion of the final degree requirements.

**19.2. Entry Option:**

Students seeking re-entry into the programme (multi-entry) must submit an application through the proper channel at the beginning of the odd semester. Admission shall be subject to fulfilment of institutional guidelines, credit mapping, and availability of seats.

**19.3. Credits Requirement for the Certifications**

| Name of the Certificate Programme | Required Credits |
|---|---|
| Post graduate Diploma<br>(Level 6.5 as per NEP 2020) | 40* - 45 |

* The minimum number of credits that a student must earn (as per the respective curriculum) in order to get the above certification program

## 20.0 ELIGIBILITY FOR THE AWARD OF THE MASTER'S DEGREE

**20.1** A student shall be declared to be eligible for the award of the Master's Degree, if he/she has:

i. Successfully acquired the required credits as specified in the curriculum corresponding to his/her programme within the maximum period of 8 semesters from the date of admission, including break of study.

ii. No disciplinary action is pending against him/her.

iii. Enrolled and completed at least one value added course.

iv. Enrollment in at least one MOOC / SWAYAM course (non-credit) before the final semester.

**20.2** The award of the degree must have been approved by the Institute.

## 21.0 POWER TO MODIFY

Notwithstanding all that have been stated above, the Academic Council has the right to modify any of the above regulations from time to time.

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**B.S. ABDUR RAHMAN CRESCENT INSTITUTE OF SCIENCE AND TECHNOLOGY**

**REGULATIONS 2025**

**CURRICULUM & SYLLABI FOR**

**M.SC. ACTUARIAL SCIENCE**

**SEMESTER I**

| Sl. No. | Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|---|
| 1. | MAF 6101 | Fundamentals of Financial Mathematics | 3 | 1 | 0 | 4 |
| 2. | MAF 6102 | Probability and Distributions | 3 | 1 | 0 | 4 |
| 3. | MAF 6103 | Business Economics | 3 | 1 | 0 | 4 |
| 4. | MAF 6104 | Financial Reporting and Accounting | 3 | 1 | 0 | 4 |
| 5. | MAF 6105 | Principles of Insurance | 2 | 0 | 0 | 2 |
| 6. | MAF 6106 | Mathematical Statistics | 3 | 1 | 0 | 4 |
| 7. | MAF 6107 | Actuarial Computational Laboratory (MS – Excel) | 0 | 0 | 4 | 2 |
| | | **Credits** | | | | **24** |

**SEMESTER II**

| Sl. No. | Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|---|
| 1. | MAF 6201 | Applications of Financial Mathematics | 3 | 1 | 0 | 4 |
| 2. | MAF 6202 | Fundamentals of Life Contingencies | 3 | 1 | 0 | 4 |
| 3. | MAF 6203 | Descriptive Statistical Methods in Actuarial Science | 3 | 1 | 0 | 4 |
| 4. | MAF 6204 | Stochastic Models | 2 | 1 | 0 | 3 |
| 5. | MAF 6205 | R – Programming | 0 | 0 | 4 | 2 |
| 6. | GEF 6202 | Research Methodology and IPR | 3 | 1 | 0 | 4 |
| 7. | ENF 6281 | Professional Communication | 0 | 0 | 2 | 1 |
| 8. | MAF 6206 | Mini Project | 0 | 0 | 6 | 3 |
| 9. | ---- | Value Added Course | - | - | - | - |
| | | **Credits** | | | | **25** |

**SEMESTER III**

| Sl. No. | Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|---|
| 1. | MAF 7101 | Applications of Life Contingencies | 3 | 1 | 0 | 4 |
| 2. | MAF 7102 | Financial Economics | 3 | 1 | 0 | 4 |
| 3. | MAF 7103 | Applied Statistical Methods in Actuarial Science | 3 | 1 | 0 | 4 |
| 4. | MAF 7104 | Survival Models | 3 | 1 | 0 | 4 |
| 5. | MAF 7105 | Actuarial Computational Laboratory (Python) | 0 | 0 | 4 | 2 |
| 6. | | Elective – I | 3 | 0 | 0 | 3 |
| 7. | | Elective – II | 3 | 0 | 0 | 3 |
| 8. | MAF 7201 | Project Phase – I | 0 | 0 | 8 | 4* |
| 9. | MAF 7106 | Industry Internship | 0 | 0 | 4 | 2 |
| | | MOOC Course | | | | - |
| | | **Credits** | | | | **26** |

**SEMESTER IV**

| Sl. No. | Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|---|
| 1. | MAF 7201 | Project Phase – II | 0 | 0 | 24 | 8 |
| | | **Credits** | | | | **(4+8=12)** |

**Overall Total Credits – 87**

# Industrial training will be undertaken during first year summer vacation for 30 days. The credit will be awarded in the 3rd Semester.

* Credits for Project Work Phase – I to be accounted along with Project Work Phase – II in IV Semester.

## LIST OF ELECTIVES

### Elective – I

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| MAFY 01 | Financial Management of Life Office | 3 | 0 | 0 | 3 |
| MAFY 02 | Islamic Investments | 3 | 0 | 0 | 3 |
| MAFY 03 | Corporate Finance | 3 | 0 | 0 | 3 |
| MAFY 04 | Mortality projection & Machine Learning | 3 | 0 | 0 | 3 |

### Elective – II

| Course Code | Course Title | L | T | P | C |
|---|---|---|---|---|---|
| MAFY 05 | Financial Markets | 3 | 0 | 0 | 3 |
| MAFY 06 | Islamic Asset and Fund Management | 3 | 0 | 0 | 3 |
| MAFY 07 | Portfolio and Credit Risk Management | 3 | 0 | 0 | 3 |

**SEMESTER I**

| | | | | | |
|---|---|---|---|---|---|
| **MAF 6101** | **FUNDAMENTALS OF FINANCIAL** | **L** | **T** | **P** | **C** |
| **SDG 4** | **MATHEMATICS** | **3** | **1** | **0** | **4** |

**COURSE OBJECTIVES:**

- **COB1:** To familiarize students with the cash flow models.
- **COB2:** To understand and differentiate between various types of interest rates used in financial applications.
- **COB3:** To explain the different types of level annuity contracts and their practical relevance.
- **COB4:** To enable to evaluate various types of variable annuity contracts.
- **COB5:** To prepare and analyse loan schedules based on different repayment structures.

**MODULE I CASH FLOW MODEL 9+3**

Cash flow model – Cash flow process, outflows – Cash flow model for a zero-coupon bond – Time value of money – Simple and Compound interest problems – Present value and simple discount – Investing over a period.

**MODULE II INTEREST RATES 9+3**

Interest rates – Nominal and Effective rate of interest – Accumulation factors – Principle of consistency – The force of interest – Present values – The basic compound interest functions – Interest payable monthly – Real and money interest rates.

**MODULE III LEVEL ANNUITIES 9+3**

Level annuities – Present values and Accumulations – Payments made in arrear – Payments made in advance – Continuously payable annuities – Annuities payable monthly – Non-integer values – Perpetuities.

**MODULE IV VARIABLE NNUITY CONTRACT 9+3**

Deferred and increasing annuities – Deferred annuities – Varying annuities – Decreasing payments – Irregular payments – Sudden changes in interest rates – Simple and Compound increasing annuities.

**MODULE V LOAN SCHEDULES 9+3**

Equations of value – Uncertain payment or receipt – Loan schedules- Calculation of capital outstanding – Calculation of interest and capital elements – Installments payable more frequently than annually – Consumer credit – Flat rates and APRs.

**L – 45; T – 15; TOTAL – 60**

**REFERENCES:**


1. Mark S. Joshi, “The concepts and practice of Mathematical Finance”, Cambridge University Press, 2nd Edition (2008).
2. Paul Wilmott, Sam Howison, and Jeff Dewynne, “The Mathematics of Financial derivatives”, Cambridge University press, 1995.
3. S.M. Ross “An Introduction to Mathematical finance”, Cambridge University Press.
4. J J McCutcheon and Dr W F Scott, “An Introduction to the Mathematics of Finance”, Heinemann, 1986.
5. Bowers, Newton L et al. “Actuarial mathematics”, 2nd Edition, Society of Actuaries, 1997.
6. Butcher, M V; Nesbitt, Cecil J. “Mathematics of compound interest”, Ulrich's Books, 1971.


**COURSE OUTCOMES:**

**CO1:** describe financial transactions using generalized cash-flow models.

**CO2:** express time value through compounding, discounting.

**CO3:** show how interest rates or discount rates may be expressed in terms of different time periods.

**CO4:** Calculate present, accumulated values with interest rates, inflation adjustments.

**CO5:** illustrate how a loan may be repaid by regular instalments of interest and capital.

| **Board of Studies (BOS):** | **Academic Council:** |
|---|---|
| 17th BOS of Department of Mathematics and Actuarial Science held on 23.06.2025. | 24th ACM held on 26.08.2025 |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| **CO1** | - | - | L | - | - | - | - |
| **CO2** | - | L | - | - | - | M | - |
| **CO3** | - | - | - | - | - | - | - |
| **CO4** | - | - | - | M | | - | - |
| **CO5** | H | - | - | - | M | - | - |

*** Legend: L – Low (1), M – Medium (2), H – High (3).**

**SDG 4:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

This course covers basic financial mathematics: interest calculations, accumulated value, present value, and loan computations.

| MAF 6102 | PROBABILITY AND DISTRIBUTIONS | L | T | P | C |
|---|---|---|---|---|---|
| SDG: 4 | | 3 | 1 | 0 | 4 |

**COURSE OBJECTIVES:**

- **COB1:** To introduce the fundamental concepts of probability theory.
- **COB2:** To familiarize with discrete probability distributions and their applications.
- **COB3:** To enlighten with continuous probability distributions and their characteristics.
- **COB4:** To acquaint with the concepts and properties of two-dimensional random variables.
- **COB5:** To understand conditional expectation and the law of large numbers.

**MODULE I BASIC PROBABILITY 9+3**

Basics of probability – The addition and multiplication rule – Conditional probability and total probability – Baye's theorem – Random variables – Expectation of a random variable – Continuous random variable – Functions of random variable.

**MODULE II DISCRETE PROBABILITY DISTRIBUTIONS 9+3**

Discrete distributions – Uniform, Bernoulli, Binomial, Geometric, Negative binomial, Hypergeometric and Poisson distribution – Probability generating functions – Moment generating functions – Cumulant generating functions.

**MODULE III CONTINUOUS PROBABILITY DISTRIBUTIONS 9+3**

Continuous distributions – Uniform, Gamma, exponential, chi-square, Beta, Normal distribution, Lognormal distribution, t-distribution, F-distribution – Deriving the Poisson process, Random number simulation – Moment generating functions, Cumulant generating functions.

**MODULE IV JOINT DISTRIBUTIONS 9+3**

Joint distributions – Expectations of functions of two variables – Convolutions – Using generating functions to derive distributions of linear combinations of independent random variables.

**MODULE V** **CONDITIONAL EXPECTATION AND LAW OF LARGE NUMBERS** **9+3**

Conditional expectation and Conditional variance - Compound distributions – Functions of vector random variables – Weak and strong law of large numbers - Central Limit Theorems - Normal approximations – The continuity correction.

**L – 45; T – 15; TOTAL – 60**

**REFERENCES:**


1. Miller I, Miller M, [Freund J. E.], “Mathematical statistics”, 7th Edition, Prentice Hall International, 1999.
2. S.C Gupta, V.K Kapoor, “Fundamentals of mathematical statistics”, Sultan Chand and Sons, New Delhi.
3. Dekking, F.M. Kraaikamp, C., LopuhaH.P., Meester, L.E, “A Modern Introduction to Probability and Statistics”, Springer text series, 2nd Edition.
4. Chin Long Chiang, “Statistical Methods of Analysis”, World Scientific Books, 2003.


**COURSE OUTCOMES:** On completion of the course the students will be able to

**CO1:** summarize the main features of a data set (exploratory data analysis).

**CO2:** explain the concepts of probability.

**CO3:** explain probability distributions, expected value, variance, higher moments.

**CO4:** enumerate independence, joint distributions and generating functions.

**CO5:** state the central limit theorem, and apply it.

**Board Of Studies (BOS):**

17th BOS of Department of Mathematics and Actuarial Science held on 23.06.2025.

**Academic Council:**

24th ACM held on 26.08.2025

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | - | - | L | - | - | - | - |
| CO2 | - | L | - | - | - | M | - |
| CO3 | - | - | - | | | - | - |
| CO4 | - | - | - | M | | - | - |
| CO5 | H | - | - | | M | - | - |

*** Legend: L – Low (1), M – Medium (2), H – High (3).**

**SDG 4:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

This subject covers basic probability, random variables, distributions, and joint distributions relevant to actuarial work.

| MAF 6103 | BUSINESS ECONOMICS | L | T | P | C |
|---|---|---|---|---|---|
| SDG: 4 | | 3 | 1 | 0 | 4 |

**COURSE OBJECTIVE:**

- **COB1:** To introduce different types of economic systems and the basic concepts of demand and supply.
- **COB2:** To make familiar with real-world perfect competition, monopoly.
- **COB3:** To understand how products are marketed and the role of advertising.
- **COB4:** To know market failures, government roles, trade mechanics.
- **COB5:** To understand overall economic environment of a country.

**MODULE I ECONOMIC CONCEPTS, SUPPLY AND DEMAND 8+3**

Economic concepts and systems – Different economic systems – Main strands of economic thinking – Demand – Supply – Price and output determination – Price elasticity of demand – The time dimension – The control of prices – Indirect taxes and subsidies – Marginal utility theory – Indifference analysis – Demand under conditions of risk and uncertainty – Behavioural economics –The short-run and long – run theory of production and Costs Revenue – Profit maximization.

**MODULE II MONOPOLY AND OLIGOPOLY 8+3**

Production and costs – Revenue and profit maximization – Perfect competition and monopoly – Comparing monopoly with perfect competition –Contestable markets – Imperfect competition – Monopolistic competition- Oligopoly – Collusive oligopoly – Non-collusive oligopoly.

**MODULE III PRODUCTS, MARKETING AND ADVERTISING 8+3**

Products, marketing, and advertising – Growth strategy and globalization – Growth and profitability – Constraints on growth – Alternative growth strategies – Internal and External growth – Globalization – Pricing strategies – Pricing and market structure – Price discrimination – Multiple product pricing.

**MODULE IV GOVERNMENT INTERVENTION & INTERNATIONAL TRADE 12+3**

Government intervention in markets –Objectives – Types of market failure – Types of government intervention – Government and the firm – Competition policy –

Policies towards R&D – Supply-side policy – Market-orientation – Industrial policy – International trade – Trading patterns – advantages – The world trading system and the WTO – Balance of payments and exchange rates – The balance of payments account – Fixed versus floating exchange rates – Business activity, unemployment and Inflation – Keynesian model – The "disappearance" of the Phillips curve – Business cycles.

**MODULE V THE MACROECONOMIC ENVIRONMENT 9+3**

The macroeconomic environment –Objectives – The circular flow of income – The measurement and determination of national income – Economic growth – The Aggregate Demand and Aggregate Supply model money and interest rates – The financial system – The supply and demand of money – Equilibrium in the money market – The effect of a change in the money supply –Demand-side macroeconomic policy – Fiscal policy – Monetary policy – The supply side problem.

**L – 45; T – 15; TOTAL – 60**

**REFERENCES:**

1. Sloman, John, Hinde, Kevin, "Economics for business", 4th Edition, Prentice Hall, 2007, ISBN: 9780273709084. [No: 38420].
2. Frederik Mishkin, "Economics of Money banking and Financial Markets", Prentice Hall, July, 2009.

**COURSE OUTCOMES:** On completion of the course the students will be able to

**CO1:** discuss supply, demand, market equilibrium, and elasticity effects on markets.

**CO2:** explain firms' production choices, competition types, and market dynamics.

**CO3:** define GDP, GNP, NNP and their limitations.

**CO4:** evaluate how savings and policies impact economic growth,

**CO5:** understand exchange rates, trade, payments.

**Board Of Studies (BOS):**
17th BOS of Department of Mathematics and Actuarial Science held on 23.06.2025.

**Academic Council:**
24th ACM held on 26.08.2025

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | - | - | - | - | - | - | - |
| CO2 | - | - | H | - | - | - | - |
| CO3 | - | H | - | - | M | - | - |
| CO4 | - | - | - | - | - | - | - |
| CO5 | L | - | - | H | - | - | - |

*** Legend: L – Low (1), M – Medium (2), H – High (3).**

**SDG 4:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

This course provides understanding of economics in insurance and financial systems.

| MAF 6104 | FINANCIAL REPORTING AND ACCOUNTING | L | T | P | C |
|---|---|---|---|---|---|
| SDG: 4 | | 3 | 1 | 0 | 4 |

**COURSE OBJECTIVE:**

**COB1:** To understand finance in organizational operations.

**COB2:** To introduce financial instruments, business applications.

**COB3:** To know the accounting basics and standards.

**COB4:** To prepare financial statements.

**COB5:** To interpret financial statements and understand their limitations**.**

**MODULE I THE KEY PRINCIPLES OF FINANCE 9+3**

The key principles of finance – Finance and the real resources of an organization – Business objectives – The maximization of shareholder wealth – Company ownership – Types of business entity – Types of medium-term company finance – Types of short-term company finance – Taxation – Personal taxation – Corporation tax – Capital gains Tax – Double taxation relief.

**MODULE II FINANCIAL INSTRUMENTS 9+3**

Financial instruments – Debenture – Unsecured loan stocks – Subordinated debt – Eurobond loan capital – Share capital – Convertible – Warrants – Use of derivatives – Financial futures – Options – Interest rates and currency swaps – Issue of shares – Obtaining stock exchange quotation – Rights issues – Scrip issues.

**MODULE III INTRODUCTION TO ACCOUNTS 9+3**

Introduction to accounts – Users –Regulation –Requirements – Accounting standards Board – The auditors' report – Accounting concepts – The main accounts – balance sheet –Income statement –Cash flow statement – Statement of changes in equity – Notes to the accounts.

**MODULE IV GENERATING ACCOUNTS 9+3**

Depreciation – purpose of depreciation – straight line basis – Reducing balance method – Generating accounts – The trial balance – Constructing financial statements – Group accounts and insurance company accounts – Subsidiary companies – Consolidated balance sheets – Goodwill on consolidation – Minority interests – Associated companies.

**MODULE V INTERPRETATION AND LIMITATION OF ACCOUNTS 9+3**

Interpretation of accounts –Security of loan capital – Income cover and income priority percentages – Asset cover and asset priority percentages – Gearing – shareholder analysis – Ratios involving share information – Profitability ratios – Liquidity ratios – Efficiency ratios – Limitations in the interpretation of accounts.

**L – 45; T – 15; TOTAL – 60**

**REFERENCES:**


1. Anne Britton, Chris Waterston, “Financial Accounting”, Pearson Education,2009.
2. Barry Elliott, Jamie Elliott “Financial Accounting and reporting”, Trans-Atlantic publications, 2005.
3. Lawrence Revsine, “Financial Reporting and Analysis”, McGraw Hill, 2008.
4. Samuels, J MBrayshaw, R E Craner, “Financial statement analysis in Europe” -Chapman & Hall, 1995.
5. Brigham, Eugene F, Houston, Joel F. “Fundamentals of financial management” 9th Edition - Harcourt Brace, 2000.
6. Brett M, “How to read the financial pages”, 2nd Edition-Random House Business Books, 2003.
7. Holmes, Geoffrey; Sugden, Alan; Gee, Paul. – “Interpreting company reports and accounts”- 8thEdition - Pearson Education, 2002.
8. Brealey, Richard A; Myers, Stewart C. – “Principles of corporate finance” - 7thEdition -McGrawHill, 2003.


**COURSE OUTCOMES:** On completion of the course the students will be able to

**CO1:** demonstrate finance principles, personal and corporate taxation.

**CO2:** exhibit knowledge of investment and asset management terms.

**CO3:** enumerate key financial instruments and issuance methods.

**CO4:** describe account construction and company features.

**CO5:** interpret company accounts, investments, limitations.

| **Board Of Studies (BOS):** | **Academic Council** |
|---|---|
| 17th BOS of Department of Mathematics and Actuarial Science held on 23.06.2025. | 24th ACM held on 26.08.2025 |

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| **CO1** | - | - | L | - | - | - | - |
| **CO2** | - | L | - | | - | M | - |
| **CO3** | - | - | - | | - | - | - |
| **CO4** | - | - | - | M | - | - | - |
| **CO5** | H | - | - | - | M | - | - |

*** Legend: L – Low (1), M – Medium (2), H – High (3).**

**SDG 4:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Understand corporate finance, financial instruments, risk management and interpreting accounts.

| MAF 6105 | PRINCIPLES OF INSURANCE | L | T | P | C |
|---|---|---|---|---|---|
| SDG: 4 | | 2 | 0 | 0 | 2 |

**COURSE OBJECTIVES:**

- **COB1:** To introduce risk concepts, types, and classifications.
- **COB2:** To understand insurance fundamentals and operations.
- **COB3:** To familiarize with insurance customer types and needs.
- **COB4:** To provide clarity on basic insurance principles.
- **COB5:** To understand and use common insurance terminology effectively.

**MODULE I THE CONCEPT OF RISK 6**

The concept of risk – Kinds and classification of risk – Assessment – Transfer –Risk appraisal – Risk selection –Underwriting risk appraisal – Mortality tables –Physical and moral hazards –Representations –Warranties –Conditions.

**MODULE II THE BUSINESS OF INSURANCE 6**

The business of insurance – Risk managed by individuals –Risk managed by insurers – Premium fixing –Reinsurance and its importance – Role of insurance in economic development – The insurance market – Role of intermediaries – Specialists – Regulator.

**MODULE III INSURANCE CUSTOMERS 6**

Insurance customers – Types of customers – Customer mindset and customer satisfaction – Importance of ethical behavior – History of insurance – History of insurance in India.

**MODULE IV BASIC PRINCIPLES OF INSURANCE 6**

Basic principles of insurance – Utmost good faith – Indemnity & Proximate cause - Insurable interest – Material facts – Economic principles of insurance – Sharing – Subrogation – contribution –Legal principles of insurance – Actuarial principles.

**MODULE V INSURANCE TERMINOLOGY 6**

Insurance terminology – Terms that are specific to Life insurance – Traditional product offered by Life insurance companies – Features of module linked policies – Features of annuities and group policies –Terms that are specific to General insurance – Product offered by Non-Life insurance companies – Fire insurance – Marine insurance – Various

product under miscellaneous category.

**L – 30; TOTAL – 30**

**REFERENCES:**


1. Neelam C Gulati, “Principles of Insurance Management”, Excel Books, New Delhi.
2. Harriett E Jones, “Principles of Insurance FLMI Insurance Education Program”, Life Management Institute LOMA, (Dec 1995).
3. Robert I Mehr, “Principles of Insurance” Richar D Irwin”, (8th Edition, 1985).
4. Ben G Baldwin, “The New Life Insurance Investment Advisor”, 2nd Edition. Mc Graw Hill.


**COURSE OUTCOMES:** On completion of the course the students will be able to

**CO1:** describe the basic principle of insurance.

**CO2:** identify different kind of insurable risk.

**CO3:** explain the history of insurance.

**CO4:** plan new products-based on the market need.

**CO5:** demonstrate the insurance terminology.

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**Academic Council:**
24th ACM held on 26.08.2025

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | - | - | - | - | - | - | - |
| CO2 | - | - | H | - | | - | - |
| CO3 | - | H | - | - | M | - | - |
| CO4 | - | - | - | - | | - | - |
| CO5 | M | - | - | - | | - | - |

*** Legend: L – Low (1), M – Medium (2), H – High (3).**

**SDG 4:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

This course provides an introduction to insurable risks, insurance principles, products, markets, and history.

| MAF 6106 | MATHEMATICAL STATISTICS | L | T | P | C |
|---|---|---|---|---|---|
| SDG 4 | | 3 | 1 | 0 | 4 |

**COURSE OBJECTIVE:**

- **COB1:** To identify sampling methods and distributions.
- **COB2:** To apply estimation techniques to derive population parameters.
- **COB3:** To formulate and test hypotheses using appropriate statistical methods
- **COB4:** To analyze relationships using bivariate correlation analysis.
- **COB5:** To know regression analysis for prediction and decision-making.

**MODULE I SAMPLING 9+3**

Types of Sampling – Moments of the sample mean and variance – Sampling distributions for the normal.

**MODULE II ESTIMATION 9+3**

Point estimation – Method of moments – Method of maximum likelihood – One and two parameter cases – Incomplete samples – Unbiasedness – Mean square error – Asymptotic distribution of MLEs – Confidence intervals – normal distribution – Binomial & Poisson – Two-sample problems – Paired data.

**MODULE III HYPOTHESIS TESTING 9+3**

Hypothesis testing – Hypotheses – Test statistics – Decisions and errors – Classical testing – significance and p-values – Basic tests – Single samples – Two independent samples – Paired data – Tests and confidence intervals – Chi square test – t-test – F-test – Fisher's exact test.

**MODULE IV CORRELATION ANALYSIS 9+3**

Bivariate correlation analysis – Pearson's correlation coefficient – Spearman's rank correlation coefficient – The Kendall rank correlation coefficient – Multivariate correlation analysis – Principal component analysis.

**MODULE V REGRESSION ANALYSIS 9+3**

The simple bivariate linear model – The multiple linear regression model – The full normal model and inference – Analysis of variance (ANOVA).

**L – 45; T – 15; TOTAL – 60**

**REFERENCES:**


1. Miller I, Miller M, [Freund J. E.], "Mathematical statistics" 7th Edition, Prentice Hall International, 1999.
2. Dekking, F.M., Kraaikamp, Lopuha, Meester, "A Modern Introduction to Probability and Statistics" Springer, 2nd Edition.
3. Chin Long Chiang, "Statistical Methods of Analysis "World Scientific Books, 2003.


**COURSE OUTCOMES:** On completion of the course the students will be able to

**CO1:** explain the statistical inference and sampling distributions.

**CO2:** construct confidence intervals for unknown parameters.

**CO3:** define the test statistics and test the hypotheses.

**CO4:** analyze linear relationships using correlation and regression.

**CO5:** explain the concepts of analysis of variance and use them.

**Board Of Studies (BOS):**

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| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | - | - | - | - | - | - | - |
| CO2 | - | - | H | - | | - | - |
| CO3 | - | H | - | - | M | - | - |
| CO4 | - | - | - | - | | - | - |
| CO5 | M | - | - | - | | - | - |

*** Legend: L – Low (1), M – Medium (2), H – High (3).**

**SDG 4:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Mathematical Statistics provides grounding in advanced probability, hypothesis testing, regression, and ANOVA for actuarial applications.

| | | | | | |
|---|---|---|---|---|---|
| **MAF 6107** | **ACTUARIAL COMPUTATIONAL** | **L** | **T** | **P** | **C** |
| **SDG: 4** | **LABORATORY (MS – EXCEL)** | **0** | **0** | **4** | **2** |

**COURSE OBJECTIVES:**

- **COB1:** To introduce basic Excel calculations and data handling.
- **COB2:** To develop use of Pivot Tables for analysis.
- **COB3:** To familiarize with key Excel math and stats functions.
- **COB4:** To enable effective data visualization with charts.
- **COB5:** To provide basics of Excel Macros and VBA for automation.

**MODULE I INTRODUCTION TO MS-EXCEL** **6**

Custom toolbar/Custom menu bar – Paste options/Paste list/Paste special – Managing comments/Protect worksheet – Create lists/Data form – Custom sort/Auto filters/subtotals – Labels in formulas – IF/AND/OR conditions – Basic formatting techniques– Conditional formatting– Naming ranges and cells– Auto – Filter and advanced data filtering– Data validation with in – Cell drop – Down list.

**MODULE II PIVOT TABLES** **6**

Introduction to pivot tables– Drill – Down functionality – Show/hide totals – Error/empty cell display options – Value calculation – Label layout –Sorting labels.

**MODULE III FUNCTION & FORMULA**

Mathematical and statistical function – Lookup and reference function – Index and Match Function – Date and Time function – Text Function-Logical function.

**MODULE IV DATA DISPLAY**

Bar charts and dot charts – Pie charts – Histograms – Formatting/editing chart axes –Data labels –Legends – Data series –Chart titles – Sparklines.

**MODULE V EXCEL MACROS AND VBA** **6**

Macro in Excel – Developer Options – Record a Macro – Advance Macro – Run Macro – Introduction to VBA.

**P – 60; TOTAL – 60**

**REFERENCES:**


1. D.M. Levine, D.F. Stephan, T.C. Krehbiel, M.L. Berenson, “Statistics for Managers Using Microsoft Excel” ,5th Edition, Pearson Education Ltd., 2008.
2. Jonathan Swan, “Practical Financial Modelling: A Guide to Current Practice”, 2nd Edition, CIMA Publishing, 2009.
3. David C. M. Dickson, Mary R. Hardy and Howard R. Waters, “Actuarial Mathematics for Life Contingent Risks”, 3rd Edition, Cambridge University Press, 2019.


**COURSE OUTCOMES:** On completion of the course the students will be able to

**CO1:** entering data.

**CO2:** calculating a set of data.

**CO3:** displaying the data in a meaningful way.

**CO4:** sharing data so that others can understand.

**CO5:** using functions and formulae and inserting charts and graphs.

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**Academic Council:**

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| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | - | - | - | - | - | - | - |
| CO2 | - | | H | - | - | - | - |
| CO3 | - | H | - | - | M | - | - |
| CO4 | - | - | - | L | - | - | - |
| CO5 | - | - | - | | - | M | - |

*** Legend: L – Low (1), M – Medium (2), H – High (3).**

**SDG4:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

This laboratory provides basic Excel skills for effective actuarial calculations.

## SEMESTER II

| | | | | | |
|---|---|---|---|---|---|
| **MAF 6201** | **APPLICATIONS OF FINANCIAL** | **L** | **T** | **P** | **C** |
| **SDG: 4** | **MATHEMATICS** | **3** | **1** | **0** | **4** |

**COURSE OBJECTIVES:**

- **COB1:** To introduce fundamentals of project appraisal and investment decision.
- **COB2:** To solve basic problems involving compound interest.
- **COB3:** To familiarize with arbitrage opportunities and forward contracts.
- **COB4:** To understand interest rate structure and its impact on financial instruments.
- **COB5:** To provide introduction to stochastic interest rate models for analysis.

**MODULE I PROJECT APPRAISAL 8+3**

Project appraisal – Accumulated value – Net present values – Internal rate of return – Comparison of two investment projects – Different interest rates for lending and borrowing – Payback periods.

**MODULE II ELEMENTARY COMPOUND INTEREST PROBLEMS 12+3**

Elementary compound interest problems – Fixed interest securities – Calculating the price – Calculating yields – The effect of the term to redemption on the yield – Optional redemption date – Deferred income tax – Capital gains tax – Uncertain income securities – Equities – Property – Real rates of interest – Inflation adjusted cash flows – Calculating real yields using an inflation index – Index-linked bonds.

**MODULE III ARBITRAGE AND FORWARD CONTRACTS 8+3**

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 known dividend yield – Hedging – The value of a forward contract.

**MODULE IV TERM STRUCTURE OF INTEREST RATES 9+3**

Term structure of interest rates – Discrete time-spot rates – Forward rates – Continuous time-spot rates – Forward rates – Instantaneous forward rates – Theories

of the term structure of interest rates – Yields to maturity – Par yields – Duration – Convexity and immunization.

**MODULE V STOCHASTIC INTEREST RATE MODELS 8+3**

Stochastic interest rate models – Simple interest rate models – Preliminary remarks – Fixed interest rate model – Varying interest rate model – Log-normal distribution.

**L – 45; T – 15; TOTAL – 60**

**REFERENCES:**


1. Mark S, Joshi,"The concepts and practice of Mathematical Finance",Cambridge University Press, 2nd Edition (2008).
2. Paul Wilmott, Sam Howison, and Jeff Dewynne, "The Mathematics of Financial Derivatives" Cambridge University press, 1995.
3. S.M. Ross "An Introduction to Mathematical finance" Cambridge University Press.
4. J. J. McCutcheon and W. F. Scott, "An Introduction to the Mathematics of Finance Heinemann",1986.
5. Bowers, Newton L et al. "Actuarial mathematics" – 2nd Edition. – Society of Actuaries, 1997.
6. Butcher, M. V. Nesbitt, Cecil J. "Mathematics of compound interest". Ulrich's Books, 1971.
7. Ingersoll, Jonathan E. Rowman & Littlefield, "Theory of Financial Decision Making" 1987.
8. Kellison, Stephen G,"The theory of interest",2nd Edition Irwin, 1991.


**COURSE OUTCOMES:** On completion of the course the students will be able to

**CO1:** show use of discounted cash flow in investment appraisal.

**CO2:** describe asset risks, estimate equity, property, index-linked bond values.

**CO3:** calculate forward contract pricing using arbitrage-free methods.

**CO4:** show an understanding of the term structure of interest rates.

**CO5:** deliver understanding of stochastic interest models for investment returns.

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**Academic Council:**

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| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | - | - | - | - | - | - | - |
| CO2 | - | - | H | - | | - | - |
| CO3 | - | H | - | - | M | - | - |
| CO4 | M | - | - | M | - | - | - |
| CO5 | - | - | - | - | - | H | - |

*** Legend: L – Low (1), M – Medium (2), H – High (3).**

**SDG 4:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

This course provides advance knowledge on financial mathematics like project evaluation, Investment decision and stochastic interest rate model.

| MAF 6202 | FUNDAMENTALS OF LIFE CONTINGENCIES | L | T | P | C |
|---|---|---|---|---|---|
| SDG 4 | | 3 | 1 | 0 | 4 |

**COURSE OBJECTIVES:**

- **COB1:** To introduce life table construction and its use in actuarial calculations.
- **COB2:** To familiar with different types of life assurance and life annuity contracts.
- **COB3:** To understand net premium and reserve calculations for life insurance.
- **COB4:** To explain variable benefit policies and with-profit contract structures.
- **COB5:** To calculate gross premiums for both fixed and variable benefit contracts.

**MODULE I THE LIFE TABLE 9+3**

The life table – Constructing a life table – Using the life table – The pattern of human mortality – Life table functions at non-integer ages – Uniform Distribution of Deaths (UDD) – Constant Force of Mortality (CFM) – The general pattern of mortality – Select mortality – Constructing select and ultimate life tables – Evaluation of assurances and annuities – Premium conversion equations – Variance of benefits – Expected present values of annuities payable m-times each year.

**MODULE II LIFE ASSURANCE & ANNUITY CONTRACTS 9+3**

Life assurance contracts – Whole life assurance, Term assurance, Pure endowment, Endowment assurance, Deferred assurance benefits – Life annuity contracts – Whole life annuities arrears/advance, Temporary annuities arrears/advance, Deferred annuities, Deferred annuities-due, Continuous annuities – Mean and variance of the present value random variable claim acceleration approximation.

**MODULE III NET PREMIUMS AND RESERVES 9+3**

Net premiums and reserves – The basis – The net premium – The insurer's loss random variable – Reserves – Prospective reserve – Retrospective reserves –

Conditions for equality of prospective and retrospective reserves – Net premium reserves – Recursive calculation of reserves.

**MODULE IV WITH-PROFIT POLICIES** **9+3**

Variable benefits and with-profit policies – Variable payments – Payments varying at a constant compound rate – Payments changing by a constant monetary amount – With-profit contracts – Types of bonus – Calculating net premiums and net premium reserves for with-profit contracts – Accumulating with-profits contracts.

**MODULE V GROSS PREMIUMS AND RESERVES** **9+3**

Gross premiums and reserves for fixed and variable benefit contracts – Types of expenses incurred in writing a life insurance contract – The influence of inflation on expenses – Gross future loss random variable for standard contracts – Determining gross premiums using the equivalence principle – Gross premium reserves – Equality of gross premium prospective and retrospective reserves.

**L – 45; T – 15; TOTAL – 60**

**REFERENCES:**


1. B H Smith, “Contingencies of Value”, Harvard University Press, 1988.
2. Alistair Neil, “Life Contingencies”, Butterworth-Heinemann Ltd; illustrated Edition (1977).
3. Griffith Davis, “Table of Life Contingencies”, Longman & Co, 1825, University of California Library.
4. Micheal M Parmenter, “Theory of Interest and Life contingencies with Pension”, 3rd Edition.
5. Bowers, Newton L et al., “Actuarial mathematics”, 2nd Edition, Society of Actuaries, 1997.
6. Benjamin, Bernard; Pollard, John H, “The analysis of mortality and other actuarial statistics” 3rd Edition, Faculty and Institute of Actuaries, 1993.
7. Gerber, Hans U, “Life insurance mathematics” 3rd Edition, Springer, Swiss Association of Actuaries, 1997.
8. Booth, Philip Metal. “Modern actuarial theory and practice”, Chapman & Hall, 1999.

**COURSE OUTCOMES:** On completion of the course the students will be able to

**CO1:** define the different life table function and how to use it

**CO2:** explain assurance and annuity contracts with present value formulae.

**CO3:** calculate net premiums and reserves using ultimate or select mortality.

**CO4:** enumerate net premium and reserve calculations for varying benefits

**CO5:** describe the calculation of gross premiums and reserves of assurance and annuity contracts.

**Board Of Studies (BOS):**

17th BOS of Department of Mathematics and Actuarial Science held on 23.06.2025.

**Academic Council:**

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| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | | | | | | | M |
| CO2 | | | H | | | | |
| CO3 | | H | | | M | | |
| CO4 | | | | | | L | |
| CO5 | M | | | M | | | |

*** Legend: L – Low (1), M – Medium (2), H – High (3).**

**SDG 4:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

This subject provides mathematical techniques to model insurance risks, calculate premiums, and reserves.

| | | | | | |
|---|---|---|---|---|---|
| **MAF 6203** | **DESCRIPTIVE STATISTICAL METHODS IN** | **L** | **T** | **P** | **C** |
| **SDG 4** | **ACTUARIAL SCIENCE** | **3** | **1** | **0** | **4** |

**COURSE OBJECTIVES:**

- **COB1:** To introduce fundamentals of Bayesian statistics and actuarial applications.
- **COB2:** To understand basic loss distributions used in modelling insurance claims.
- **COB3:** To familiarize with reinsurance types and purposes.
- **COB4:** To provide understanding of credibility theory and Empirical bayes methods.
- **COB5:** To know Generalized linear Models in insurance and risk modelling.

**MODULE I BAYESIAN STATISTICS 9+3**

Bayesian statistics – Bayes' Theorem – Prior and posterior distributions – Conjugate priors – Improper prior distributions – The loss function – Quadratic loss – Absolute error loss – All-or-nothing loss.

**MODULE II LOSS DISTRIBUTIONS 9+3**

Loss distributions – Moment Generating Functions and basic loss distributions – Exponential – Gamma – Normal – Pareto and generalized Pareto distributions – lognormal distribution – Weibull distribution – The Burr distribution – Estimation – The method of moments – Maximum Likelihood Estimation – Goodness of fit tests – Mixture distributions.

**MODULE III REINSURANCE 9+3**

Reinsurance – Reinsurance arrangements – Excess of loss reinsurance – The insurer – The reinsurer – Proportional reinsurance – Particular distributions – Lognormal distribution – Normal distribution – Inflation – Estimation – Policy excess.

**MODULE IV CREDIBILITY THEORY 9+3**

Credibility theory – Credibility – The credibility premium formula – The credibility factor – Bayesian credibility – The Poisson/gamma model – The normal/normal model – Bayesian approach to credibility – Empirical Bayes credibility theory – EBCT Model to estimate risk premium – EBCT Model to estimate claim frequency.

**MODULE V GENERALISED LINEAR MODELS 9+3**

Generalized linear models – Exponential families – Normal distribution – Poisson distribution – Binomial distribution – Gamma distribution – Link functions and linear predictors – Deviance of model fitting – Residuals analysis and assessment of model fit.

**L – 45; T – 15; TOTAL – 60**

**REFERENCES:**


1. Dobson, Annette J.,"An introduction to statistical modeling"- Chapman & Hall, 1983.
2. Hossack, Ian B, Pollard, John H, Zehnwirth, Benjamin. "Introductory statistics with applications in general insurance" 2nd Edition, Cambridge University Press, 1999.
3. Klugman, Stuart A, Panjer, Harry H, Willmot, Gordon E, Venter, Gary G. "Loss models: from data to decisions", John Wiley & Sons, 1998.
4. Daykin, Chris D, Pentikainen, Teivo, Pesonen, Martti. "Practical risk theory for actuaries", Chapman & Hall, 1994.
5. Critian P Robert, "Monte Carlo Statistical Methods", 2nd Edition, Springer- Verlag.
6. George W Snedecor "Statistical Methods", 8th Edition, Iowa State University Press.
7. G.S. Maddala, C.R Rao, "Statistical methods in Finance", Jan 1996, Elsevier Science and technology.
8. Philip J Boland "Statistical and Probabilistic Methods in Actuary Science", Chapman & Hall Press, 2007.


**COURSE OUTCOMES:** On completion of the course the students will be able to

**CO1:** explain the concepts of decision theory and apply them.

**CO2:** calculate probabilities and moments of loss distributions.

**CO3:** enumerate reinsurance types and purposes.

**CO4:** apply the Bayesian estimators.

**CO5:** construct risk models and severity distributions.

**Board Of Studies (BOS):**

17th BOS of Department of Mathematics and Actuarial Science held on 23.06.2025.

**Academic Council:**

24th ACM held on 26.08.2025

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | - | - | - | - | - | - | M |
| CO2 | - | - | H | - | - | - | - |
| CO3 | - | H | - | - | M | - | - |
| CO4 | - | - | - | - | - | - | - |
| CO5 | H | - | - | - | - | - | - |

*** Legend: L – Low (1), M – Medium (2), H – High (3).**

**SDG 4:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

This subject provides grounding in Bayesian statistics, Loss distributions, Reinsurance, and Credibility theory..

| MAF 6204 | STOCHASTIC MODELS | L | T | P | C |
|---|---|---|---|---|---|
| SDG: 4 | | 2 | 1 | 0 | 3 |

**COURSE OBJECTIVES:**

- **COB1:** To explain actuarial modeling principles and stochastic concepts.
- **COB2:** To apply Markov chains theory and analyze Chapman-Kolmogorov equations.
- **COB3:** To construct two-state Markov model for use in actuarial contexts.
- **COB4:** To analyze time-homogeneous Markov jump processes.
- **COB5:** To examine the features of time-inhomogeneous Markov jump processes.

**MODULE I ACTUARIAL MODELING & STOCHASTIC PROCESSES 6+3**

Principles of actuarial modelling – The benefits and limitations – Stochastic and deterministic models – Suitability of a model – Short-term and long-term properties of a model – Analyzing the output of a model – Sensitivity testing – Stochastic Processes – Sample Paths – Stationarity – Increments – The Markov property – Filtrations – White noise – General random walk – Poisson process – Compound Poisson process.

**MODULE II MARKOV CHAINS 6+3**

Markov chains – The Chapman-Kolmogorov equations – Time homogeneous Markov chains – No Claims Discount policy – Simple random walk on Z = {... − 2, − 1, 0,1, 2, ...} and {0,1, 2, ..., b} – A model of accident proneness – The long-term distribution of a Markov chain – The stationary probability distribution – Estimating transition probabilities – Assessing the fit – Simulation.

**MODULE III TWO-STATE MARKOV MODEL 6+3**

The two-state Markov model – Assumptions underlying the model – Comparison with other models – Probabilities – Statistics – Joint density function – The maximum likelihood estimators – The distribution of $\tilde{\mu}$ – The Poisson model of mortality.

**MODULE IV TIME-HOMOGENEOUS MARKOV JUMP PROCESSES 6+3**

Time-homogeneous Markov jump processes – Poisson process – Chapman-Kolmogorov equations – Transition matrix – Transition rates – Health-sickness-

death model – Kolmogorov's forward and backward differential equations – Holding times and occupancy probabilities – Expected time to reach state k starting from state i- Jump chain – Two-decrement model – MLE.

**MODULE V TIME-INHOMOGENEOUS MARKOV JUMP PROCESSES 6+3**

Time-inhomogeneous Markov jump processes – Chapman-Kolmogorov equations – Transition rates – Kolmogorov's forward and backward differential equations – Occupancy probabilities – Residual holding times – Integrated form of the Kolmogorov forward and backward equations – Applications.

**L – 30; T – 15; TOTAL – 45**

**REFERENCES:**


1. Brzezniak, Zdzislaw, Zastawniak, Tomasz. "Basic stochastic processes; A course through exercises"- Springer, 1998.
2. Hickman, James C. "Introduction to actuarial modeling" – North American Actuarial Journal (1997) 1(3) 1-5.
3. Kulkarni, Vidyadhar G. "Modeling, analysis, design, and control of Stochastic Systems" – Springer, 1999.
4. Grimmett, Geoffrey; Stirzaker, David. – "Probability and random processes" 3rd Edition, Oxford University Press, 2001.
5. Bowers, Newton L; Gerber, Hans U; Hickman, James C; Jones, Donald A, Nesbitt, Cecil J. – "Actuarial mathematics", 2nd Edition, Society of Actuaries, 1997.


**COURSE OUTCOMES:** On completion of the course the students will be able to

- **CO1:** describe the principles of actuarial modeling and stochastic processes.
- **CO2:** define and apply Markov chain.
- **CO3:** apply two state model for transition intensity.
- **CO4:** solve insurance related problem based on Markov chain.
- **CO5:** enumerate Integrated form of the Kolmogorov forward and backward equations.

**Board Of Studies (BOS):**

17th BOS of Department of Mathematics and Actuarial Science held on 23.06.2025.

**Academic Council:**

24th ACM held on 26.08.2025

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| **CO1** | L | - | | - | - | - | - |
| **CO2** | - | | H | - | - | - | - |
| **CO3** | - | H | - | - | M | - | - |
| **CO4** | - | - | - | - | - | M | - |
| **CO5** | - | - | - | H | - | - | - |

*** Legend: L – Low (1), M – Medium (2), H – High (3).**

**SDG 4:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

This subject covers actuarial modeling, stochastic processes, Markov chains, and NCD/HSD model applications.

| MAF 6205 | R – PROGRAMMING | L | T | P | C |
|---|---|---|---|---|---|
| SDG: 4 | | 0 | 0 | 4 | 2 |

**R:** A Language and Environment for Statistical Computing

**COURSE OBJECTIVES:**

**COB1:** To perform basic mathematical calculations using R programming

**COB2:** To develop custom R functions for mathematical and statistical applications.

**COB3:** To create bar charts and various types of plots for data visualization.

**COB4:** To calculate probabilities using R for different scenarios.

**COB5:** To apply statistical tests and utilize relevant R packages for data analysis

.

**MODULE I INTRODUCTION TO THE R LANGUAGE 6**

Calculating with R-Named storage-Listing the objects in the workspace-Vectors-Missing values and other special values-Extracting elements from vectors-Data Frames- Dates and times-Lists-Logical operations in R-Relational operators. Vector & Matrices

**MODULE II PROGRAMMING WITH R 6**

Flow control – The for () loop – The if () statement – The while () loop – The repeat loop – The break and next statements – Writing own function to solve the problems

**MODULE III HIGH-LEVEL PLOTS 6**

Bar charts and dot charts – Pie Charts – Histograms – Box Plots – Scatter plots – QQ plots – The plotting region and margins – Adding to plots – Setting graphical parameters – Time series plot – fit a linear model to a bivariate data frame

**MODULE IV SIMULATING VALUES AND CALCULATING PROBABILITIES 6**

Uniform – Binomial – Geometric – Negative binomial – Hypergeometric – Poisson – Gamma – Exponential – Chi-square – Beta – Normal – lognormal – *t* distribution – F distribution – Monte Carlo simulation.

**MODULE V STATISTICAL TEST AND R PACKAGES 6**

Markov Chain-Weibull distribution **–** Flexsurv – Survival mortality smooth – Time series – Comparing simulated samples – Confidence interval – Hypothesis test – Pearson correlation coefficient – Spearman rank correlation coefficient – Kendall rank

correlation coefficient – Regression model

**P – 60; TOTAL – 60**

**REFERENCES:**


1. Grolemund, G., “Hands-On Programming with R”, 1st Edition, O’Reilly Media, 2014.
2. Maindonald, J., Braun, W. J., “Data Analysis and Graphics Using R: An Example-Based Approach”, 3rd Edition, Cambridge University Press, 2010.
3. Lander, J. P., “R for Everyone: Advanced Analytics and Graphics”, 2nd Edition, Pearson Education, 2017.


**COURSE OUTCOMES:** On completion of the course the students will be able to

**CO1:** perform simple mathematical calculations.

**CO2:** write simple program.

**CO3:** draw different plot.

**CO4:** Simulate values and calculate different probabilities.

**CO5:** perform statistical test using R.

**Board Of Studies (BOS):**

17th BOS of Department of Mathematics and Actuarial Science held on 23.06.2025.

**Academic Council:**

24th ACM held on 26.08.2025

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | - | - | - | - | - | M | - |
| CO2 | - | - | H | - | - | - | - |
| CO3 | - | H | | - | M | - | - |
| CO4 | - | - | - | L | - | - | - |
| CO5 | M | - | - | - | - | - | - |

*** Legend: L – Low (1), M – Medium (2), H – High (3).**

**SDG 4:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

R-Programming is to give the basic knowledge of a system for statistical and Actuarial computation and graphics.

| GEF 6202 | RESEARCH METHODOLOGY AND IPR | L | T | P | C |
|---|---|---|---|---|---|
| SDG: 4, 9, 11 and 15 | | 3 | 1 | 0 | 4 |

**COURSE OBJECTIVES: Students will be trained to**

**COB1:** Basic concepts of Research and formulation.

**COB2:** Safety in research laboratory and research data collection.

**COB3:** Impart knowledge for enabling students to develop data analytics skills and valid interpretation.

**COB4:** write Scientific and Technical reports and Thesis

**COB5:** Familiar the Intellectual Property Rights.

**MODULE I INTRODUCTION TO RESEARCH METHODOLOGY AND RESEARCH FORMULATION** **L: 12 T: 0 P: 0**

Research: Objectives, Motivation and types - Approaches, Significance of Research, Research process, Criteria of good research, Limitations Encountered by researchers - Defining and formulating the research problem, selecting the problem, necessity of defining the problem, importance of literature review in defining a problem, literature review - primary and secondary sources, reviews, monograph, patents, research databases, web as a source, identifying gap areas from literature and research database. Formulating working hypotheses.

**MODULE II GOOD LABORATORY PRACTICES, SAFETY and DATA COLLECTION** **L: 10 T: 2 P: 0**

Introduction: History, definition, Principles, Good Laboratory Practices (GLP) and its application GLP training: Stepwise implementation of GLP and compliance monitoring, Safety Symbols, Science Safety Rules - Dress Code, First Aid, Heating and Fire Safety - Observation and Collection of data, methods of data collection; Primary and secondary; data processing, analysis strategies and tools, data analysis with statistical tools (Hypothesis testing, large and small sample test). Importance of negative results.

**MODULE III DATA ANALYSIS and DRAWING** **L: 12 T: 0 P: 0**

Analyzing the data and drawing structures / schemes / flow charts using Chemdraw and Chemsketch - Measures of central tendency - mean median and mode - Sampling methods - Data analysis using Excel, Origin and Sigma plot - data analysis with statistical tools (Sigma STAT, SPSS student, ANOVA) - hypothesis testing - Importance and scientific methodology in recording results - Error significance - Conceptions of error of measurement - absolute and relative errors, true score theory and generalisability theory.

**MODULE IV RESEARCH ETHICS and TECHNICAL WRITING** **L: 08 T: 4 P: 0**

Introduction to ethics, scientific misconduct - causes and effects; fabrication; authorship issues, The investigation and punishment of scientific misconduct (Erratum and Retraction) - Different types of scientific and technical publications - Definition and importance of Journal Impact factor, COPE guidelines, Cite Scores and Citation Indexes. Technical writing skills for report, synopsis, thesis and book chapter - . Preparing manuscripts for international journals - softwares; MS Office/LATEX, Grammarly; Mendeley; detection of similarity index / plagiarism / AI support by Turnitin as per UGC Norms.

**MODULE V INTELLECTUAL PROPERTY RIGHTS** **L: 08 T: 4 P: 0**

Basics of Intellectual Property - Intellectual Property system in India, IP Research, and Universities - Patents Act, 1970, Patents—From ball pens to biologics - Patentable subject matter, Rights conferred Exceptions, Term of protection and Conditions on Patent applicants and patent process. Trade Mark Act, 1999, Trade secrets, The Designs Act, 2000, Copy Right, Royalty, Geographical indications, Industrial designs, Trade related aspects of Intellectual Property Rights (TRIPS); development of TRIPS complied regime in India. Enforcement of Intellectual Property Rights, Function of UNESCO in IPR maintenance.

**L - 45; T - 15; P - 0; Total Hours: 60**

**TEXT BOOKS:**

1. Cooper Donald R, Schindler Pamela S and Sharma JK., 2012. “Business Research Methods”, Tata McGraw Hill Education, 11th Edition.

2. Kothari C.R., “Research Methodology, Methods and Techniques”, Wiley Eastern Ltd., NewDelhi, 1991.

**REFERENCES:**

1. Anthony, M., Graziano, A.M. and Raulin, M.L., 2009. Research Methods: A Process of Inquiry, Allyn and Bacon.
2. Garg, B.L., Karadia, R., Agarwal, F. and Agarwal, U.K., 2002. An introduction to Research Methodology, RBSA Publishers.
3. Day, R.A., 1992.How to Write and Publish a Scientific Paper, Cambridge University Press.
4. Sinha, S.C. and Dhiman, A.K., 2002. Research Methodology, Ess Ess Publications. 2 volumes
5. Essentials of Research Design and Methodology Geoffrey R. Marczyk, David DeMatteo, David Festinger, 2005. John Wiley and Sons Publishers, Inc
6. Biochemical Calculations: How to Solve Mathematical Problems in General Biochemistry, 2nd Edition, Irwin H. Segel, 1976. John Wiley and Sons Publishers, Inc
7. R Arora. Encyclopaedia of Research Methodology in Biological Sciences., Anmol Publishing, 2004.
8. Coghill M. and Gardson L.R., The ACS Style Guide Effective Communication of Scientific Information, 3rd Edn., Oxford University Press, 2006.

**COURSE OUTCOMES: The students will be able to**

**CO1:** recognize the basic concepts of research and its methodologies

**CO2:** select appropriate safety measurements and data collection methods

**CO3:** Apply various statistical hypothesis testing and interpret the results.

**CO4:** write scientific report as journal article, thesis and technical proposal for funding.

**CO5:** propose research findings as patents, copyrights, trademarks and other IPR.

**Board of Studies (BoS):** 14th BoS of Department of Chemistry held

**Academic Council:** 24th ACM held on

on 17.07.2025 26.08.2025

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PSO1 | PSO2 | PSO3 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | H | H | | | | M | | H | | |
| **CO2** | | H | | M | M | H | H | | H | H |
| **CO3** | | H | | | M | | | M | M | |
| **CO4** | | | H | | | | M | | | |
| **CO5** | H | | | | | H | M | | | H |

*** Legend: L – Low (1), M – Medium (2), H – High (3).**

SDG 4: Quality Education

SDG 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

SDG 11: Sustainable Cities and Communities

SDG 15: Life on Land

Statement:

The understanding of concepts of high quality research, innovative thinking, knowledge on sustainable development and service to the society and mankind through quality research.

| ENF 6281 | PROFESSIONAL COMMUNICATION | L | T | P | C |
|---|---|---|---|---|---|
| SDG: 4 & 8 | | 0 | 0 | 2 | 1 |

**COURSE OBJECTIVES:**

**COB1:** To introduce the fundamentals of professional communication in workplace contexts.

**COB2:** To develop structured presentation and public speaking skills.

**COB3:** To develop students' proficiency in written correspondence, including emails, and reports.

**COB4:** To enhance awareness and use of body language in professional settings

**COB5:** To instil appropriate workplace etiquette and digital professionalism.

**MODULE I COMMUNICATION AT THE WORKPLACE P: 6**

Language and communication fundamentals, Types of workplace communication, Formal and informal Communication, Direction and flow of Communication- Organizational communication and interpersonal dynamics, 7 Cs of Communication - Ethical use of AI assisted communication tools

**MODULE II PRESENTATION & PUBLIC SPEAKING SKILLS P: 6**

Importance of presentation skills, Managing public speaking anxiety, Structured planning and delivery of presentations, Use of visual aids and technology - Interactive tools

**MODULE III CORRESPONDENCE AT WORK P: 9**

Digital correspondence - Email Writing and Etiquette, Report Writing: Incident Reports, Feasibility Reports, and Executive Summaries

**MODULE IV BODY LANGUAGE P: 5**

Fundamentals of body language in professional communication, Types of non-verbal cues, posture -Interpreting and responding to non-verbal signals in

interpersonal and group contexts, Cultural variations in body language and their implications in global communication

**MODULE V WORKPLACE ETIQUETTE P: 4**

Workplace etiquette, Cultural sensitivity in globalized work environments, Gender sensitivity and inclusivity, DEI, Netiquette and digital professionalism - video conferencing, Professional networking (Social media, LinkedIn, etc.), Virtual team dynamics

**P – 30; Total Hours:30**

**TEXT BOOKS:**

1. Course material by the Department of English

**REFERENCES:**


3. Bovee, C. L., & Thill, J. V. *Business Communication Today* (14th ed.). Pearson, 2021.
4. Cardon, P. W., & Marshall, B. The hype and reality of social media use for work collaboration and team communication. *International Journal of Business Communication*, 52(3), 2015, 273–293.
5. Guffey, M. E., & Loewy, D. *Essentials of Business Communication* (11th ed.). Cengage Learning, 2020.
6. Jones, D. A., & Pittman, M. The digital professionalism paradox: Workplace norms and expectations in the era of online communication. *Journal of Applied Communication Research*, 49(3), 2021, 283–301.
7. Keyton, J., & Smith, F. L. M. Communication practices of work teams: Task, social, and identity functions. *Journal of Business Communication*, 46(4), 2009, 402–426.
8. Krizan, A. C., Merrier, P., Logan, J., & Williams, K. *Business Communication* (9th ed.). Cengage Learning, 2016.
9. Lesikar, R. V., Flatley, M. E., Rentz, K., & Lentz, P. *Lesikar's Business Communication: Connecting in a Digital World* (13th ed.). McGraw-Hill Education, 2019.
10. Madlock, P. E. The link between leadership style, communicator competence, and employee satisfaction. *Journal of Business Communication*, 45(1), 2008, 61–78.
11. Raman, M., & Sharma, S. Technical communication: Principles and practice (3rd ed.). Oxford University Press, 2015.

12. Robles, M. M. Executive perceptions of the top 10 soft skills needed in today's workplace. *Business Communication Quarterly*, 75(4), 2012, 453–465. https://doi.org/10.1177/1080569912460400

**COURSE OUTCOMES:**

On completion of the course, students will be able to

**CO1:** Demonstrate clarity in professional communication by selecting appropriate modes and formats for workplace interactions.

**CO2:** Deliver structured presentations with confidence, using relevant verbal and visual communication techniques.

**CO3:** Produce clear and effective written correspondence, including emails, and formal reports.

**CO4:** Interpret and apply non-verbal communication cues appropriately in professional contexts.

**CO5:** Exhibit workplace etiquette, digital conduct, and cultural sensitivity in professional environments.

**Board of Studies (BoS):**

18th BoS of the Department of English held on 04.06.2025

**Academic Council:**

24th AC held on 26.08.2025

| | PO1 | PO2 | PO3 | PO4 | PO5 |
|---|---|---|---|---|---|
| CO1 | | | | | |
| CO2 | | | | | |
| CO3 | | | | | |
| CO4 | | | | | |
| CO5 | | | | | |

**Legend: L – Low (1), M – Medium (2), H – High (3).**

**SDG 4:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all

**Statement:** This course ensures that the students acquire quality education and are also made eligible to obtain productive and decent employment.

**SDG 8:** Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all

**Statement:** This course equips students with the competencies required for employment in a dynamic global workforce.

| MAF 6206 | MINI PROJECT | L | T | P | C |
|---|---|---|---|---|---|
| SDG: 11 | | 0 | 0 | 6 | 3 |

**COURSE OBJECTIVES:**

**COB1:** To understand and analyze actuarial problems.

**COB2:** To apply actuarial models and tools in practice.

**GENERAL GUIDELINES:**

- The Mini Project will include a mid-semester presentation and an end-semester presentation. The mid-semester presentation will focus on the identification of actuarial or risk-related problems based on current industry trends, along with a preliminary analysis of the problem using appropriate actuarial, statistical, or financial techniques.
- Students may choose minor but relevant issues in the actuarial science domain for their mini project. Topics may include, but are not limited to, insurance product design, risk assessment, mortality, or morbidity analysis, reserving techniques. The project may involve data analysis, validation of existing models, simulation studies, or empirical investigations using real or simulated datasets.
- The end-semester presentation shall be supported by a detailed project report, which must clearly describe the problem statement, objectives, data sources, assumptions, methodology adopted, actuarial models used, analysis performed, results obtained, and conclusions. The report should also highlight the practical relevance of the study to the actuarial profession.
- The departmental committee will monitor the continuous assessment of the Design Project.

**COURSE OUTCOMES:**

At the end of the Project, the students will be able to

**CO1:** identify and analyze real-world actuarial problems

**CO2:** Use actuarial models, data, and tools for decision-making.

**CO3:** Improved technical reporting and presentation skills

**Board of Studies (BoS) :**
17th BOS of Department of Mathematics and Actuarial Science held on 23.06.2025.

**Academic Council:**
24th ACM held on 26.08.2025

| | PO1 | PO2 | PO3 | PO4 |
|---|---|---|---|---|
| **CO1** | 2 | - | 3 | 1 |
| **CO2** | 2 | - | 3 | 2 |
| **CO3** | - | 3 | - | - |

Note: 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

**SDG 11:** Make cities and human settlements inclusive, safe, resilient and sustainable.

**Statement:** A holistic understanding of risk and uncertainty, supported by actuarial modeling and data analysis, is essential for sustainable financial decision-making.

**SEMESTER III**

| | | | | | |
|---|---|---|---|---|---|
| **MAF 7101** | **APPLICATIONS OF LIFE CONTINGENCIES** | **L** | **T** | **P** | **C** |
| **SDG: 4** | | **3** | **1** | **0** | **4** |

**COURSE OBJECTIVES:**

**COB1:** To familiarize with data analysis and cash flow modeling.

**COB2:** To study mortality profit using DSAR, EDS, and ADS values.

**COB3:** To apply decrement models for future risk assessment.

**COB4:** To explore unit-linked policies and evaluate profit-testing cashflows.

**COB5:** To understand profit testing and pricing in setting insurance reserves.

**MODULE I SIMPLE ANNUITIES AND ASSURANCES INVOLVING TWO LIVES 9+3**

Simple annuities and assurances involving two lives – Random variables to describe joint life functions – Determining simple probabilities involving two lives – Determining present values involving two lives – 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 value of annuities payable m times a year – Premium conversion relationships.

**MODULE II MORTALITY PROFIT 9+3**

Mortality profit – Death strain at risk (DSAR) – Expected death strain (EDS) for a single policy – Actual death strain (ADS) for a single policy – Mortality profit.

**MODULE III COMPETING RISKS 9+3**

Competing risks **–** Multiple state modeling – Valuing benefits upon competing risks – Multiple decrement tables – Multiple decrement service table for pensions calculations – Updating a service table – Multiple decrement table rates under the assumption of uniformity in the single decrement tables – Consistency with the multiple state approach.

**MODULE IV UNIT-LINKED &PROFIT TESTING 9+3**

Unit-linked contracts – Evaluating expected cashflows for various contract types-profit tests for annual premium contracts – Determining premiums using a profit test – Evaluating expected cash flows for various contract – Profit tests for annual premium contracts – Profit testing using the present value random variable – Pricing using a profit

test.

**MODULE V RESERVING ASPECT OF PROFIT TESTING 9+3**

Determining reserves using profit testing – Pricing and reserving bases – Determining reserves for a unit – Linked policy using cash flow techniques – Determining reserves for a conventional policy using cash flow techniques – Effect of pricing and reserving bases on a profit test.

**L – 45; T – 15; TOTAL – 60**

**REFERENCES:**


1. B H Smith, “Contingencies of Value”, Harvard University Press, 1988.
2. Alistair Neil, “Life Contingencies”, Butterworth-Heinemann Ltd; illustrated Edition (1977).
3. Griffith Davis, “Table of Life Contingencies”, Longman &Co, 1825: University of California Library.
4. Micheal M Parmenter, “Theory of Interest and Life contingencies with Pension”, 3rd Edition.
5. Bowers, Newton L *et al*. – “Actuarial mathematics”, 2nd Edition. – Society of Actuaries, 1997.
6. Benjamin, Bernard; Pollard, John H. – “The analysis of mortality and other actuarial statistics”,3rd Edition. – Faculty and Institute of Actuaries, 1993.
7. Gerber, Hans U. – “Life insurance mathematics”,3rd Edition. – Springer. Swiss Association of Actuaries, 1997.


**COURSE OUTCOMES:** On completion of the course the students will be able to

- **CO1:** identify and use straightforward functions involving two lives.
- **CO2:** estimate the mortality profit or loss for a group of policies**.**
- **CO3:** to analyze actuarial models for cash flows dependent on competing risks.
- **CO4:** examine discounted cost techniques for pricing, reserving.
- **CO5:** perform the profit testing for ULIP.

**Board Of Studies (BOS):**
17th BOS of Department of Mathematics and Actuarial Science held on 23.06.2025.

**Academic Council:**
24th ACM held on 26.08.2025

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CO1** | H | - | - | - | - | - | - |
| **CO2** | - | - | H | - | - | - | - |
| **CO3** | - | H | - | - | M | - | - |
| **CO4** | - | - | - | H | - | - | H |
| **CO5** | - | - | - | - | - | L | - |

*** Legend: L – Low (1), M – Medium (2), H – High (3).**

**SDG 4:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

This course provides basic financial mathematics concepts for calculating interest, present and accumulated values, and loan.

| MAF 7102 | FINANCIAL ECONOMICS | L | T | P | C |
|---|---|---|---|---|---|
| SDG: 4 | | 3 | 1 | 0 | 4 |

**COURSE OBJECTIVES:**

- **COB1:** To introduce the efficient market hypothesis and economic models.
- **COB2:** To study stochastic dominance and utility theory in consumer choice.
- **COB3:** To understand the risk measures and utility-based decision models.
- **COB4:** To formulate asset pricing models using portfolio theory.
- **COB5:** To develop knowledge of Brownian motion, martingales, SDEs, and the Ornstein–Uhlenbeck process.

**MODULE I EFFICIENT MARKET HYPOTHESIS & CONSUMER CHOICE THEORY 9+3**

The three forms of the efficient market hypothesis –Utility theory – Measuring risk aversion – Construction of utility functions – Stochastic dominance – Relationship between dominance concepts and utility theory – Behavioural finance.

**MODULE II MEASURES OF INVESTMENT RISK 9+3**

Measures of investment risk – Measures of risk – Variance of return – Semi-variance of return – Shortfall probabilities – Value at risk – Tail value at risk (TailVar) and expected shortfall – Relationship between risk measures and utility functions.

**MODULE III PORTFOLIO THEORY 9+3**

Portfolio theory – Lagrangian function – Benefits of diversification – Models of asset returns – Multifactor models – Macroeconomic factor models – Fundamental factor models –Statistical factor models – Construction of models – The single-index model – The capital asset pricing model (CAPM) – Limitations of CAPM – Arbitrage pricing theory.

**MODULE IV BROWNIAN MOTION AND MARTINGALES 9+3**

Introduction to brownian motion – Standard brownian motion- Properties of brownian motion – Geometric brownian motion – Martingales – Martingales in discrete time – Martingales in continuous time.

**MODULE V STOCHASTIC CALCULUS 9+3**

Stochastic calculus – The Ito Integral – Ito's lemma – Stochastic differential equations – Diffusion and Ito process models – The Ornstein-Uhlenbeck process.

**L – 45; T – 15; TOTAL – 60**

**REFERENCES:**


1. Baxter, Martin & Andrew Rennie, Financial calculus; "An introduction to derivative pricing", Cambridge University Press, 1996.
2. Panjer, Harry H (ed), "Financial economics: with applications to investments, insurance and pensions", The Actuarial Foundation, 1998.
3. Elton, Edwin J, Martin J Gruber, Stephen J Brown, & William N Goetzmann, "Modern portfolio theory and investment analysis" (6th edition), John Wiley, 2003.
4. Hull, John C, "Options, futures and other derivatives" (5th edition), Prentice Hall, 2002.


**COURSE OUTCOMES:** On completion of the course the students will be able to

**CO1:** identify EMH forms and utility theory in behavioral finance.

**CO2:** discuss pros and cons of various investment risk measures.

**CO3:** describe properties of single and multifactor asset return models.

**CO4:** evaluate asset pricing models, assumptions, and limitations.

**CO5:** apply key concepts of Brownian motion, martingales, and the Itô integral.

**Board Of Studies (BOS):**

17th BOS of Department of Mathematics and Actuarial Science held on 23.06.2025.

**Academic Council:**

24th ACM held on 26.08.2025

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | - | - | - | M | - | - | - |
| CO2 | - | - | H | - | - | - | - |
| CO3 | - | H | - | - | M | - | - |
| CO4 | - | - | - | - | - | - | H |
| CO5 | L | - | - | - | - | - | |

*** Legend: L – Low (1), M – Medium (2), H – High (3).**

**SDG 4:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Financial Economics covers investment risk, portfolio theory, and Brownian motion for valuing securities.

| MAF 7103 | APPLIED STATISTICAL METHODS IN | L | T | P | C |
|---|---|---|---|---|---|
| SDG: 4 | ACTUARIAL SCIENCE | 3 | 1 | 0 | 4 |

**COURSE OBJECTIVES:**

**COB1:** To study ruin probability and reinsurance impact.

**COB2:** To apply Individual risk model and collective risk model.

**COB3:** To impart run-off methods for future claim estimation.

**COB4:** To explore the four main linear univariate time series models.

**COB5:** To construct Multivariate time series models and Bilinear models.

**MODULE I RUIN THEORY 9+3**

Ruin theory – Surplus process – Probability of ruin in continuous time – Probability of ruin in discrete time – Probability of ruin in the short term – Premium security loadings – Reinsurance.

**MODULE II RISK MODEL 9+3**

Risk models – General features of a product – Insurable interest – Insurable risk – Product liability – Property damage – Financial loss – Fixed benefits – Models for short term insurance contracts – Collective risk model – Aggregate claim distributions under proportional and excess of loss reinsurance – Individual risk model – Parameter variability/uncertainty.

**MODULE III RUN-OFF TRIANGLES 9+3**

Run-off triangles – Projections using development factors – Run-off patterns – Chain ladder method – Model checking – Adjusting for inflation – Inflation adjusted chain ladder method – Average cost per claim method – Loss ratios – Bornhuetter-Ferguson method.

**MODULE IV TIME SERIES – I 9+3**

Time series – Properties of a univariate time series – Stationary random series – Main linear models of time series – Autoregressive process (AR) – Moving average process (MA) – Autoregressive moving average process (ARMA) – ARIMA Model.

**MODULE V TIME SERIES – II 9+3**

Compensating for trend and seasonality – Identification of MA (q) and AR (p) models – Box-Jenkins method – Forecasting – Multivariate time series models – Bilinear

models –Threshold autoregressive models – Random coefficient autoregressive models –Autoregressive models with conditional heteroscedasticity.

**L – 45; T – 15; TOTAL – 60**

**REFERENCES:**


1. Dobson, Annette J, “An introduction to statistical modeling”,Chapman & Hall, 1983.
2. Hossack, Ian B; Pollard, John H; Zehnwirth, Benjamin,“Introductory statistics with applications in general insurance”,2nd Edition, Cambridge University Press, 1999.
3. Klugman, Stuart A, Panjer, Harry H,Willmot, Gordon E, Venter, Gary G. “Loss models: from data to decisions”, John Wiley & Sons, 1998.
4. Daykin, Chris D; Pentikainen, Teivo; Pesonen, Martti. “Practical risk theory for actuaries” - Chapman & Hall, 1994.
5. Critian P Robert, “Monte Carlo Statistical Methods”, 2nd Edition, Springer,Verlag.
6. George W Snedecor, “Statistical Methods”, 8th Edition, Iowa State University Press.
7. G.S. Maddala C.R Rao, “Statistical methods in Finance”, Jan 1996, Elsevier Science and technology.
8. Philip J Boland, “Statistical and Probabilistic Methods in Actuary Science”, Chapman & Hall Press, 2007.


**COURSE OUTCOMES:** On completion of the course the students will be able to

**CO1:** summarize the main features of a data set (exploratory data analysis).

**CO2:** explain the concepts of probability.

**CO3:** compute distributions, expectation, and variance.

**CO4:** enumerate independence, joint distributions, and generating functions.

**CO5:** state the central limit theorem, and apply it.

**Board Of Studies (BOS):**

17th BOS of Department of Mathematics and Actuarial Science held on 23.06.2025.

**Academic Council:**

24th ACM held on 26.08.2025

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | - | - | - | - | - | L | - |
| CO2 | - | - | H | - | - | - | - |
| CO3 | - | H | - | - | M | - | - |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CO4** | M | - | - | - | - | - | - |
| **CO5** | - | - | - | M | - | - | - |

*** Legend: L – Low (1), M – Medium (2), H – High (3).**

**SDG 4:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

This subject provides foundation in general insurance pricing, reserving.

| MAF 7104 | SURVIVAL MODELS | L | T | P | C |
|---|---|---|---|---|---|
| SDG: 4 | | 3 | 1 | 0 | 4 |

**COURSE OBJECTIVES:**

- **COB1:** To introduce survival probabilities using life expectancy functions.
- **COB2:** To explore Lifetime distribution function.
- **COB3:** To impart models to estimate the regression parameters (Cox Model).
- **COB4:** To study the concept of exposed to risk calculation for different ages.
- **COB5:** To enhance the smoothness and effectiveness of graduation.

**MODULE I SURVIVAL MODELS 9+3**

Survival models and the life table – Future lifetime – Probabilities of death and survival – Force of mortality $\mu_x$ – Survival probabilities – Probability density function of $T_x$ – Initial rates and central rates of mortality – Complete and curtate expectation of life – Gompertz' and Makeham's laws – Calculating the parameter values – Survival probabilities.

**MODULE II ESTIMATING THE LIFETIME DISTRIBUTION FUNCTION 9+3**

Estimating the lifetime distribution function – Kaplan-Meier and Nelson-Aalen models –Statistical Inference – Censoring mechanisms – Kaplan-Meier (product-limit) estimator – Comparing lifetime distributions – Nelson-Aalen estimate – Relationship between the Kaplan-Meier and Nelson-Aalen estimates.

**MODULE III THE COX REGRESSION MODEL 9+3**

Cox regression model – Fully parametric models – Parametric models for the hazard function-Covariates – Cox Model – Estimating the regression parameters – Partial likelihood-Model fitting.

**MODULE IV EXPOSED TO RISK 9+3**

Exposed to risk – Homogeneity – The principle of correspondence – Exact calculation of $E_x^c$ – Census approximations to $E_x^c$ – Different definitions of age.

**MODULE V GRADUATION AND STATISTICAL TESTS 9+3**

Graduation – Desirable features of a graduation – Testing the smoothness of a graduation – Statistical tests of a mortality experience-Chi square ($\chi^2$) test – Standardised deviations test – Signs test – Cumulative deviations – Grouping of signs test – Serial correlations test –Testing actual versus expected rates.

**L – 45; T – 15; TOTAL – 60**

**REFERENCES:**


1. Vlamidir I Rotar, “Actuarial Models”, Chapman & Hall, 2006.
2. Elke Korn, Ralf Korn, “Monte Carlo Simulation of financial and Actuarial model”, Chapman & Hall, (Feb 2010).
3. Dick London, “Survival models and their estimation”, ACTEX Publication. 1998.
4. A.C. Davison, “Statistical models”, Cambridge University Press, 2008.
5. Regina C, Elandt Johnson, “Survival models and data Analysis”, Wiley, Inter science, 1999.


**COURSE OUTCOMES:** On completion of the course the students will be able to

**CO1:** explain survival models and lifetime distribution estimation.

**CO2:** describe lifetime distribution estimation using Kaplan-Meier and Nelson-Aalen estimators.

**CO3:** explore proportional hazards models for covariate effects.

**CO4:** estimate transition intensities dependent on age (exact or census).

**CO5:** enumerate reasons and properties of graduated estimates.

**Board Of Studies (BOS):**

17th BOS of Department of Mathematics and Actuarial Science held on 23.06.2025.

**Academic Council:**

24th ACM held on 26.08.2025

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | H | - | - | - | - | - | - |
| CO2 | - | - | H | - | - | - | - |
| CO3 | - | H | - | - | M | - | - |
| CO4 | - | - | - | - | | - | - |
| CO5 | - | - | - | H | | - | H |

*** Legend: L – Low (1), M – Medium (2), H – High (3).**

**SDG 4:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Survival Models provides a foundation for estimating mortality and modeling premiums.

| MAF 7105 | ACTUARIAL COMPUTATIONAL | L | T | P | C |
|---|---|---|---|---|---|
| SDG: 4 | LABORATORY | 0 | 0 | 4 | 2 |

**(Python)**

**COURSE OBJECTIVES:**

**COB1:** To understand the basics of python programming and its functions.

**COB2:** To learn about strings and their various types in python.

**COB3:** To explore different files and lists for reference handling in python.

**COB4:** To apply tuples in the development and manipulation of dictionaries.

**COB5:** To perform basic statistical calculations using Python.

**MODULE I PYTHON BASICS AND FUNCTIONS 6**

Variables – Operators – Statements – Getting in Puts – Boolean conditions – Alternative, chained and nested conditions – Catching expectations – Function calls – Built-in Functions – Type conversion function and Math Function – Creating new functions, parameters and arguments – Need for functions.

**MODULE II STRINGS 6**

Traversal through Strings – String slice – looping and counting in strings – The in operator – String comparison – String methods – Parsing strings – Format operator.

**MODULE III FILES AND LISTS 6**

Opening files – Text files – Reading files – Searching through files – Selecting files names from user – Writing files – Traversing list – List operations – List slice – List methods – Deleting elements – Built – In list functions – Objects, Value, Aliasing – List arguments.

**MODULE IV DICTIONARIES AND TUPLES 6**

Dictionaries – Files and dictionaries – Looping and dictionaries – Advanced text processing – Tuples – Comparing tuples – Tuple assignments – Dictionaries and tuples – Tuples as keys in dictionaries.

**MODULE V STATISTICS IN PYTHON 6**

Types of measures – Central tendency - Quartile – Population and samples – Basic statistical packages – Basic statistical modelling.

**P – 60; TOTAL – 60**

**REFERENCES:**


1. Nischay Kumar Hegde, “Python Programming Fundamentals”, A beginners Hand book, 2018.
2. Charles R. Severance, Python for Everybody, “Exploring data using Python 3”, Schroff Publishers, 1st Edition, 2017.
3. Allen Downey, Think Python, “How to think like a computer scientist”, Schroff O’Reilly Publishers, 2nd Edition, 2016.


**COURSE OUTCOMES:** On completion of the course the students will be able to

**CO1:** apply basic function of python.

**CO2:** use the strings to control the flow.

**CO3:** perform the task for different type of data sets.

**CO4:** utilize the dictionaries and tuples.

**CO5:** perform basic statistical modeling.

**Board Of Studies (BOS):**

17th BOS of Department of Mathematics and Actuarial Science held on 23.06.2025.

**Academic Council:**

24th ACM held on 26.08.2025

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | - | M | - | - | - | - | - |
| CO2 | - | - | H | - | - | - | - |
| CO3 | - | H | - | - | M | - | |
| CO4 | - | - | - | M | | - | M |
| CO5 | M | - | - | - | | - | - |

*** Legend: L – Low (1), M – Medium (2), H – High (3).**

**SDG 4:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

Python lab provides practical knowledge of technical tools for actuarial calculations.

| MAF 7106 | INDUSTRY INTERNSHIP | L | T | P | C |
|---|---|---|---|---|---|
| SDG: 9 &11 | | 0 | 0 | 4 | 2 |

**GENERAL GUIDELINES:**

- The internship carries two credits with a minimum duration of 30 days.
- Students are encouraged to pursue an Internship in actuarial and allied domains, such as insurance companies (life, general, health), reinsurance firms, pension and retirement benefit organizations, risk management and consulting firms, financial institutions, during the summer vacation after the first year of study.
- Prior to the commencement of the internship, students must obtain permission from the Head of the Department. Students shall submit a detailed internship report at the beginning of the III Semester, describing the nature of work carried out and the actuarial concepts, models, tools, and professional practices learned during the internship period.
- The student shall also submit the internship completion certificate issued by the Industry/ Research Organization / Academic Institution along with confidential feedback provided by them (in a specified format) in a sealed cover to the Class Advisor.
- A committee comprising of faculty members constituted by the Head of the Department / Dean of School shall evaluate the Internship report, and shall conduct internship midterm reviews in the III semester of study followed by semester end oral examination.
- The weightage of marks for the internship assessment shall be 60% for the internship report and 40% for the viva-voce examination.
- Based on the evaluation of the internship report and the student's performance in the end-semester oral examination, a relative grade shall be awarded.

**COURSE OUTCOMES:**

At the end of the internship, the students will be able to

CO1: Understand key activities in actuarial and financial organizations.

CO2: Apply actuarial knowledge to real-world problems.

CO3: Provide practical suggestions for problem-solving.

CO4: Demonstrate communication and report-writing skills.

**P – 60; TOTAL – 60**

**Board of Studies (BoS) :** 17th BOS of Department of Mathematics and Actuarial Science held on 23.06.2025.

**Academic Council:** 24th ACM held on 26.08.2025

| | PO1 | PO2 | PO3 | PO4 |
|---|---|---|---|---|
| **CO1** | 2 | - | 2 | 2 |
| **CO2** | 2 | - | 3 | 2 |
| **CO3** | 2 | - | 2 | 2 |
| **CO4** | - | 3 | 2 | - |

**Note:** 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

SDG — 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

SDG - 11: Make cities and human settlements inclusive, safe, resilient and sustainable

Statement: The industry internship provides a holistic understanding of actuarial science, enabling students to apply actuarial principles for sound and sustainable financial decisions.

| MAF 7201 | PROJECT WORK (PHASE I) | L | T | P | C |
|---|---|---|---|---|---|
| SDG: 11 | | 0 | 0 | 8 | 4* |

**COURSE OBJECTIVE:**

The project work aims to provide students an opportunity to demonstrate their ability to execute a study involving actuarial analysis, modeling, risk assessment, or data-driven problem-solving in the actuarial domain.

**GENERAL GUIDELINES:**

- At post-graduate level, project work shall be carried out by the student individually.
- The students are encouraged to execute their project work (Phase I & II) in collaboration with Industry, R&D organization, Eminent Academic Institutions etc.
- The students will be given opportunity to select a project topic of his/her interest and are advised to interact with potential faculty members to discuss their project ideas for better understanding.
- A project coordinator is identified in the beginning of III semester for every batch who coordinates various activities viz. dissemination of research thrust areas of structural engineering domain, faculty expertise, allocation of project guides, conduct of periodic reviews and monitoring the performance of the students throughout the project period.
- The project guide is nominated based on the preference of students and consent of the faculty concerned.
- The Project work Phase — I, shall be carried out by the students under the guidance of allotted Guide.
- In case, the students pursuing their project in the Industry / R & D organization / Eminent academia, a competent person from the project offering organization is assigned as co-guide as per the discretion of the head of the firm, in addition to the Department allotted guide.
- In the Project work — Phase I, the students are expected to identify the project topic, refer related literatures / data / information to identify the research problem (i.e., need for the present study). The students shall conduct meticulous literature review to identify the research gap, and frame the objectives to address the same.
- The students are encouraged (i) to frame the methodology to achieve the desired objectives, (ii) to conduct study on properties of various materials used in the study as per relevant codal provisions, (iii) to acquire knowledge on relevant

software (if applicable) to conduct analytical investigation, (iv) to acquire knowledge on various experiments / techniques to conduct experimental experimentation etc.

- The Head of the Department / Dean of School shall constitute a project progress review committee comprising competent senior faculty members as members to continuously monitor the progress made by students during the Project Phase I.
- The project coordinator shall arrange to conduct three progress review meetings to ascertain the progress of the work and award the marks based on the performance on expected metrics.
- At the end of phase –I period, students shall submit a project report covering the various aspects of project work. The typical components of the project report in Phase I shall objectives, include Introduction, Need for the present study, scope for investigation, literature review and methodology.
- An oral examination (viva voce) shall be conducted as semester end examination. The weightage for periodic reviews shall be 50%. Of the remaining 50%, 20% shall be for the project report and 30% for the viva voce examination.
- The project co-ordinator shall arrange for final viva-voce examination to ascertain the overall performance in Project work.

**COURSE OUTCOMES:**

On completion of the course, students will be able to

CO1: Identify actuarial or risk-related research problems, review literature, and frame objectives and methodology.

CO2: Conduct analytical or application-oriented actuarial research using relevant models, tools, or data.

CO3: Demonstrate effective communication and professional report-writing skills.

**P – 120; TOTAL – 120**

**Board of Studies (BoS) :**

17th BOS of Department of Mathematics and Actuarial Science held on 23.06.2025.

**Academic Council:**

24th ACM held on 26.08.2025

| | PO1 | PO2 | PO3 | PO4 |
|---|---|---|---|---|
| **CO1** | 2 | - | 3 | 1 |
| **CO2** | 2 | - | 3 | 2 |
| **CO3** | - | 3 | - | - |

**Note:** 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

SDG - 11: Make cities and human settlements inclusive, safe, resilient and sustainable.

Statement: Holistic understanding of risks, financial systems, and actuarial models, supported by analytical investigation, is essential for sound and sustainable decision-making.

**SEMESTER – IV**

| | | | | | |
|---|---|---|---|---|---|
| **MAF 7201** | **PROJECT WORK (PHASE II)** | **L** | **T** | **P** | **C** |
| **SDG: 11** | | **0** | **0** | **24** | **8** |

**COURSE OBJECTIVE:**

The project aims to provide students an opportunity to demonstrate their ability to execute a study involving actuarial analysis, modeling, risk assessment, or data-driven problem-solving in the actuarial domain.

**GENERAL GUIDELINES:**

- Project work phase II is a continuation of phase I following the same guidelines.
- The project co-coordinator shall arrange to conduct three reviews to ascertain the progress of the work and award the marks based on the performance of students on desired metrices.
- Detailed experimental investigation and in-depth analytical study shall be performed in line with the objectives of the investigation.
- The students are expected to analyze the obtained results and discuss the same in an elaborate manner by preparing necessary charts/tables/curves to get an inference.
- The important conclusions need to be drawn and the scope for further research also to be highlighted.
- The outcome of project work shall preferably be published in journals/conference of National or International importance.
- At the end of project phase II, students shall submit a detailed report and it shall include Experimental investigation and analytical study, Results & Discussion of experimental/analytical work, Conclusions, References etc., in addition to work completed in Phase –I viz. Introduction, Literature and methodology.
- The project co-ordinator in consultation with Dean/ Head of the department and Controller of Examination shall arrange for a semester end oral examination by following SOP of the Institution to ascertain the overall performance of the students in Project work.
- The weightage for periodic reviews shall be 50%. Of the remaining 50%, 20% shall be for the project report and 30% for the viva voce examination.

**COURSE OUTCOMES:** On completion of the course, students will be able to

CO1: Interpret actuarial and financial data using critical thinking and analytical techniques.

CO2: Provide conclusions and recommendations for actuarial problems with emphasis on professional ethics, societal impact, and sustainable financial practices.

CO3: Demonstrate effective communication and report-writing skills

**P – 360; TOTAL – 360**

**Board of Studies (BoS) :**

17th BOS of Department of Mathematics and Actuarial Science held on 23.06.2025.

**Academic Council:**

24th ACM held on 26.08.2025

| | PO1 | PO2 | PO3 | PO4 |
|---|---|---|---|---|
| **CO1** | 3 | - | 3 | 3 |
| **CO2** | 2 | - | 2 | 2 |
| **CO3** | - | 3 | - | - |

**Note:** 1 - Low Correlation 2 - Medium Correlation 3 - High Correlation

SDG - 11: Make cities and human settlements inclusive, safe, resilient and sustainable.

Statement: Holistic understanding of risks, financial systems, and actuarial models, supported by analytical study, is essential for sound and sustainable decision-making.

## LIST OF ELECTIVES

| | | | | | |
|---|---|---|---|---|---|
| **MAFY 01** | **FINANCIAL MANAGEMENT OF LIFE OFFICE** | **L** | **T** | **P** | **C** |
| **SDG: 4** | | **3** | **0** | **0** | **3** |

**COURSE OBJECTIVES:**

- **COB1:** To introduce ethics and scientific methods in managing insurance finances.
- **COB2:** To understand actuaries role in managing company finances.
- **COB3:** To provide knowledge on maintaining company accounts, expenditure, and budgeting.
- **COB4:** To manage the asset types of the life insurance companies.
- **COB5:** To maintain company's reversionary and terminal bonuses.

**MODULE I ETHIC OF FINANCIAL MANAGEMENT 9**

Financial Management development – Scientific management – Management vs administration, ethics in management – Social responsibilities of managers-roles & responsibilities – Duties.

**MODULE II ROLE OF ACTUARY 9**

Role of actuary – Investment policy – Product pricing and design control cycle – Profit testing – Model office and uses – Analysis of surplus – Marketing – Underwriting and reinsurance policies – Reserving – Profit distribution – Sales policy – Surrender and transfer policy.

**MODULE III LIABILITY AND FISCAL RESPONSIBILITY 9**

Liability and fiscal responsibility – Budgeting – Financial ledgers – Accounts expenditure requests – Petty cash – Limited purchase orders (LPO) – Direct pay/cheque request – Journal vouchers – Funding opportunities – Resources and services.

**MODULE IV ASSET TYPES OF LIFE COMPANIES 9**

Reversionary and terminal bonuses – Solvency for a life insurance company – Mechanical and model based solvency margins – Fair values of life insurance liabilities.

**MODULE V REVERSIONARY AND TERMINAL BONUSES 9**

Asset types of life companies – Insurer's liabilities – Surplus on portfolio of

insurance –Nonprofit premiums – Owner ship of surplus and types of bonus system – Asset shares and uses.

**L – 45; T – 0; TOTAL – 45**

**REFERENCES:**


1. Peter J Booth, “Modern Actuary Theory and Practice”, 2nd Edition (2004) CRC Press.
2. David C. M. Dickson, Mary R. Hardy and Howard R. Waters, “Actuarial Mathematics for Life Contingent Risks”, 3rd Edition, Cambridge University Press, 2019
3. J David Cummins, “Financial management of Life Insurance Companies”, June 1993, Huebner International.


**COURSE OUTCOMES:** On completion of the course the students will be able to

**CO1:** understand the ethic of financial management.

**CO2:** explain the role of actuary and their work.

**CO3:** explain the Liability and fiscal responsibility of financial manager.

**CO4:** explain what are the asset and liabilities of insurance companies.

**CO5:** differentiate the different type of bonuses.

**Board Of Studies (BOS):**

17th BOS of Department of Mathematics and Actuarial Science held on 23.06.2025.

**Academic Council:**

24th ACM held on 26.08.2025

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | M | - | - | - | - | - | - |
| CO2 | - | - | H | - | - | - | - |
| CO3 | - | H | - | - | M | - | - |
| CO4 | - | - | - | - | - | - | M |
| CO5 | M | - | - | - | - | - | - |

*** Legend: L – Low (1), M – Medium (2), H – High (3).**

**SDG 4:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

This subject provides the basic idea about the financial management of companies in particular Life insurance companies.

| MAFY 02 | ISLAMIC INVESTMENTS | L | T | P | C |
|---|---|---|---|---|---|
| SDG 4 | | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES:**

- **COB1:** To understand the growth and development of the Islamic Finance.
- **COB2:** To learn the principles of business contracts under Islamic law.
- **COB3:** To explore the concepts of hedging and Islamic derivatives
- **COB4:** To gain knowledge of Islamic Insurance (Takaful).
- **COB5:** To understand the fundamentals of Islamic Asset Management.

**MODULE I ISLAMIC INVESTMENT AND GLOBAL TRENDS 9**

Islamic finance – Growth of Islamic finance industry – Expansion of sharia-compliant Investment products – Fintech and Islamic investment – International collaboration and standardization.

**MODULE II ISLAMIC LAW 9**

Objectives and sources of Islamic law – Principle of business contracts in Islamic law – Islamic banking models.

**MODULE III ISLAMIC DERIVATIVES 9**

Hedging and Islamic derivatives – Islamic bonds (sukuk) – Islamic fund management – Islamic structured products – Risk management for Islamic funds, derivatives, structured products.

**MODULE IV ISLAMIC INSURANCE 9**

Islamic insurance (takaful) – Introduction –Takaful models and mechanism – Reinsurance (Re takaful) – Concerns in the provision of takaful – Business models – Retailing.

**MODULE V ISLAMIC ASSET MANAGEMENT 9**

Islamic asset management – Screening criteria for Islamic equity funds – Islamic Indexes – Equities – Sukuk – Private equity investment – Investing in real estate and leasing funds.

**L – 45; T – 0; TOTAL – 45**

**REFERENCES:**


1. Munawar Iqbal, “A Guide to Islamic Finance”, Risk Books, UK, 2007.
2. Mahmoud A El-Gamal, “Islamic Finance: Law, Economics and Practice” Cambridge university press, 2008.
3. Sohail Jaffar, “Islamic Asset management”, Euromoney books, London, 2006.
4. Michael Mahlknecht, “Islamic capital markets and risk management”, Risk Books UK 2007.
5. Aly Khorshid, “Islamic Insurance”, Routledge Curzon, London, 2004.


**COURSE OUTCOMES:** On completion of the course the students will be able to

**CO1:** demonstrate the concept of Islamic banking models.

**CO2:** use Islamic derivatives to reduce the risk in investment.

**CO3:** enumerate the concept of Islamic insurance.

**CO4:** exhibit the concept of Islamic finance.

**CO5:** explore the concept of Islamic asset management.

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**Academic Council:**

24th ACM held on 26.08.2025

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | - | - | - | - | - | - | - |
| CO2 | - | - | H | - | - | - | - |
| CO3 | L | H | | - | M | - | - |
| CO4 | - | - | - | - | - | - | - |
| CO5 | - | - | - | L | - | - | - |

*** Legend: L – Low (1), M – Medium (2), H – High (3).**

**SDG 4:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

This subject provides the basic idea about Islamic investment in insurance sector and how it differs from other investment.

| MAFY 03 | CORPORATE FINANCE | L | T | P | C |
|---|---|---|---|---|---|
| SDG 4 | | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES:**

- **COB1:** To comprehend the role of various financial institutions in the economic development of the country.
- **COB2:** To explore the applications of derivatives such as options, forwards, and futures.
- **COB3:** To apply asset pricing models through WACC for measuring risk and adjusting the beta coefficient to gear the risk.
- **COB4:** To understand the components of capital structure that impact dividend decisions.
- **COB5:** To perform project appraisal by evaluating and valuing projects using NPV, AP, DPP, and IRR techniques.

**MODULE I FINANCIAL INSTITUTIONS 9**

Government agencies – Stock Exchange – Roles of the Stock Exchange – Derivatives exchanges – Institutional investors – Investment banks – Clearing banks – Building societies – Investment trusts – Unit trusts – Open-ended investment companies (OEICs) – Investment management companies- Self-administered pension schemes – Life insurance companies – General insurance companies.

**MODULE II USE OF DERIVATIVES 9**

Financial futures – Types of futures – Uses of financial futures – Forwards – Options- Types of options – Uses of options – Interest rate and currency swaps – Types of swaps – Uses of swaps.

**MODULE III WEIGHTED AVERAGE COST OF CAPITAL 9**

Importance and definition of WACC – Theoretical background – The traditional view – Modigliani and Miller – Cost of equity – Capital asset pricing model (CAPM) and risk – Specific risk – Systematic risk – Beta as a measure of systematic risk – Adjusting beta for gearing – Measuring beta – Cost of debt – Calculation of WACC.

**MODULE IV CAPITAL STRUCTURE AND DIVIDEND POLICY 9**

Components of capital structure – Aims of the financial manager – Theoretical background to the gearing decision – Factors affecting the gearing decision – Fundamentals of dividend policy – Factors influencing the decision on dividend policy

– Other methods of reward- Scrip or stock dividends – Share buybacks.

**MODULE V CAPITAL PROJECT APPRAISAL 9**

Capital project – Initial appraisal – Evaluation of cash flows – Methods of project evaluation – Net present value (NPV) – Internal rate of return (IRR) – Annual capital charge – Shareholder value approach – Payback period – Nominal returns – Strategic fit – Opportunity cost – Hurdle rates – Receipts/costs ratio – Results of the evaluation – Simulations – Choice of discount rate – Risk analysis – Identification of risks – Analysis of risks – Obtaining a distribution of NPVs in practice – Risk mitigation – Investment submission.

**L – 45; TOTAL – 45**

**REFERENCES:**


1. S A Ross, Wester Field, Jaffe “Corporate Finance” 8th Edition, Mc Graw Hill, 2008.
2. Interpreting company reports and accounts. Holmes, G.; Sugden, A.; Gee, P. 10th Edition, 336 pages. FT Prentice Hall, 2008. ISBN: 978-0273711414.
3. S.R Vishwanath, “Corporate Finance Theory and Practice”, Sage Publications (ca), 2007.
4. IIBF, “International Corporate Finance”, Macmillan (I) Publishing, Delhi, 2007.


**COURSE OUTCOMES:** On completion of the course the students will be able to

**CO1:** explain the basic concepts of corporate finance.

**CO2:** enumerate the various financial institutions and its purpose.

**CO3:** identify the components and factors of capital structure.

**CO4:** classify the factors and important of dividend policies.

**CO5:** show how financial techniques can be used in the assessment of capital investment projects.

**Board of Studies (BOS):**
17th BOS of Department of Mathematics and Actuarial Science held on 23.06.2025.

**Academic Council:**
24th ACM held on 26.08.2025

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | M | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **CO2** | | | H | | | | |
| **CO3** | | H | | | M | | |
| **CO4** | | | | M | | | |
| **CO5** | | | | | | | M |

*** Legend: L – Low (1), M – Medium (2), H – High (3).**

**SDG 4:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

The subject provides the basic idea about corporate finance and capital project appraisal.

| | | | | | |
|---|---|---|---|---|---|
| **MAFY 04** | **MORTALITY PROJECTION AND** | **L** | **T** | **P** | **C** |
| **SDG 4** | **MACHINE LEARNING** | **3** | **0** | **0** | **3** |

**COURSE OBJECTIVES:**

- **COB1:** To explore statistical tests used for evaluating graduation.
- **COB2:** To apply various methods for projecting mortality values such as the lee-carter model and the age-period-cohort model.
- **COB3:** To understand extreme value theory through generalized extreme value (GEV) and generalized pareto distributions.
- **COB4:** To impart knowledge of copulas, their properties, types, and calculations.
- **COB5:** To learn applications of machine learning in supervised and unsupervised learnings and its perspectives.

**MODULE I METHOD OF GRADUATION 9**

Methods of graduation – Graduation by parametric formula – Graduation by reference to a standard table – Comparison of different methods – Statistical tests of a graduation – Effect of duplicate policies.

**MODULE II MORTALITY PROJECTION 9**

Mortality projection – Methods based on expectation, extrapolation and explanation – Lee-Carter model – Age-period-cohort model – Sources of error in mortality forecasts.

**MODULE III EXTREME VALUE THEORY 9**

Extreme events and extreme value theory – Generalised extreme value (GEV) distribution – Generalised Pareto distribution – Measures of tail weight.

**MODULE IV COPULAS 9**

Copulas-Marginal and joint distributions – Properties of copulas – Sklar's theorem – Fundamental copulas – Explicit copulas – Implicit copulas – Choosing and fitting a suitable copula function – Calculating probabilities using copulas.

**MODULE V MACHINE LEARNING 9**

An overview of machine learning – Branches of machine learning – Stages of analysis in machine learning – Applications – Supervised learning –Unsupervised

learning – Perspectives of statisticians, data scientists and other quantitative researchers.

**L – 45; T – 0; TOTAL – 45**

**REFERENCES:**


1. Vlamidir I Rotar, “Actuarial Models” Chapman & Hall, 2006.
2. Elke Korn, Ralf Korn “Monte Carlo Simulation of financial and Actuarial model” Chapman & Hall, (Feb 2010).
3. Dick London, “Survival models and their estimation”, ACTEX Publication. 1998.
4. A.C. Davison, “Statistical models”, Cambridge University Press, 2008.
5. Regina C Elandt Johnson, “Survival models and data Analysis”, Wiley, Inter science, 1999.


**COURSE OUTCOMES:** On completion of the course the students will be able to

**CO1:** explain the method of Graduation.

**CO2:** project the mortality rate.

**CO3:** recognize extreme value distributions, suitable for modelling the distribution of severity of loss and their relationships.

**CO4:** describe how a copula can be characterized.

**CO5:** enlighten and apply.

**Board Of Studies (BOS):**

17th BOS of Department of Mathematics and Actuarial Science held on 23.06.2025.

**Academic Council:**

24th ACM held on 26.08.2025

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | - | - | - | - | - | - | - |
| CO2 | - | - | H | - | - | M | - |
| CO3 | H | - | - | - | - | | H |
| CO4 | - | M | - | - | - | - | - |
| CO5 | - | - | - | H | | - | - |

*** Legend: L – Low (1), M – Medium (2), H – High (3).**

**SDG 4:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

This subject provides the basic idea about the mortality projection and machine learning.

| MAFY 05 | FINANCIAL MARKETS | L | T | P | C |
|---|---|---|---|---|---|
| SDG 4 | | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES:**

**COB1:** To describe the facts of financial markets considering time variations.

**COB2:** Interest rate model, liquidity preference theory, market segmentation theory.

**COB3:** To understand production, investment, and general equilibrium models.

**COB4:** To demonstrate financial risk processes and their measurement.

**COB5:** To study the basics of Islamic trading, finance, capital markets.

**MODULE I FACTS OF FINANCIAL MARKETS 9**

Facts of financial markets – Time variation and business cycle – Equity premiums – Consumption models.

**MODULE II INTEREST RATE MODEL 9**

The rate of interest – Liquidity preference theory – Structure of interest rates – Market segmentation theory – Forward interest rates and yield curve.

**MODULE III PRODUCTION, INVESTMENT AND GENERAL EQUILIBRIUM 9**

Production, investment and general equilibrium – Labour income – Idiosyncratic risk – Challenges for the future.

**MODULE IV FINANCIAL RISK PROCESSES 9**

Financial risk processes – Risk measurement – Team structure dynamics – Financial risk management.

**MODULE V ISLAMIC FINANCE 9**

Islamic banking and finance – Socio economic responses – Resilience and stability – Current developments – Islamic structured products – Islamic capital markets – Trust and wealth managements.

**L – 45; T – 0; TOTAL – 45**

**REFERENCES:**

1. John H Cochrane, “Financial markets and the real economy “, Now

Publishers, Oct 2005.

2. Don K Mak, “The science of financial market trading”, World Scientific, 2003.
3. Keith Pilbeam ,“Finance and Financial Markets” 2nd Edition, Palgrave Macmillan
4. Lloyd B Thomas, “Money banking and Financial Markets “, 1997, Student Gd Edition, Mc Graw hill.
5. Stepeh G Cecchetti, “Money banking and Financial Markets”, 1st Edition, 2005, Mc Graw hill.
6. Natalie Schoon, “Islamic banking and Finance”, Spiramus Press Ltd., Jan, 2009.

**COURSE OUTCOMES:** On completion of the course the students will be able to

**CO1:** explain the basic concept of financial market.

**CO2:** demonstrate the concept of financial risk management.

**CO3:** interpret the treading procedure in financial market.

**CO4:** enlighten the importance of Islamic finance.

**CO5:** explore the concept of Islamic banking and finance.

**Board Of Studies (BOS):**

17th BOS of Department of Mathematics and Actuarial Science held on 23.06.2025.

**Academic Council:**

24th ACM held on 26.08.2025

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | - | - | - | - | - | - | - |
| CO2 | - | - | H | - | - | - | - |
| CO3 | - | H | - | - | M | - | - |
| CO4 | - | | - | - | - | - | - |
| CO5 | M | | - | - | - | M | - |

*** Legend: L – Low (1), M – Medium (2), H – High (3).**

**SDG 4:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

This subject provides the basic idea about the production, investment, risk process and market treading in financial market.

| | | | | | |
|---|---|---|---|---|---|
| **MAFY 06** | **ISLAMIC ASSET AND FUND** | **L** | **T** | **P** | **C** |
| **SDG 4** | **MANAGEMENT** | **3** | **0** | **0** | **3** |

**COURSE OBJECTIVES:**

- **COB1:** To identify the features of the capital market related to the risk-return principle in Islam.
- **COB2:** To understand the concepts of Islamic stocks and wealth management.
- **COB3:** To impart Norms for shariah screening in Islam.
- **COB4:** To analyze and critically assess the various Islamic screening norms.
- **COB5:** To demonstrate Islamic real estate and project financing.

**MODULE I THE CAPITAL MARKET 9**

The Capital Market – Functions and Objective – Risk return principle in Islam – Cost of Capital – Shariah principles for capital market.

**MODULE II ISLAMIC STOCKS AND WEALTH MANAGEMENT 9**

Islamic stocks and wealth management – Equity shares and funds – Business and Structure of islamic enterprise – Indebtedness – Earnings from impermissible activities.

**MODULE III SHARIAH SCREENING IN ISLAM 9**

Norms for Shariah screening in Islam – Dow Jones islamic investment criteria – Norms used in India, Pakistan and Middle East.

**MODULE IV ISLAMIC SCREENING NORMS 9**

Critical assessment of islamic screening norms – Suitability of market cap – Purification and zakah.

**MODULE V REAL ESTATE AND PROJECT FINANCING 9**

Islamic real estate and Project financing – Characteristics of real estate – Islamic REITS & REMFs – Islamic module trusts and mudaraba Certificates.

**L – 45; T – 0; TOTAL – 45**

**REFERENCES:**


1. Munawar Iqbal, “A Guide to Islamic Finance, “Risk Books, UK, 2007.
2. Mahmoud A El-Gamal, “Inslamic Finance: Law, Economics and Practice”, Cambridge university Press, 2008.
3. Sohail Jaffar, “Islamic Asset management”, Euromoney books, London, 2006.
4. Michael Mahlknecht, “Islamic capital markets and risk management”, Risk Books UK 2007.
5. Aly Khorshid, “Islamic Insurance”, Routledge Curzon, London, 2004.
6. Sohail Jaffar, “Islamic Insurance”, Euromoney books, London, 2006.


**COURSE OUTCOMES:** On completion of the course the students will be able to

**CO1:** explain the concept of capital market.

**CO2:** demonstrate the concept of Islamic stocks and wealth management.

**CO3:** apply the concept of real estate and project financing.

**CO4:** explore the idea of Islamic banking.

**CO5:** understand the concept of Islamic banking.

**Board of Studies (BOS):**

17th BOS of Department of Mathematics and Actuarial Science held on 23.06.2025.

**Academic Council:**

24th ACM held on 26.08.2025

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | | | | | | | |
| CO2 | | | H | | | | |
| CO3 | | H | | | M | | |
| CO4 | L | | | | | | |
| CO5 | | | | | | L | |

*** Legend: L – Low (1), M – Medium (2), H – High (3).**

**SDG 4:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

This subject provides the basic idea about the Islamic asset and fund management.

| MAFY 07 | PORTFOLIO AND CREDIT RISK | L | T | P | C |
|---|---|---|---|---|---|
| SDG 4 | MANAGEMENT | 3 | 0 | 0 | 3 |

**COURSE OBJECTIVES:**

- **COB1:** To study the basic concept of valuation of derivative securities.
- **COB2:** To apply the Binomial model for pricing derivative instruments.
- **COB3:** To explore the applications of The Black-Scholes model.
- **COB4:** To demonstrate the 5-step method in both discrete and continuous time.
- **COB5:** To construct various models for credit events and recovery rates .

**MODULE I VALUATION OF DERIVATIVE SECURITIES 9**

Arbitrage – European options – American options – Factors affecting option price – Pricing forward contracts – Bounds for option prices – Put-call parity – The Greeks.

**MODULE II THE BINOMIAL MODEL 9**

The one-period model – Two-period binomial tree – n-period binomial tree – Recombining binomial trees – Calibrating binomial models – State price deflator approach.

**MODULE III BLACK-SCHOLES OPTION PRICING FORMULA 9**

Assumptions of Black-scholes model – The black-scholes model – Black-scholes model for dividend – Paying shares.

**MODULE IV THE 5-STEP METHOD IN DISCRETE & CONTINUOUS TIME 9**

Tradable assets – Self-financing strategies – Replicating strategies and complete markets –Cameron-Martin – Girsanov theorem – Martingale representation theorem – Diffusion models – The martingale approach (the 5-step method) – The 5-step approach with dividends.

**MODULE V CREDIT RISK 9**

Credit events and recovery rates – Structural models – Reduced-form models – Intensity-based models – Merton model – Two-state models for credit ratings – Jarrow-Lando-Turnbull (JLT) model.

**L – 45; TOTAL – 45**

**REFERENCES:**


1. Andrew Kimble, “Credit Risk: From Transaction of Portfolio Management”, Nov, 2003, Butterworth Heinemann.
2. Andrew Fight, “Credit risk Management”, 2007, Elsevier India Private Limited.
3. Ludwig B chincarini, “Quantitative Equity Portfolio Management”, 2006, Mc Graw Hill.
4. Greg N Gregoriou, Critisian Hoppe, “The Handbook of Credit Portfolio Management”, 2008, Mc Graw Hill.


**COURSE OUTCOMES:** On completion of the course the students will be able to

**CO1:** develop an understanding of option prices, valuation, and hedging.

**CO2:** show how to use binomial trees and lattices in valuing options.

**CO3:** show how to use the Black-Scholes model in valuing options.

**CO4:** enumerate the theory to estimate risk neutral pricing strategy.

**CO5:** demonstrate a knowledge of simple models for credit risk.

**Board of Studies (BOS):**

17th BOS of Department of Mathematics and Actuarial Science held on 23.06.2025.

**Academic Council:**

24th ACM held on 26.08.2025

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 |
|---|---|---|---|---|---|---|---|
| CO1 | - | - | - | - | - | - | - |
| CO2 | - | - | H | - | - | - | - |
| CO3 | - | H | - | - | M | - | - |
| CO4 | - | - | - | - | - | - | - |
| CO5 | H | - | - | - | - | - | - |

*** Legend: L – Low (1), M – Medium (2), H – High (3).**

**SDG 4:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

This subject provides the basic idea about portfolio theory and credit risk management.