Actuarial Mathematics

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What is an Actuary?

Actuaries are professionals who

- ▶ Manage risk
- ▶ Predict the likelihood of future events and model the financial impact of future scenarios
- ▶ Find creative ways to mitigate the undesirable effects of future events

Employment

- ▶ Most are employed in the insurance and financial industries
- ▶ Others work in the transportation, environmental, medical, and manufacturing industries and in government
- ▶ Number of jobs in this field is increasing at a rate of 18% (much faster than average)
- ▶ 2016 median annual salary of actuaries was $100,610
- ▶ Always highly ranked in job satisfaction surveys

Credentialing of Actuaries in the US

Society of Actuaries: www.soa.org

- ▶ Associate of the Society of Actuaries (ASA)
- ▶ Fellow of the Society of Actuaries (FSA)
- ▶ Chartered Enterprise Risk Analyst (CERA)

Casualty Actuarial Society: www.casact.org

- ▶ Associate of the Casualty Actuarial Society (ACAS)
- ▶ Fellow of the Casualty Actuarial Society (FCAS)
- ▶ Chartered Enterprise Risk Analyst (CERA)

Be An Actuary: beanactuary.org

SOA Credentialing: ASA (Associate of the Society of Actuaries)

KSU is designated **UCAP**-**Advanced Curriculum** by the SOA.

Exam P–Probability
Exam FM–Financial Mathematics
Exam IFM–Investment and Financial Markets
Exam LTAM–Long-Term Actuarial Mathematics
Exam STAM–Short-Term Actuarial Mathematics
Exam SRM–Statistics for Risk Modeling
Exam PA–Predictive Analytics

VEE Mathematical Statistics
VEE Economics
VEE Accounting and Finance
    (Grade of B- or better required for VEE credit)

Fundamentals of Actuarial Practice (FAP) eLearning Course
Associateship Professionalism Course (APC)

SOA Credentialing: ASA (Associate of the Society of Actuaries)

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Exam P–Probability: MATH 40011
Exam FM–Financial Mathematics: MATH 30055
Exam IFM–Investment and Financial Markets: MATH 40059
Exam LTAM–Long-Term Actuarial Mathematics: MATH 40055-6
Exam STAM–Short-Term Actuarial Mathematics
Exam SRM–Statistics for Risk Modeling (?)
Exam PA–Predictive Analytics (?)

VEE Mathematical Statistics: MATH 40012
VEE Economics: ECON 22060-1
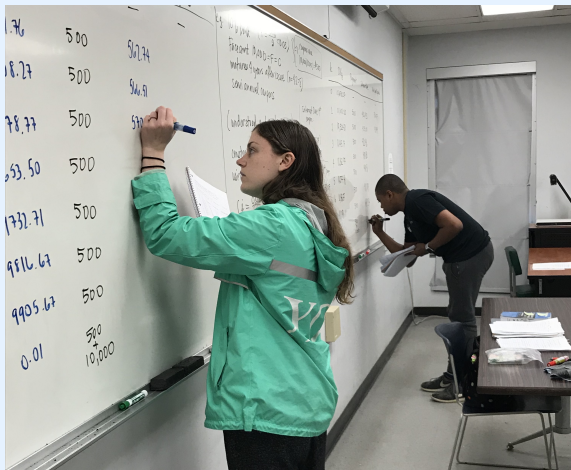VEE Accounting and Finance: ACCT 23020, FIN 36063
        (Grade of B- or better required for VEE credit)

Fundamentals of Actuarial Practice (FAP) eLearning Course
Associateship Professionalism Course (APC)

- Currently Concentration under BS in Mathematics
- Hope to be major in 2019-20 catalog
- Actuarial Mathematics vs. Actuarial Science

Highlights of Curriculum changes as of Fall 2018

- New required courses:
  - MATH 20011 Decision Making Under Uncertainty
  - MATH 31011 Proofs in Discrete Mathematics
  - MATH 32044 Ordinary Differential Equations

- Old requirement removed:
  - FIN 36059 Intermediate Investments

- Computing requirement change:
  - CS 10062 Programming for Problem Solving in Science *OR*
  - CS 13001 Comp Sci I: Programming and Problem Solving *OR*
  - CS 13011 & 13012 Computer Science IA & IB

- New statistics courses:
  - MATH 20011 Decision Making Under Uncertainty
  - MATH 40015 Applied Statistics
  - MATH 40024 Computational Statistics
  - MATH 40028 Statistical Learning

- Mathematics Electives (6 hrs) and Allied Area Electives (3 hrs) now specified and listed on GPS Audit in Flashline
  - Students on old catalogs: Allied Area Electives (9 hrs) now listed on GPS Audit
  - Students need my approval only for courses not on this list (e.g., MATH 31011, MATH 32044 for those on old catalogs)

- Language added to Catalog entries for MATH 30011 (Basic Prob and Stats), MATH 34001 (Fund Concepts of Alg), MATH 34002 (Fund Concepts of Geom):
  - *This course CANNOT be used to meet the mathematics requirements for a BA in Mathematics or a BS in Applied Mathematics or Mathematics.*
  - Exceptions should be rare and only for students on old catalog already promised approval

- BS in Actuarial Mathematics

- New requirement (left off 2018 change as oversight):
  - COMM 15000 Introduction to Human Communication

Major Requirements

MATH 12002 Analytic Geometry and Calculus I
MATH 12003 Analytic Geometry and Calculus II
MATH 22005 Analytic Geometry and Calculus III
MATH 21001 Linear Algebra
MATH 20011 Decision Making Under Uncertainty
MATH 32044 Ordinary Differential Equations
MATH 31011 Proofs in Discrete Mathematics
CS 10062 *or* 13001 *or* (13011 and 13012)

MATH 30055 Mathematical Theory of Interest
MATH 40011 Probability Theory and Applications
MATH 40012 Theory of Statistics
MATH 40055 Actuarial Mathematics I
MATH 40056 Actuarial Mathematics II
MATH 40059 Stochastic Actuarial Models

(COMM 15000 Intro to Human Communication?)
ECON 22060 Principles of Microeconomics
ECON 22061 Principles of Macroeconomics
ECON 32050 Applied Econometrics I
ACCT 23020 Intro to Financial Accounting
FIN 36053 Business Finance

MATH Electives (6 hrs) from list in catalog

Allied Area Electives (3 hrs) from list in catalog

Typical/Recommended Second Major or Minor

- ► Finance

- ► Economics

- ► Data Analytics

- ► Computer Science

- ► Insurance Studies

- ► Foreign language

- ► Anything the student loves!

Sequencing Recommendations: General Principles

- 2–3 MATH courses per semester MAX

- Spread Kent Core courses across whole 4 years

- Spread Business courses, but start early if considering minor or double major

- CS requirement early

- Summer MATH classes very challenging: strong students only

- Remember that all MATH prereqs require C or better (really should have B or better)

- Two issues in prerequisites:
  - Content
  - Mathematical maturity

Sequencing Recommendations

- Take in sequence without skipping a semester:
  - MATH 12002 Analytic Geometry and Calculus I
  - MATH 12003 Analytic Geometry and Calculus II
  - MATH 22005 Analytic Geometry and Calculus III
  - MATH 32044 Ordinary Differential Equations ("Calc IV")

- Can take concurrently with MATH 12003 (Calc II)
  - MATH 21001 Linear Algebra
  - MATH 20011 Decision Making Under Uncertainty

- Can take concurrently with MATH 22005 (Calc III)
  - MATH 30055 Mathematical Theory of Interest
  - MATH 31011 Proofs in Discrete Mathematics

Highlights of Timing Changes

- Moved Act Math courses earlier in the curriculum
  - Students can see if they like it
  - Take more SOA exams before graduating
  - Get internship earlier
- MATH 30055 (Theory of Interest) to be offered Fall (not Spring) beginning Fall 2019
  - Actuarial Math students should take it Fall of sophomore year
  - Then take Exam FM in spring
- MATH 40011 (Probability) to be offered both Fall and Spring (not Summer) beginning Spring 2019
  - Actuarial Math students should take it Spring of sophomore year
  - Then take Exam P in summer
- MATH 40055-6 (Act Math I-II) can then be taken junior year
  - Prereqs are MATH 30055 and MATH 40011
  - Then take Exam LTAM following fall

- MATH 40059 Stochastic Actuarial Models is probably hardest course in Actuarial Math curriculum— take Spring of senior year

- ECON 32050 Applied Econometrics I
  - Prerequisites
    - MATH 12002 (Calc I)
    - ECON 22060 (Microeconomics)
    - MIS 24056 (Business Analytics I): typically waived for our students who have taken MATH 40011-12
  - ECON 32051 Applied Econometrics II is a good course for our students, so maybe take ECON 32050 earlier than indicated on roadmap