جامعة البحرين
University of Bahrain
مركز ضمان الجودة والاعتماد الأكاديمي
Quality Assurance and Accreditation Center

Academic Course Specification Form

استمارة توصيف المقرر الأكاديمي

القسم الخاص بالطالب
Section Concerning the Student

1. **Course Code:**	**MATHS 373**	1. رمز المقرر:
2. **Course Title**	**Introduction to Actuarial Mathematics**	2. اسم المقرر:
3. **College:**	College of Science	3. الكلية:
4. **Department:**	Department of Mathematics	4. القسم:
5. **Academic Program:**	**B.Sc. in Actuarial Science**	5. البرنامج الأكاديمي:
6. **Course Credits:**	3-0-3	6. عدد الساعات المعتمدة:
7. **Course NQF Level**	8	7. مستوى المقرر وفقا للإطار الوطني للمؤهلات:
8. **Notional Hours:**	133	8. عدد الساعات الافتراضية:
9. **NQF Credits**	13	9. عدد الساعات المعتمدة للمقرر وفقا للإطار الوطني للمؤهلات:
10. **Prerequisite:**	MATHS 371	10. المتطلب المسبق للمقرر:
11. **Lectures Timing & Location:**	TBA	11. وقت المحاضرة ومكانها:
12. **General Mode of Teaching and Learning**	تقليدي Tranditional	12. النمط العام للتعليم والتعلّم:
13. **Course Coordinator:**	TBA	13. منسق المقرر:
14. **Course Instructor:**	TBA	14. مدرس المقرر:
15. **Office Hours and Location:**	TBA	15. الساعات المكتبية ومكانها:
16. **Instructor's Email:**	TBA	16. البريد الإلكتروني لمدرس المقرر:
17. **Academic Year:**	Click or tap here to enter text.	17. السنة الأكاديمية:
18. **Semester:**	الفصل الأول First Semester	18. الفصل الدراسي:

19. Textbook(s):	.19 الكتب الدراسية للمقرر:

- **Book 1:**
  ''Derivatives Markets'', Third Edition, Robert L. McDonald, 2014, ISBN 13: 978-1-292-02125-6 Chapters 1 (1.1-1.2), 2, 9, 10, 12 and 13 Only
- **Book 2:**
  Actuarial Mathematics for Life Contingent Risks, Third Edition, Dickson, C.M.D., Hardy, M.R., Waters, H.R. (2020), Cambridge University Press ISBN: 978-1-108-47808-3. Exercises are considered part of the required readings.
  - Chapters 1 – 2, Excluding 1.12, 2.7
  - Student should also exclude information on De Moivre's Law on Page 42.
- **Book 3:**
  Loss Models: From Data to Decisions, (Fifth Edition), 2019, by Klugman, S.A., Panjer, H.H. and Willmot, G.E., Wiley, ISBN: 978-1-119-52378-9 Chapters 3, 5 and 6 Only

20. References:	.20 المراجع:

- The Mathematics of Financial Derivatives: A Student Introduction, Wilmott, Howison, Dewynne, 1995, ISBN: 9780521497893
- J.C. Hull: Options, Futures and Derivatives, Prentice Hall, 6th edition, 2006. IBSN:978-013149908

21. Other learning resources used (e.g. e-Learning, field visits, periodicals, software, etc.):	.21 مصادر أخرى (مثال : التعلم الالكتروني، زيارات ميدانية، دورات، برامج كمبيوتر، الخ....)

- University Platforms (Blackboard & Microsoft Teams)
- Research Databases
- University Library

22. Course Description (as published in the College Catalogue):	.22 توصيف المقرر(حسبما ورد في دليل الكلية):

Option pricing fundamentals; Key characteristics of life insurance policy, long-term health coverage, pension, and survival models; Market Risk Measures; Basic actuarial quantities for some loss distributions.

23. Course Intended Learning Outcomes (3 to 5 CILOs):	.23 مخرجات التعلّم للمقرر (CILOs) (3 إلى 5 مخرجات تعلّمية):
1. Analyze the Binomial Option Pricing Model and the Black Scholes Formula	
2. Describe the key characteristics of life insurance, long-term health coverage and pension	
3. Explain key concept of survival models for discrete and continuous models	
4. Construct new distributions from continuous loss models	
5. Formulate basic actuarial quantities for some loss distributions	

24. Course Assessment Percentages (As per Regulations of Study and Examination at the University of Bahrain):	.24 أساليب التقويم ونسبها المئوية (بحسب نظام الدراسة والامتحانات في جامعة البحرين):
ASSIGNMENTS	20%
TEST#1	20%
TEST#2	20%
EXAM	40%
Total	**100%**

✯ There should be at least two assignments per semester so that each won't exceed 10% of the total course grade.

25. Description of Topics Covered:	.25 وصف الموضوعات التي ينبغي تناولها:
Topic Title ***(e.g. chapter/experiment title)*** الموضوع	***Description*** التفصيل
Book 1: Option Pricing Fundamentals	Valuation of simple options using risk neutral expected present values, under the binomial and Black-Scholes models
Book 2: Introduction to life insurance and survival models	Key concepts of parametric and non-parametric mortality models for individual lives
Book 3: Introduction to short-term actuarial method, severity, and frequency distributions	Key concepts of short-term actuarial methods and loss distributions

<table>
<tr><th colspan="3">26. Weekly Schedule</th><th colspan="2">26. الجدول الأسبوعي:</th></tr>
<tr><th>Week
الإسبوع</th><th>Date
التاريخ</th><th>Topics Covered
المواضيع المعروضة</th><th>CILOs
المخرجات التعلُمية للمقرر
(CILOs)</th><th>Teaching/Assessment Mode and Method
منهجية ونمط التدريس/التقييم</th></tr>
<tr><td>01</td><td></td><td>Book 1-Ch. 1: Introduction to Derivatives:
1.1 What is a Derivative?
1.4 The Use of Derivatives
Book 1-Ch. 2: An Introduction to Forwards and Options
2.1 Forwards Contracts
2.2 Call Options
2.3 Put Options</td><td>1</td><td rowspan="10">Traditional Teaching
تدريس تقليدي</td></tr>
<tr><td>02</td><td></td><td>Book 1-Ch. 9: Parity and Other Option Relationships
9.1 Put-Call Parity</td><td>1</td></tr>
<tr><td>03</td><td></td><td>Book 1-Ch. 10: Binominal Option Pricing: Basic Concepts
10.1 A One-Period Binominal Tree
10.2 Constructing a Binominal Tree
10.3 Two or More Binominal Periods
10.4 Put Options
Book 1-Ch. 12: The Black-Scholes Formula
12.1 Introduction
12.2 Applying the formula to other Assets: Cross-currency Option
Book 1-Ch. 13: Market Making and Delta-Hedging
13.3 Delta-Hedging
13.4 The Mathematics of Delta-Hedging (Read Only)</td><td>1</td></tr>
<tr><td>04</td><td></td><td>Book 2-Ch. 1: Introduction to life and long-term health insurance:
1.1 Background
1.2 Traditional life insurance contracts
1.3 Modern insurance contracts
Marketing, pricing, and issuing life insurance.</td><td>2</td></tr>
<tr><td>05</td><td></td><td>Book 2-Ch. 1: Introduction to life and long-term health insurance:
1.4 Life annuities
1.5 Long-term coverages in health insurance
1.6 Mutual and proprietary insurers
1.7 Other life contingent contracts
Pensions</td><td>2</td></tr>
<tr><td>06</td><td></td><td>Book 2-Ch. 2: Survival models:
2.2 The future lifetime random variable
2.3 The force of mortality
2.4 Actuarial notation</td><td>2</td></tr>
<tr><td>07</td><td></td><td>Book 2-Ch. 2: Survival models:
2.5 Mean and standard deviation of T_x
2.6 Curtate future lifetime</td><td>2</td></tr>
<tr><td>08</td><td></td><td>Book 3-Ch. 3: Basic Distributional Quantities
3.1 Moments
3.2 Percentiles
3.4 Tails of Distributions
3.4.1 Classification Based on Moments
3.4.2 Comparison Based on Limiting Tail Behavior</td><td>3</td></tr>
<tr><td>09</td><td></td><td>3.4.3 Classification Based on the Hazard Rate Function
3.4.4 Classification Based on the Mean Excess Loss Function
3.4.5 Equilibrium Distributions and Tail Behavior</td><td>3</td></tr>
<tr><td>10</td><td></td><td>3.5 Measures of Risk
3.5.1 Introduction
3.5.2 Risk Measures and Coherence
3.5.3 Value at Risk
3.5.4 Tail Value at Risk</td><td>4</td></tr>
</table>

11		**Book 3-Ch. 5: Continuous Models** 5.2 Creating New Distributions 5.2.1 Multiplication by a Constant	**4**	
12		5.2.2 Raising to a Power 5.2.3 Exponentiation	5	
13		5.2.4 Mixing 5.2.5 Frailty Models	5	
14		5.2.6 Splicing **Book 3-Ch. 6: Discrete Distribution** 6.5 The (a, b, 0) Class	5	
15		Book 3-Ch. 6: Discrete Distribution 6.6 Truncation and modification at Zero	5	

27. Academic Integrity Statement:	**27. بيان النزاهة الأكاديمية:**
Students are to observe the highest level of honesty and academic ethics in pursuit of their academic goals as per UOB Regulations of Student Conduct and Academic Integrity, Anti-plagiarism Policies, and Students' Rights and Responsibilities Handbook. The consequences for cheating, plagiarism, unauthorized collaboration, and other forms of academic dishonesty can be very serious and will be dealt with as per the aforementioned policies and regulations.	يعتبر الصدق والنزاهة عنصران أساسيان في العملية الأكاديمية. حيث يُتوقع من الطلاب خلال سعيهم لتحقيق أهدافهم الأكاديمية التحلي بالأمانة والأخلاق في جميع الأوقات، وذلك وفقًا للوائح والأنظمة الخاصة بطلبة جامعة البحرين، بالإضافة إلى دليل حقوق الطلبة وواجباتهم، وكما جاء في سياسة الانتحال الخاصة بجامعة البحرين. حيث سيتم التعامل مع أي انتهاك للنزاهة الأكاديمية بحسب ما تنص عليه السياسات والأنظمة السابق ذكرها.
28. Attendance and Absence Regulations:	**28. نظام الحضور والغياب:**
Students are required to adhere to regular attendance for class lectures and practical sessions, as determined by the nature of the course, as per Article (33), of Regulations of Study and Examination at the University of Bahrain.	يُتوقع من الطلاب الالتزام بالحضور المنتظم للساعات الصفية والعملية بحسب طبيعة المقرر، وفقًا للمادة (33)، من نظام الدراسة والامتحانات في جامعة البحرين.