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| For Academic Affairs and Research Use Only |
| Proposal Number | SM07 |
| CIP Code:  |  |
| Degree Code: |  |

**New or Modified Course Proposal Form**

**[X] Undergraduate Curriculum Council**

**[ ] Graduate Council**

|  |
| --- |
| **[X]New Course, [ ]Experimental Course (1-time offering), or [ ]Modified Course (Check one box)** |

Signed paper copies of proposals submitted for consideration are no longer required. Please type approver name and enter date of approval.

|  |  |
| --- | --- |
| Hong Zhou 3/27/2023**Department Curriculum Committee Chair** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…**COPE Chair (if applicable)** |
| Amanda Lambertus 3/27/2023**Department Chair** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…**Head of Unit (if applicable)**   |
| John Hershberger 3/27/2023**College Curriculum Committee Chair** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…**Undergraduate Curriculum Council Chair** |
| Mary Elizabeth Spence 3/27/2023**Office of Accreditation and Assessment (new courses only)** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…**Graduate Curriculum Committee Chair** |
| 3/31/2023**College Dean** | Len Frey 4/20/2023**Vice Chancellor for Academic Affairs** |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…**General Education Committee Chair (if applicable)**   |  |

1. **Contact Person (Name, Email Address, Phone Number)**

SUZANNE MELESCUE, scmelescue@astate.edu

MOHAMED MILAD, mmilad@astate.edu

Mathematics & Statistics Dept. (870) 972-3090

1. **Proposed starting term and Bulletin year for new course or modification to take effect**

FALL 2023; Bulletin 2023-2024

**Instructions:**

*Please complete all sections unless otherwise noted. For course modifications, sections with a “Modification requested?” prompt need not be completed if the answer is “No.”*

|  |  |  |
| --- | --- | --- |
|  | **Current (Course Modifications Only)** | **Proposed (New or Modified)** *(Indicate “N/A” if no modification)* |
| **Prefix** |  | **MATH**  |
| **Number\*** |  | **4373** |
| **Title** |  | **Financial Mathematics** |
| **Description\*\*** |  | A rigorous mathematical treatment of topics in financial management and markets, including interest, equations of value, annuities, loans, bonds, calculation of yield rates, interest rate sensitivity, general cash flows, and immunization. FallPrerequisite: MATH 2214 or Approval by Instructor |

 ***\**** (Confirm with the Registrar’s Office that number chosen has not been used before and is available for use. For variable credit courses, indicate variable range. *Proposed number for experimental course is 9*.)

\*\*Forty words or fewer as it should appear in the Bulletin.

1. **Proposed prerequisites and major restrictions** **[Modification requested? [Yes/No]]**

(Indicate all prerequisites. If this course is restricted to a specific major, which major. If a student does not have the prerequisites or does not have the appropriate major, the student will not be allowed to register).

1. YES Are there any prerequisites?

MATH 2214 or Approval by Instructor

* 1. Why or why not?

An understanding of single variable differentiation and integration, including improper integration, is essential. These topics are completed in Calculus 2 (MATH 2214)

1. NO Is this course restricted to a specific major?
	1. If yes, which major? Enter text...
2. **Proposed course frequency [Modification requested? [Yes/No]]**

(e.g. Fall, Spring, Summer; if irregularly offered, please indicate, “irregular.”) *Not applicable to Graduate courses.*

Fall

1. **Proposed course type [Modification requested? [Yes/No]]**

Will this course be lecture only, lab only, lecture and lab, activity (e.g., physical education), dissertation/thesis, capstone, independent study, internship/practicum, seminar, special topics, or studio? Please choose one.

Lecture

1. **Proposed grade type [Modification requested? [Yes/No]]**

What is the grade type (i.e. standard letter, credit/no credit, pass/fail, no grade, developmental, or other [please elaborate])

Standard Letter

1. No Is this course dual-listed (undergraduate/graduate)?
2. No Is this course cross-listed?

*(If it is, all course entries must be identical including course descriptions. Submit appropriate documentation for requested changes. It is important to check the course description of an existing course when adding a new cross-listed course.)*

**a.** – If yes, please list the prefix and course number of the cross-listed course.

 Enter text...

 **b.** – **Yes / No** Can the cross-listed course be used to satisfy the prerequisite or degree requirements this course satisfies?  Enter text...

1. No Is this course in support of a new program?

a. If yes, what program?

 Enter text...

1. No Will this course be a one-to-one equivalent to a deleted course or previous version of this course (please check with the Registrar if unsure)?

a. If yes, which course?

Enter text...

**Course Details**

1. **Proposed outline** **[Modification requested? [Yes/No]]**

(The course outline should be topical by weeks and should be sufficient in detail to allow for judgment of the content of the course.)

**MATH 4373 Financial Mathematics – Course Outline**

Weeks 1-2: Simple Interest and Discount; Compound Interest and Discount; Nominal Interest and Discount

Weeks 3-5: Force of Interest and Discount; Varying Rates of Interest and Discount

Weeks 6-7: Annuities – Immediate, Due, Deferred, Payable Less Frequently, Payable More Frequently

Week 8: Geometric Annuities; Arithmetic Annuities; Increasing and Decreasing Annuities

Weeks 9 -10: Arithmetic Perpetuities; Continuous Annuities; Continuous Varying Annuities

Week 11: Loan Payments; Loan Amortization; Balloon and Drop Payments

Week 12 Bond Pricing; Bond Amortization; Callable Bonds

Week 13: Duration; Convexity; Approximations of Value

Weeks 14-15: Cash Flow Matching; Immunization; Spot and Forward Rates

1. **Proposed special features** **[Modification requested? [Yes/No]]**

(e.g. labs, exhibits, site visitations, etc.)

N/A

1. **Department staffing and classroom/lab resources**

**Full time faculty/instructors**

1. Will this require additional faculty, supplies, etc.?

 No

1. No Does this course require course fees?

 *If yes: please attach the New Program Tuition and Fees form, which is available from the UCC website.*

**Justification**

**Modification Justification (Course Modifications Only)**

1. Justification for Modification(s)

N/A

**New Course Justification (New Courses Only)**

1. Justification for course. Must include:

 a. Academic rationale and goals for the course (skills or level of knowledge students can be expected to attain)

We developed this course to provide students with a rigorous mathematical background to help them be successful on the actuarial exam FM/2 (Financial Mathematics).

Students will be able to: (1) Apply mathematical theory associated with financial transactions and the time value of money; (2) Apply mathematical models in interest theory to solve problems involving annuities, cash flows, loans, and immunization; (3) Design and evaluate mathematical models

b. How does the course fit with the mission of the department? If course is mandated by an accrediting or certifying agency, include the directive.

This course will be a required course for students in our B.S. Actuarial Science program that began Fall 2022. The course is designed to provide students with a rigorous mathematical background to be successful on Exam FM/2 (Financial Mathematics), which is a required exam to obtain credentials from the Society of Actuaries.

This course fits in well with our department’s mission of providing a robust mathematical experience to prepare students for a variety of future endeavors and careers in business, industry, government, research, and academia.

c. Student population served.

Students enrolled in the Actuarial Science Program; Other upper-level students who meet the prerequisite- or have equivalent background in mathematics/finance- and are interested in an actuary career

d. Rationale for the level of the course (lower, upper, or graduate).

This course is an upper-level course because students need to complete foundational knowledge courses in mathematics and finance.

**Assessment**

**Assessment Plan Modifications (Course Modifications Only)**

1. **Yes / No** Do the proposed modifications result in a change to the assessment plan?

 *If yes, please complete the Assessment section of the proposal*

**Relationship with Current Program-Level Assessment Process (Course modifications skip this section unless the answer to #18 is “Yes”)**

1. What is/are the intended program-level learning outcome/s for students enrolled in this course? Where will this course fit into an already existing program assessment process?

This course supports program-level outcomes 1, 3, and 5 (see below) in the B.S. Actuarial Science Program.

1. Considering the indicated program-level learning outcome/s (from question #19), please fill out the following table to show how and where this course fits into the program’s continuous improvement assessment process.

*For further assistance, please see the ‘Expanded Instructions’ document available on the UCC - Forms website for guidance, or contact the Office of Assessment at 870-972-2989.*

 *(Repeat if this new course will support additional program-level outcomes)*

|  |  |
| --- | --- |
| **Program-Level Outcome (from question #19)** | PLO 1: Identify and utilize the appropriate mathematical and statistical tools to model and solve a variety of problems in actuarial science. |
| Assessment Measure | Actuarial Exam FM (Financial Mathematics) and P (Probability) – direct measure Program exit survey developed by the faculty – indirect measure |
| Assessment Timetable | The outcome will be reviewed assessed in year 4 and then it will be assessed and reviewed annually. |
| Who is responsible for assessing and reporting on the results? | The program director in collaboration with the department chair will assess, analyze and report the results of the program assessment. |
| **Program-Level Outcome (from question #19)** | PLO 3: Demonstrate understanding of the concepts, corresponding theories, and applications related to the areas of mathematics, statistics, finance, economics, and accounting. |
| Assessment Measure | Actuarial Exam FM and P – direct measure Program exit survey developed by the faculty – indirect measure |
| Assessment Timetable | The outcome will be reviewed assessed in year 4 and then it will be assessed and reviewed annually. |
| Who is responsible for assessing and reporting on the results? | The program director in collaboration with the department chair will assess, analyze and report the results of the program assessment. |
| **Program-Level Outcome (from question #19)** | PLO 5: Students will design and evaluate models that measure the impact of identified risks |
| Assessment Measure | Targeted course project – direct measure Program exit survey developed by the faculty – indirect measure |
| Assessment Timetable | The outcome will be reviewed assessed in year 4 and then it will be assessed and reviewed annually. |
| Who is responsible for assessing and reporting on the results? | The program director in collaboration with the department chair will assess, analyze and report the results of the program assessment. |

 **Course-Level Outcomes**

1. What are the course-level outcomes for students enrolled in this course and the associated assessment measures?

|  |  |
| --- | --- |
| **Outcome 1** | Students will be able to explain and compare different types of interest: simple vs compound interest, discount interest, nominal vs effective interest rates, rate vs force of interest, real vs money interest rates, the term structure of interest. |
| Which learning activities are responsible for this outcome? | Assigned readings and problem sets; Class discussions/activities with data sets and examples |
| Assessment Measure  | Graded assignments; Midterm exams and final |
| **Outcome 2** | Students will be able to explain the relation between a present value, a set of cash flows and interest as well as the interest rate risk. |
| Which learning activities are responsible for this outcome? | Assigned readings and problem sets; Class discussions/activities with data sets and examples |
| Assessment Measure  | Graded assignments; Midterm exams and final |
| **Outcome 3** | Students will be able to apply mathematical theory associated with financial transactions and the time value of money |
| Which learning activities are responsible for this outcome? | Problem sets; Class activities with data sets and examples |
| Assessment Measure  | Graded assignments; Midterm exams and final |
| **Outcome 4** | Students will be able to apply mathematical models in interest theory to solve problems involving annuities, cash flows, loans, and immunization. |
| Which learning activities are responsible for this outcome? | Problem sets; Class activities with data sets and examples |
| Assessment Measure  | Graded assignments; Midterm exams and final |
| **Outcome 5** | Students will be able to design and evaluate mathematical models. |
| Which learning activities are responsible for this outcome? | Problem sets; Class activities with data sets and examples |
| Assessment Measure  | Graded assignments; Midterm exams and final; Course Project |

**Bulletin Changes**

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| **Instructions**  |
| **Please visit** [**http://www.astate.edu/a/registrar/students/bulletins/index.dot**](http://www.astate.edu/a/registrar/students/bulletins/index.dot) **and select the most recent version of the bulletin. Copy and paste all bulletin pages this proposal affects below. Please include a before (with changed areas highlighted) and after of all affected sections.** **\*Please note: Courses are often listed in multiple sections of the bulletin. To ensure that all affected sections have been located, please search the bulletin (ctrl+F) for the appropriate courses before submission of this form.**  |

2022 - 2023 Undergraduate Bulletin

**BEFORE CHANGES IN COURSE DESCRIPTIONS**





**AFTER CHANGES IN COURSE DESCRIPTIONS**



MATH 4373 – Financial Mathematics

A rigorous mathematical treatment of topics in financial management and markets, including interest, equations of value, annuities, loans, bonds, calculation of yield rates, interest rate sensitivity, general cash flows, and immunization. Fall

Prerequisite: MATH 2214 or Approval by Instructor



**BEFORE CHANGES IN Actuarial Science MAJOR REQUIREMENTS/ELECTIVES**

* [FIN 4723 - Investments](https://catalog.astate.edu/preview_program.php?catoid=3&poid=1988&returnto=77) **Sem. Hrs:** **3**
* [ISBA 2033 - Programming Fundamentals](https://catalog.astate.edu/preview_program.php?catoid=3&poid=1988&returnto=77) **Sem. Hrs:** **3**
* [MATH 2214 - Calculus II](https://catalog.astate.edu/preview_program.php?catoid=3&poid=1988&returnto=77) **Sem. Hrs:** **4**
* [MATH 3243 - Linear Algebra](https://catalog.astate.edu/preview_program.php?catoid=3&poid=1988&returnto=77) **Sem. Hrs:** **3**
* [MATH 3254 - Calculus III](https://catalog.astate.edu/preview_program.php?catoid=3&poid=1988&returnto=77) **Sem. Hrs:** **4**
* [MATH 4403 - Differential Equations](https://catalog.astate.edu/preview_program.php?catoid=3&poid=1988&returnto=77) **Sem. Hrs:** **3**
* [MATH 4573 - Actuarial Science Seminar](https://catalog.astate.edu/preview_program.php?catoid=3&poid=1988&returnto=77) **Sem. Hrs:** **3**
* [REI 3513 - Risk and Insurance](https://catalog.astate.edu/preview_program.php?catoid=3&poid=1988&returnto=77) **Sem. Hrs:** **3**
* [STAT 3233 - Applied Statistics I](https://catalog.astate.edu/preview_program.php?catoid=3&poid=1988&returnto=77) **Sem. Hrs:** **3**

## ELECTIVES:

* Electives (Eight hours must be upper-level) **Sem. Hrs: 16**

## TOTAL REQUIRED HOURS: 120

**AFTER CHANGES IN Actuarial Science MAJOR REQUIREMENTS/ELECTIVES**

* [FIN 4723 - Investments](https://catalog.astate.edu/preview_program.php?catoid=3&poid=1988&returnto=77) **Sem. Hrs:** **3**
* [ISBA 2033 - Programming Fundamentals](https://catalog.astate.edu/preview_program.php?catoid=3&poid=1988&returnto=77) **Sem. Hrs:** **3**
* [MATH 2214 - Calculus II](https://catalog.astate.edu/preview_program.php?catoid=3&poid=1988&returnto=77) **Sem. Hrs:** **4**
* [MATH 3243 - Linear Algebra](https://catalog.astate.edu/preview_program.php?catoid=3&poid=1988&returnto=77) **Sem. Hrs:** **3**
* [MATH 3254 - Calculus III](https://catalog.astate.edu/preview_program.php?catoid=3&poid=1988&returnto=77) **Sem. Hrs:** **4**
* MATH 4373 – Financial Mathematics Sem. Hrs: 3
* [MATH 4403 - Differential Equations](https://catalog.astate.edu/preview_program.php?catoid=3&poid=1988&returnto=77) **Sem. Hrs:** **3**
* [MATH 4573 - Actuarial Science Seminar](https://catalog.astate.edu/preview_program.php?catoid=3&poid=1988&returnto=77) **Sem. Hrs:** **3**
* [REI 3513 - Risk and Insurance](https://catalog.astate.edu/preview_program.php?catoid=3&poid=1988&returnto=77) **Sem. Hrs:** **3**
* [STAT 3233 - Applied Statistics I](https://catalog.astate.edu/preview_program.php?catoid=3&poid=1988&returnto=77) **Sem. Hrs:** **3**

## ELECTIVES:

* Electives (Five hours must be upper-level) **Sem. Hrs: 13**

## TOTAL REQUIRED HOURS: 120

The 8-semester degree plan DOES NOT appear in the 2022-2023 Bulletin. Below is the approved (2022) B.S Actuarial Science 8-semester degree plan with this new course inserted:

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| **Arkansas State University-Jonesboro****Degree: Bachelor of Science** **Major: Actuarial Science****Year: 2022-2023** |
| Students requiring developmental course work based on low entrance exam scores (ACT, SAT, ASSET, COMPASS) may not be able to complete this program of study in eight (8) semesters. Developmental courses do not count toward total degree hours. **Students having completed college level courses prior to enrollment will be assisted by their advisor in making appropriate substitutions. In most cases, general education courses may be interchanged between semesters.** A minimum of 45 hours of upper division credit (3000-4000 level) is required for this degree. |
| **Year 1** |  | **Year 1** |
| **Fall Semester** |  | **Spring Semester** |
| **Course No.** | **Course Name** | **Hrs** | **Gen Ed** |  | **Course No.** | **Course Name** | **Hrs** | **Gen Ed** |
| MATH 1093 | Making Connections | 3 |  |  | MATH 2214 | Calculus II | 4 |  |
| MATH 2204 | Calculus I | 4 | X |  | ENG 1013 | Composition II | 3 | X |
| ENG 1003 | Composition I | 3 | X |  |  ENG 2003 or ENG 2013ENG 2013 orPHIL 1103 | Intro to World Lit I or World Literature Since 1660Intro to World Lit II orIntro to Philosophy | 3 | X |
|  MUS 2503 or THEA 2503 or ART 2503 | Fine Arts-Musical or Fine Arts-Theatre or Fine Arts -Visual | 3 | X |   |  COMS 1203 | Oral Communication | 3 | X |
|  HIST 2763 or HIST 2773 orPOSC 2103 | U.S. to 1876 orU.S. since 1876 orIntro to U.S. Gov’t | 3 | X |  |  ECON 2313 | Principles of Macroecon | 3 | X |
|  |  |  |  |  |  |  |  |  |
| **Total Hours** |  | 16 |  |  | **Total Hours** |  | 16 |  |
| **Year 2** |  | **Year 2** |
| **Fall Semester** |  | **Spring Semester** |
| **Course No.** | **Course Name** | **Hrs** | **Gen Ed** |  | **Course No.** | **Course Name** | **Hrs** | **Gen Ed** |
| MATH 3254 | Calculus III | 4 |  |  | MATH 4403 | Differential Equations | 3 |  |
| ACCT 2033 | Intro to Financial Accounting | 3 |  |  | ACCT 2133 | Intro to Managerial Accounting | 3 |  |
| Life Science | BIO with LAB | 4 | X |  | PHYS 2034 orPHYS 2054 | University Physics IGeneral Physics I | 4 | X |
| ISBA 2033 | Programming Fundamentals | 3 |  |  | ECON 2323 | Principles of Microeconomics | 3 | X |
|  | Elective | 1 |  |  | STAT 3233 | Applied Stat I | 3 |  |
|  |  |  |  |  |  |  |  |  |
| **Total Hours** |  | 15 |  |  | **Total Hours** |  | 16 |  |
| **Year 3** |  | **Year 3** |
| **Fall Semester** |  | **Spring Semester** |
| **Course No.** | **Course Name** | **Hrs** | **Gen Ed** |  | **Course No.** | **Course Name** | **Hrs** | **Gen Ed** |
|  | Elective | 3 |  |  | *STAT 4443* | *Stochastic Processes* | *3* |  |
| FIN 3713 | Business Finance | 3 |  |  | MATH 3243 | Linear Algebra | 3 |  |
| REI 3513 | Risk and Insurance | 3 |  |  | FIN 3723 | Financial Analytics & Modeling | 3 |  |
| STAT 4483  | Statistical Methods Using R  | 3 |  |  |  | Elective  | 3 |  |
| ISBA 3413ISBA 3423 orISBA 3663 | Big Data for BusinessData visualization for BusinessData Mining for Business | 3 |  |  | ISBA 3413ISBA 3423 orISBA 3663 | Big Data for BusinessData visualization for BusinessData Mining for Business | 3 |  |
|  |  |  |  |  |  |  |  |  |
| **Total Hours** |  | 15 |  |  | **Total Hours** |  | 15 |  |
| **Year 4** |  | **Year 4** |
| **Fall Semester** |  | **Spring Semester** |
| **Course No.** | **Course Name** | **Hrs** | **Gen Ed** |  | **Course No.** | **Course Name** | **Hrs** | **Gen Ed** |
| FIN 3773 | Financial Risk Management | 3 |  |  | STAT 4463 | Probability and Statistics II | 3 |  |
| STAT 4453 | Probability and Statistics I | 3 |  |  | *MATH 4573* | *Actuarial Science Seminar* | 3 |  |
| REI 4513 orREI 4543 | Property and LiabilityLife InsuranceLife Insurance | 3 |  |  | FIN 4723 | Investments | 3 |  |
| ***MATH 4373*** | ***Financial Mathematics*** | ***3*** |  |  |  | Elective | 3 |  |
|  | Elective | 3 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| **Total Hours** |  | 15 |  |  | **Total Hours** |  | 12 |  |
| **Total Jr/Sr Hours \_\_51\_ Total Degree Hours \_\_120\_** |
| **Graduation Requirements:** |