

	MAHATMA GANDHI UNIVERSITY Kottayam, Kerala Undergraduate Programmes (HONOURS) 2026 Admission Onwards
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SYLLABUS			
SIGNATURE COURSE			
Name of the College	Alphonsa College, Pala		
Faculty/ Discipline	Mathematics		
Programme	BSc (Hons) Mathematics		
Course Coordinator	Arya S		
Contributors	Sheena Mathew, Sonia K Thomas		
Course Name	Interest Theory and Cash Flow Models		
Type of Course	DSE		
Specialization title	Actuarial Science		
Course Code	MG3DSEMATA03		
Course Level	200		
Course Summary	This course introduces cash-flow models for a range of financial instruments, including fixed-interest and index-linked securities, equity, loans, and annuities. It develops the concept of the time value of money using simple and compound interest, including continuous compounding and varying rates. Students learn to compute present and accumulated values through discounting and accumulation over general periods.		
Semester	3	Credits	4
Course Details	Learning Approach		Total Hours
	Credits	4	60
Pre-requisites, if any	NIL		

Course Outcomes (CO)

Number of COs		4	
CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Understand Generalized Cash-Flow Models	U	PO1, PO2
2	Apply Time Value of Money Principles	A	PO1
3	Evaluate present and accumulated values	E	PO1
4	Evaluate level annuities and apply equated time	E	PO1, PO2

*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)

CO-PO Articulation Matrix

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	3	-	-	-	-	-	-	-	-
CO 2	3	-	-	-	-	-	-	-	-	-
CO 3	3	-	-	-	-	-	-	-	-	-
CO 4	3	3	-	-	-	-	-	-	-	-

'0' is No Correlation, '1' is Slight Correlation (Low level), '2' is Moderate Correlation (Medium level) and '3' is Substantial Correlation (High level).

Course Content

Content for Classroom transaction (Units)

Module	Units	Course Description	Hrs	CO No.
1	Cash flow Model			
	1.1	Cash Flow Process, Examples of Cash flow Scenarios	6	["1"]
	1.2	Fixed Interest Securities, Index Linked Securities, and Cash on Deposit	5	["1"]
	1.3	Equity, Annuity, An Interest Only Loan, and Repayment Loan	4	["1"]
2	The Time Value of Money			
	2.1	Time Value of Money, Interest, Accumulation and Amount Functions	5	["2"]
	2.2	Simple Interest, Compound Interest (Annual Compounding), Compound Interest (Continuous Compounding)	7	["2"]
	2.3	Compound Interest: Varying Annual Rates, Amount of Interest Earned	6	["2"]
3	Discounting and accumulating			
	3.1	Present Values, Present Value for Compound Interest, Present Value at a Specified Time (Current Value)	7	["3"]
	3.2	Accumulated values, Accumulating Over General Periods (The Delayed Deposit Trap)	8	["3"]
4	Level Annuities			
	4.1	Present Value of a Sequence of Payments, Present Value of a Sequence of Payments at Time t_1 .	7	["4"]
	4.2	Method of Equated Time	5	["4"]

Teaching and Learning Approach	Classroom Procedure (Mode of transaction) Lecture. Classes using ICT Tools and Field Visit
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Assessment Types	MODE OF ASSESSMENT Mode of Assessment: Theory
	A. Continuous Comprehensive Assessment (CCA) • Theory - 30 Marks Module Test, Seminar, Assignment, Quiz, Viva voce
	B. End Semester Evaluation (ESE) • Theory - 70 Marks Assessment Methods – End Semester Examination Duration of Examination – 2.00 Hrs Pattern of examination for Theory – Non-MCQ Different parts of written examination – Part - A , B , C Answer Type: ◦ PART - A ◦ One or two Sentences - (5 out of 8) – $5 \times 2 = 10$ ◦ PART - B ◦ Short Essays/Problems - (5 out of 8) – $5 \times 6 = 30$ ◦ PART - C ◦ Essays - (3 out of 6) – $3 \times 10 = 30$

References

- ActEd Study Material: Subject - CM1
- Mathematical basis of life insurance – IC81 – Insurance Institute of India material
- Actuarial Mathematics. Bowers, Newton L et al. – 2nd ed. – Society of Actuaries, 1997.xxvi, 753 pages. ISBN: 0 938959 46 8

Suggested Readings

- Chan, W. S., & Tse, Y. K. (2021). Financial Mathematics for Actuaries (3rd ed.). World Scientific Publishing.

Affidavit

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MAHATMA GANDHI UNIVERSITY

Kottayam, Kerala

Undergraduate Programmes (HONOURS)
2026 Admission Onwards

SYLLABUS

SIGNATURE COURSE

Name of the College	Alphonsa College, Pala		
Faculty/ Discipline	Mathematics		
Programme	BSc (Hons) Mathematics		
Course Coordinator	Arya S		
Contributors	Sheena Mathew, Sonia K Thomas		
Course Name	Basics of Life Contingencies		
Type of Course	DSE		
Specialization title	Actuarial Science		
Course Code	MG4DSEMATA03		
Course Level	200		
Course Summary	This course introduces the valuation of life-contingent assurance and annuity benefits using actuarial notation and commutation functions. It covers whole life, term, pure endowment, and endowment assurance, along with whole life, temporary, deferred, and increasing annuities.		
Semester	4	Credits	4
Course Details			
	Learning Approach	Lecture	Total Hours
	Credits	4	60
Pre-requisites, if any	NIL		

Course Outcomes (CO)

Number of COs		4	
CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Understand assurance benefit structures	U	PO1
2	Apply annuity valuation methods	A	PO1, PO2
3	Compute net premiums for assurance plans	E	PO2
4	Compute net premiums for annuity plans	E	PO1, PO2

*Remember (K), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C), Skill (S), Interest (I) and Appreciation (Ap)

CO-PO Articulation Matrix

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 1	3	-	-	-	-	-	-	-	-	-

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 2	3	3	-	-	-	-	-	-	-	-
CO 3	-	3	-	-	-	-	-	-	-	-
CO 4	3	3	-	-	-	-	-	-	-	-

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Course Content

Content for Classroom transaction (Units)

Module	Units	Course Description	Hrs	CO No.
1	Assurance Benefits			
	1.1	Introduction, Whole life assurance, Term Assurance	6	["1"]
	1.2	Pure endowment Assurance- Endowment Assurance	7	["1"]
	1.3	Commutation Functions Dx, Cx, Mx and Rx	7	["1"]
2	Annuity Benefits			
	2.1	Introduction - Whole life annuity (due and arrear),	5	["2"]
	2.2	Temporary annuity (Due and Arrear)-deferred whole life annuity	5	["2"]
	2.3	Variable life annuity-Increasing life annuity	5	["2"]
	2.4	Commutation functions Nx and Sx	5	["2"]
3	Net Premiums for Assurance Plans			
	3.1	Natural premiums- Level Annual Premiums	5	["3"]
	3.2	Actuarial Notations-Mathematical expressions for level annual premium under various Assurance plans	5	["3"]
4	Net Premiums for Annuity Plans			
	4.1	Net Premiums- Problems on net Premiums	5	["4"]
	4.2	Actuarial Notations-Mathematical expressions for level annual premium under various Annuity plans	5	["4"]

Teaching and Learning Approach	Classroom Procedure (Mode of transaction) Lecture, Class with ICT Tools, Field Visit
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Assessment Types	MODE OF ASSESSMENT Mode of Assessment: Theory
	A. Continuous Comprehensive Assessment (CCA) • Theory - 30 Marks Module Test, Seminar, Assignment, Quiz, Viva voce
	B. End Semester Evaluation (ESE) • Theory - 70 Marks Assessment Methods – End Semester Examination Duration of Examination – 2.00 Hrs Pattern of examination for Theory – Non-MCQ Different parts of written examination – Part - A , B , C Answer Type: ◦ PART - A ◦ One or two Sentences - (5 out of 8) – $5 \times 2 = 10$ ◦ PART - B ◦ Short Essays/Problems - (5 out of 8) – $5 \times 6 = 30$ ◦ PART - C ◦ Essays - (3 out of 6) – $3 \times 10 = 30$

References

- Mathematical Basis of Life assurance – IC -81 - Insurance Institute of India

Suggested Readings

- Actuarial Mathematics for Life Contingent Risks – Author: David C. M. Dickson, Mary R. Hardy, Howard R. Waters

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SYLLABUS			
SIGNATURE COURSE			
Name of the College	Alphonsa College, Pala		
Faculty/ Discipline	Mathematics		
Programme	BSc (Hons) Mathematics		
Course Coordinator	Arya S		
Contributors	Sheena Mathew, Sonia K Thomas		
Course Name	Financial Mathematics I		
Type of Course	DSE		
Specialization title	Actuarial Science		
Course Code	MG5DSEMATA03		
Course Level	300		
Course Summary	It focuses on the measurement and application of interest, discounting, and time-based value assessment of money. Students will explore various interest measures, including nominal and compound discount rates, force of interest, and their use in securities such as Treasury bills and zero-coupon bonds.		
Semester	5	Credits	4
Course Details	Learning Approach		Total Hours
	Credits	4	60
Pre-requisites, if any	Basic financial mathematics		

Course Outcomes (CO)

Number of COs		4	
CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Understand the Measurement of Interest and Discounting	U	PO1, PO2
2	Apply Annuity Concepts to Financial Calculations	A	PO1, PO2
3	Evaluate and Compare Perpetuity Structures	E	PO2
4	Analyze Deferred and Block Payment Structures	An	PO1

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CO 4	3	-	-	-	-	-	-	-	-	-

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Course Content

Content for Classroom transaction (Units)

Module	Units	Course Description	Hrs	CO No.
1	Measurement of Interest			
	1.1	Rates of Discount, Discount Rates For Compound Interest, Accumulating With Discount Rates	8	["1"]
	1.2	Nominal Discount Rates, Simple Discount Rates	5	["1"]
	1.3	Zero Coupon Bond, T- Bills	4	["1"]
	1.4	Force of Interest, Force of Interest as a Nominal Rate,	3	["1"]
2	Annuities			
	2.1	Annuities, Annuities Immediate, Finite Geometric Series	5	["2"]
	2.2	Level Annuities, Annuity Immediate,	5	["2"]
	2.3	Performing Annuity Calculations with the BA II Plus, Annuities with Non-Annual Payments	5	["2"]
	2.4	Annuity Due, Time of First and Last Payment	5	["2"]
3	Perpetuities			
	3.1	Perpetuity Immediate, Perpetuity Due	5	["3"]
	3.2	Relationships Between Perpetuity Immediate and Perpetuity Due, Non-Annual Payments	5	["3"]
4	Deferred Annuities and Block Payments			
	4.1	Deferred Annuities, Block Payments	6	["4"]
	4.2	Annuities with Values at Non-Zero Times	4	["4"]

Teaching and Learning Approach	Classroom Procedure (Mode of transaction) Lectures, Class with ICT Tools
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Assessment Types	MODE OF ASSESSMENT Mode of Assessment: Theory
	A. Continuous Comprehensive Assessment (CCA) • Theory - 30 Marks Module Test, Seminar, Assignment, Practical, Quiz, Viva voce
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References

- Chan, W. S., & Tse, Y. K. (2021). Financial Mathematics for Actuaries (3rd ed.). World Scientific Publishing.
- Wilders, D. G. (2019). The Economics of Insurance: How Insurers Create Value for Shareholders. Springer.

Suggested Readings

- Broverman, S. A. (2017). Mathematics of Investment and Credit (7th ed.). ACTEX Publications.

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SIGNATURE COURSE			
Name of the College	Alphonsa College, Pala		
Faculty/ Discipline	Mathematics		
Programme	BSc (Hons) Mathematics		
Course Coordinator	Arya S		
Contributors	Sheena Mathew, Sonia K Thomas		
Course Name	Financial Mathematics II		
Type of Course	DSE		
Specialization title	Actuarial Science		
Course Code	MG6DSEMATA03		
Course Level	300		
Course Summary	This course explains the mathematical and financial principles underlying investment strategies, loan amortization, and bond valuation. It explores premiums, discounts, and the factors influencing interest rates in financial markets. Students gain practical skills in calculating effective yields, unpaid balances, and bond values for informed financial decision-making.		
Semester	6	Credits	4
Course Details	Learning Approach		Total Hours
	Credits	4	60
Pre-requisites, if any	Fundamentals of Financial Mathematics		

Course Outcomes (CO)

Number of COs		4	
CO No.	Expected Course Outcome	Learning Domains *	PO No
1	Understand and compare major investment assets	U	PO1, PO2
2	Apply Amortization Methods for Loan Repayment	A	PO1
3	Evaluate Bonds and Their Valuation	E	PO1
4	Analyze Premium, Discount, and Interest Rate Determinants	An	PO2, PO10

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CO-PO Articulation Matrix

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CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10
CO 2	3	-	-	-	-	-	-	-	-	-
CO 3	3	-	-	-	-	-	-	-	-	-
CO 4	-	3	-	-	-	-	-	-	-	3

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Course Content

Content for Classroom transaction (Units)

Module	Units	Course Description	Hrs	CO No.
1	Investment			
	1.1	Characteristics of Fixed interest Govt. bonds	6	["1"]
	1.2	Index linked Govt. bonds- Govt. bill	6	["1"]
	1.3	Ordinary Shares, Property, Certificate of deposit	4	["1"]
2	Amortization			
	2.1	Amortizing a loan, Amortization Using A Level Annuity, Calculating Unpaid Balance, Amortization Tables	8	["2"]
	2.2	Interest and Principal Payments	4	["2"]
3	Bonds			
	3.1	Bond valuation, Bond Terminology and Notation	5	["3"]
	3.2	Coupon Rate vs Interest Rate, Price, Par Value, and Redemption Amount, Special Coupon Rate, Bond Valuation Formulas	7	["3"]
4	Premium and Discount			
	4.1	Premium, Discount, Amount of Premium or Discount, Book Value of a Bond, Comparing Book Values	8	["4"]
	4.2	Determinants of Interest Rates Supply and Demand of Money, Effects of Interest Rates on Borrowing and Lending,	8	["4"]
	4.3	Components of Interest Rates, Real Risk-Free Rate, Maturity Risk, Default Risk Premium	4	["4"]

Teaching and Learning Approach	Classroom Procedure (Mode of transaction) Lecture, Classes using ICT Tools, Industrial Visit
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Assessment Types	MODE OF ASSESSMENT Mode of Assessment: Theory
	A. Continuous Comprehensive Assessment (CCA) • Theory - 30 Marks Module Test, Seminar, Assignment, Quiz, Viva voce
	B. End Semester Evaluation (ESE) • Theory - 70 Marks Assessment Methods – End Semester Examination Duration of Examination – 2.00 Hrs Pattern of examination for Theory – Non-MCQ Different parts of written examination – Part - A , B , C Answer Type: ◦ PART - A ◦ One or two Sentences - (5 out of 8) – $5 \times 2 = 10$ ◦ PART - B ◦ Short Essays/Problems - (5 out of 8) – $5 \times 6 = 30$ ◦ PART - C ◦ Essays - (3 out of 6) – $3 \times 10 = 30$

References

- ActEd Study Material: Subject - CM1
- Wilders, D. G. (2019). The Economics of Insurance: How Insurers Create Value for Shareholders. Springer.
- Bower, N. L., Gerber, H. U., Hickman, J. C., Jones, D. A., & Nesbitt, C. J. (1997). Actuarial Mathematics
- Mathematical basis of life insurance – IC81 – Insurance Institute of India materia

Suggested Readings

- Kellison, S. G. (2008). The Theory of Interest (3rd ed.). McGraw-Hill Education.
- Promislow, S. D. (2014). Fundamentals of Actuarial Mathematics. John Wiley & Sons.

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