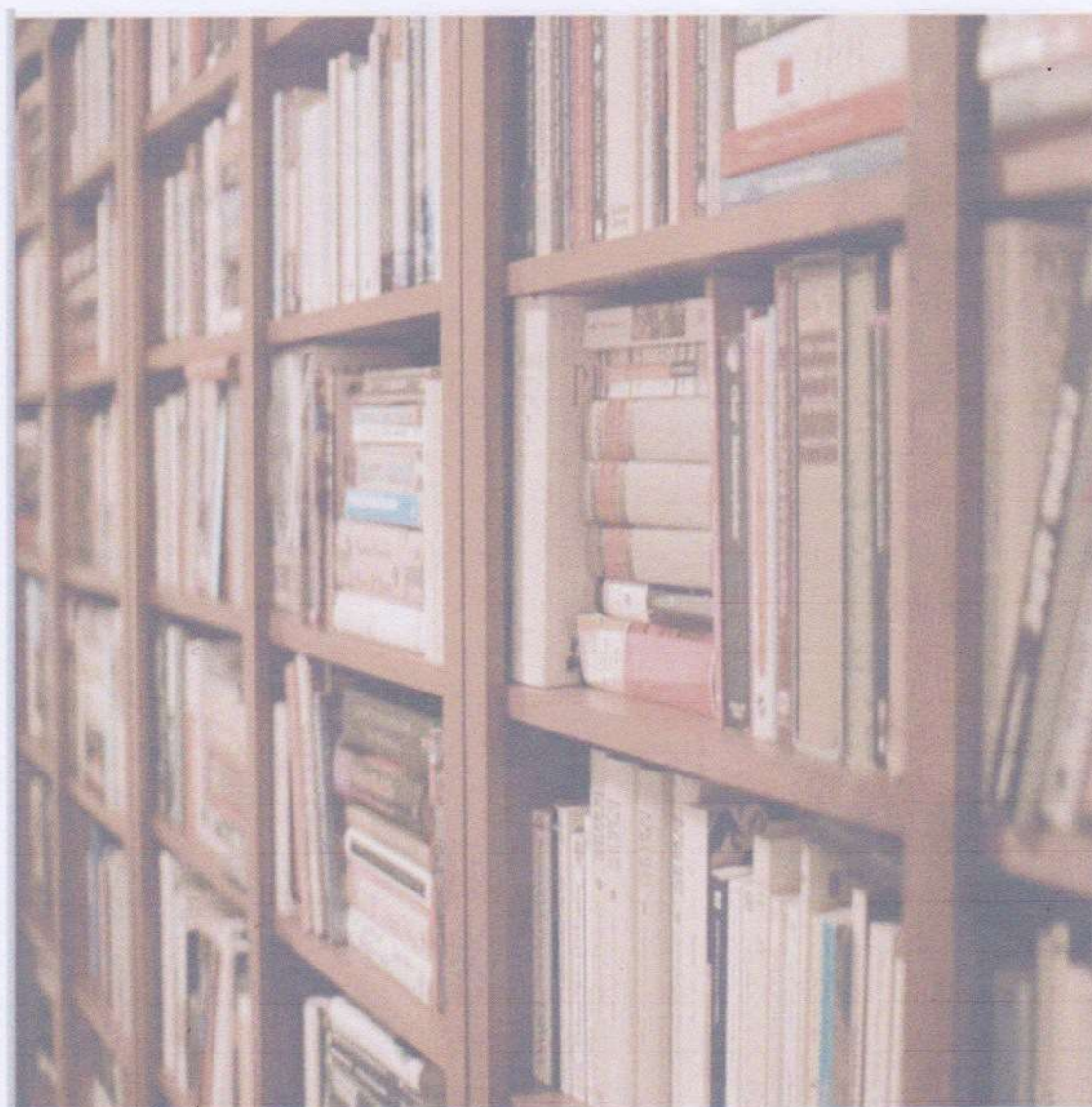


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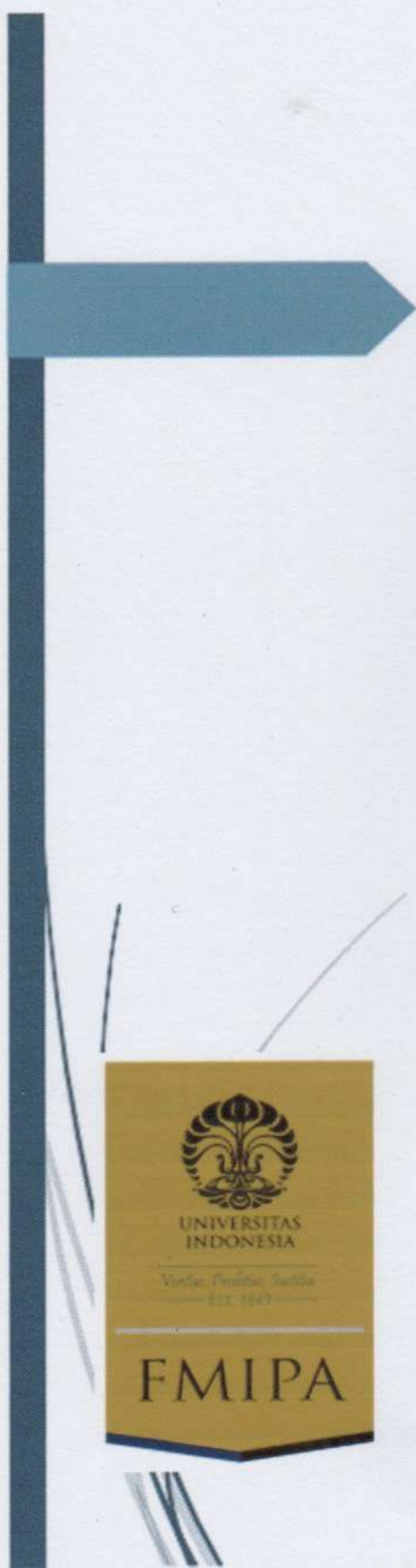
ACTUARIAL SCIENCE UNDERGRADUATE STUDY PROGRAM



DEPARTMENT OF MATHEMATICS
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
UNIVERSITY OF INDONESIA

2020





Curriculum

Guidebook 2020

Actuarial Science Undergraduate Study Program



Department of Mathematics

**FACULTY OF MATHEMATICS AND
NATURAL SCIENCES (FMIPA)**

UNIVERSITY OF INDONESIA



FOREWORD

Praise the presence of the Almighty God for His grace, this Curriculum Guidebook 2020 for the Actuarial Science Undergraduate Study Program – Department of Mathematics of the Faculty of Mathematics and Natural Sciences of the University of Indonesia (FMIPA UI) has been compiled. For this reason, we express our deepest appreciation and gratitude to all parties involved, especially the Mathematics Department Curriculum Team, FMIPA UI of 2020.

The Curriculum Guidebook 2020 for the Actuarial Science Undergraduate Study Program - Mathematics Department, FMIPA UI, was compiled based on the 2020 Curriculum Document for the Actuarial Undergraduate Study Program - Mathematics Department, FMIPA UI and the Regulation of the Rector of the University of Indonesia Number 014 of 2016 concerning Implementation of Undergraduate Program with the University of Indonesia. We hope that the Curriculum Guidebook 2020 for the Actuarial Science Undergraduate Study Program – Department of Mathematics, FMIPA UI, can be useful for all parties who want to know or are involved in the implementation of education in the Actuarial Science Undergraduate Study Program, Department of Mathematics, FMIPA UI.

Depok, August 2020

Actuarial Science Undergraduate Study Program

Department of Mathematics

Faculty of Mathematics and Natural Sciences, University of Indonesia



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PROFILE OF STUDY PROGRAM

Profile of Study Program	
Name of Study Program	: Actuarial Science Undergraduate Study Program Department of Mathematics Faculty of Mathematics and Natural Sciences, University of Indonesia
Type of Class	: Regular
Study Scheme	: Full Time
Introduction Language	: Indonesian
Operating License	: Decision of the Rector of the University of Indonesia Number: 1878/SK/R/UI/2017, dated August 30, 2017
Accreditation	: Universities National Accreditation Board (BAN-PT) – with Category B dated July 30, 2019
Admission Prerequisites	: Pass the admission test through the Achievement Pathway, SNMPTN, SBMPTN, or SIMAK UI
Total Credits	: 144 Credits
Length of Study	: 8 Semesters and can be taken 7 - 12 Semesters
Academic Degree	: Bachelor of Actuarial Science (<i>Sarjana Ilmu Aktuarial</i> / S.Aktr)



1. INTRODUCTION

The 2020 Curriculum is an update of the 2017 Curriculum in the Actuarial Science Undergraduate Study Program – Department of Mathematics, FMIPA UI. This Curriculum Improvement is a response to several needs and paradigms that are currently emerging. First, there is a need to respond to developments in the industry with the emergence of new literacy paradigms, such as coding, artificial intelligence, data science and big data. The 2017 curriculum has adopted this paradigm, so there are no significant changes related to this paradigm in the 2020 curriculum. The major change to the 2020 Curriculum is in the framework of complying with the Regulation of the Minister of Education and Culture concerning the Independent Campus which allows the students to be independent in studying outside the student's study program for three semesters.

In addition, this curriculum change also adapts the 2017 curriculum to the minimum curriculum developed by nine Universities in cooperation with the Risk Management, Economic Sustainability, and Actuarial Science Development in Indonesia (READI) Project and the Indonesian Mathematical Society (IndoMS). This minimum curriculum was formulated from various universities in Indonesia, several universities abroad such as the Statistics and Actuarial Science Department, University of Waterloo, Canada, the Indonesian Actuarial Association (PAI), as well as the syllabus from the International Actuarial Association (IAA), namely the international actuarial association where most of the actuary professional organizations are members, including PAI.

The 2020 Curriculum has begun to be applied for the Students of Actuarial Science Study Program of 2020 intake. Meanwhile, the students of the previous intake still use the 2017 Curriculum. The main difference between the 2020 Curriculum and the 2017 Curriculum is that the 2020 Curriculum allows the students to be independent in choosing a course of 45 credits in 3 semesters according to the regulations established by the Ministry of Education and Culture of the Republic of Indonesia for



Higher Education. These elective courses are not only Elective Courses offered by the Actuarial Science Undergraduate Study Program of the University of Indonesia, but also Courses offered by other Study Programs within the University of Indonesia, other Study Programs outside the University of Indonesia both domestically and abroad, as well as activities in Companies or other Institutions that are reputable and have a relationship with the field of Actuarial Science or Risk Management. Due to the large number of Credits for these elective courses, the role of the Academic Advisor will be very important in assisting Students in choosing these Elective Courses. Therefore, the Students can choose elective courses or activities that are in accordance with their study plan both in scientific and professional aspects.

In addition to the freedom to choose Elective Courses, there are other changes to the 2020 curriculum, namely changes to the name of the Course or the number of credits in several Courses. The Final Assignment (Final Project) in the 2020 Curriculum does not have to be in the form of a minor thesis, but can also be in the form of a project report or industry internship. In accordance with the policy of the University of Indonesia, the 2020 Curriculum does not hold English Courses, however the students must pass the English examination which is organized by an Institution determined by the University of Indonesia independently.

2. VISION, MISSION, AND OBJECTIVES

Vision

To become an Actuarial Science Undergraduate Study Program that is capable of playing a role at the national and global level in the fields of education, research and the applications thereof.

Mission

1. Educating the students to be able to solve actuarial science problems.
2. Applying actuarial science to the insurance and financial industry.



3. Providing consultations related to actuarial science to the public.
4. Able to compete at the national and global level

Objectives

1. Able to solve theoretical and applied problems in actuarial science.
2. Able to learn independently and adapt to developments in the concept of actuarial science in life insurance, general insurance and risk management.
3. Having critical and logical analytical power in the application of actuarial science and having good professional ethics.
4. Able to communicate, and be responsible for the field of knowledge mastered in the profession.

3. GRADUATES PROFILES

Graduates Profiles
Bachelor Degree of Actuarial Science who is able to design solutions to actuarial problems and risk management in the insurance, retirement, social security, investment, banking industries and other related industries by using actuarial science in accordance with academic ethics.

4. GRADUATE LEARNING ACHIEVEMENT

Code	Graduate Learning Achievement
CPL-1	Able to use spoken and written language well in Indonesian and English for both academic and non-academic activities
CPL-2	Having integrity and be able to think critically, creatively, and innovatively as well as having intellectual curiosity to solve problems at individual and group level
CPL-3	Able to take advantage of communication information



Code	Graduate Learning Achievement
	technology.
CPL-4	Able to identify various entrepreneurial efforts that are characterized by innovation and independence based on ethics.
CPL-5	Able to provide alternative solutions to various problems that arise in society, the nation and the state.
CPL-6	Able to apply the theoretical concepts of basic science, mathematics, probability and statistics to actuarial science
CPL-7	Able to apply the concepts of algorithms and programming to actuarial science
CPL-8	Able to design a solution to problems in the actuarial and risk management sectors using actuarial science, finance, statistical methods and data science.
CPL-9	Able to further develop oneself and/or adapt, both in the field of actuarial science and other relevant fields, including the fields they will be involved in in their future world of work.
CPL-10	Able to design solutions to a task or project, including learning or developing something that relatively new, both independently and in groups, as well as making reports and presenting the same in an interesting way.

The relationship between Graduate Learning Achievements and Graduate Profiles can be explained in the form of a network as shown in Figure 1.



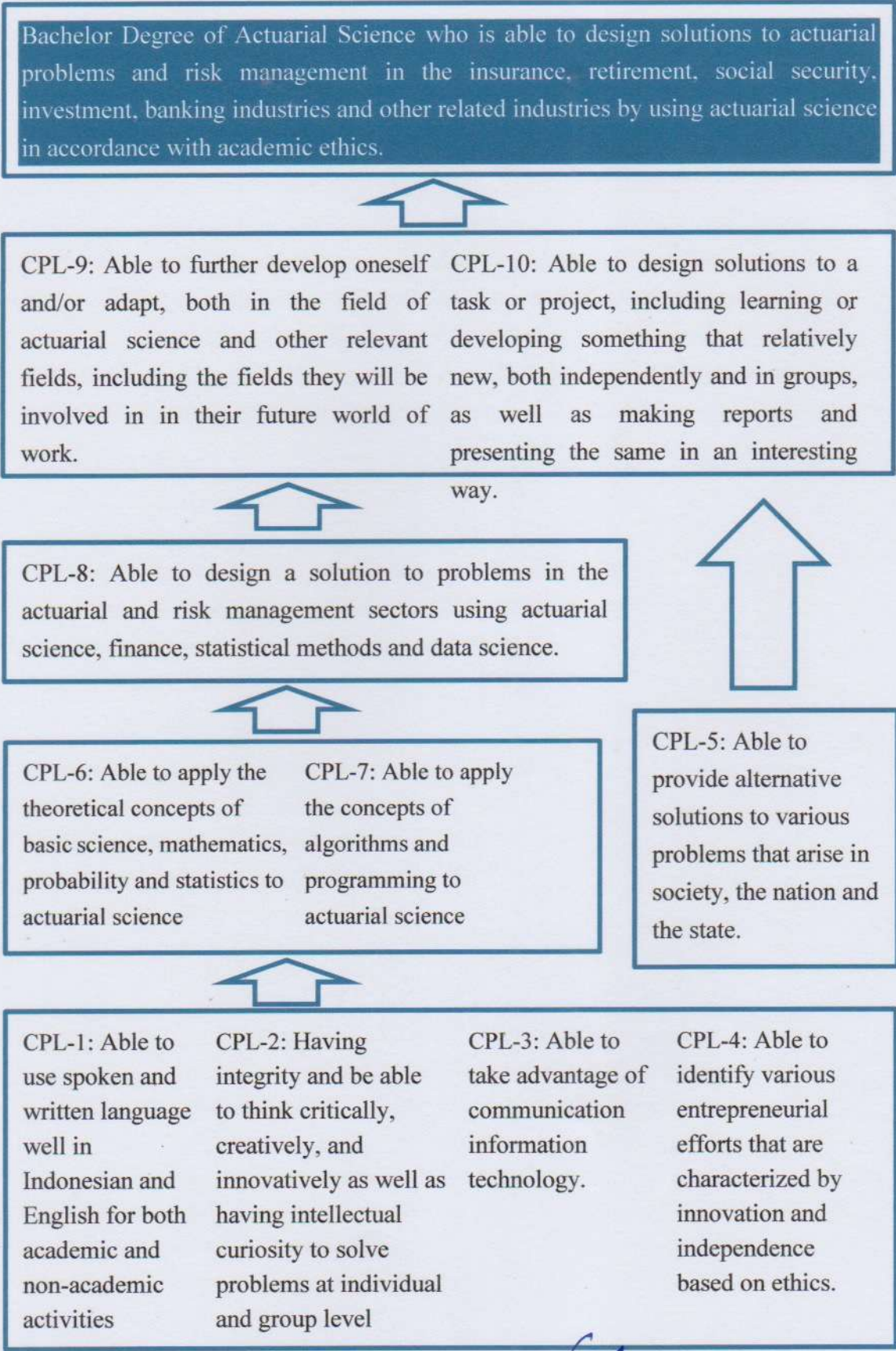


Figure 1. Graduate Learning Achievement Network



5. CURRICULUM STRUCTURE

In general, courses are grouped based on course type as shown in Table 1. To complete the Actuarial Science Undergraduate Study Program of the University of Indonesia, the students are required to take 99 credits of compulsory courses and 55 credits of elective courses or activities. So that the students must take a total of 144 credits within 7 – 12 semesters to become a Bachelor Degree of Actuarial Science.

Table 1. Course Groups

Type of Courses		Credits	Total
Compulsory Courses	University	9	99
	Faculty	8	
	Department	27	
	Study Program	55	
Elective Courses		45	45
Total			144

The courses in the Actuarial Science Undergraduate Study Program of the University of Indonesia mentioned above are prepared by taking into account the curriculum regulations of the University of Indonesia, Faculty of Mathematics and Natural Sciences, and Department of Mathematics. Details of University Compulsory Courses and Faculty Compulsory Courses are set forth in Table 2 and Table 3. In Table 2, the University of Indonesia does not provide English Courses, however, the students must pass English independently based on examinations held by the Institution as determined by the University of Indonesia.

Table 2. University Compulsory Courses

No.	Code	Name of Courses	Credit	Prerequisite
1	UIGE600006	MPKT	5	-
2	UIGE600004	Religious	2	-
3	UIGE600003	English	2	-
Total			9 Credits	



Table 3. Faculty Compulsory Courses

No.	Code	Name of Courses	Credit	Prerequisite
1	SCMF600002	Introduction to Data Science	2	-
2	SCCH601101	Basic Chemistry	2	-
3	SCPH601110	Basic Physics	2	-
4	SCBI601112	General Biology	2	-
Total			8 Credits	

The Department Compulsory Courses aims to provide mathematical theory as the basic theory needed by actuarial science. This course group has a weight of 27 credits consisting of 9 courses. Details of the Departmental Compulsory Subject groups are set forth in Table 4.

Table 4. Department Compulsory Courses

No.	Code	Name of Courses	Credit	Prerequisite
1	SCMA601001	Logic and Set	3	-
2	SCMA601003	Elementary Linear Algebra	2	-
3	SCMA601006	Linear Algebra 1	3	Elementary Linear Algebra
4	SCMA601002	Calculus 1	3	-
5	SCMA601005	Calculus 2	3	Calculus 1
6	SCMA602008	Analysis 1	4	Calculus 2
7	SCMA601004	Algorithm and Programming	3	-
8	SCMA601007	Numerical Methods	3	Algorithm and Programming
9	SCST601003	Mathematical Statistics 1	3	Introduction to Data Science, Calculus 1
Total			27 Credits	

The Study Program Compulsory Courses are prepared by referring to the minimum curriculum made by the Actuarial Sciences Group from the Indonesian Mathematics Society (IndoMS). The minimum curriculum was formulated from several universities in Indonesia, several universities abroad, as well as syllabus from



the International Actuarial Association (IAA). Table 5 provides details of the Study Program Compulsory Courses. Study Program Compulsory Courses provide the students with a strong theoretical basis of actuarial science. So that the students have the ability to keep up with developments in advanced actuarial science and the skills to apply actuarial science in the field of actuarial and risk management.

Table 5. Study Program Compulsory Courses

No.	Code	Name of Courses	Credit	Prerequisite
1	SCAK602001	Introduction to Differential Equations	2	Calculus 1
2	SCAK602002	Advanced Calculus	3	Calculus 2
3	SCST602004	Mathematical Statistics 2	3	Mathematical Statistics 1
4	SCAK602020	Mathematical Finance 1	3	Calculus 2
5	SCAK602021	Mathematical Finance 2	3	Mathematical Finance 1
6	SCST602006	Linear Models	3	Mathematical Statistics 1
7	SCST602012	Survival Models	3	Linear Models
8	SCST602010	Forecasting Methods	3	Linear Models
9	SCAK602004	Life Contingencies 1	3	Mathematical Statistics 1
10	SCAK602013	Life Contingencies 2	3	Life Contingencies 1
11	SCAK602011	Risk Modeling 1	3	Mathematical Statistics 1
12	SCAK602018	Risk Modeling 2	3	Risk Modeling 1
13	SCAK602005	Stochastic Models 1	3	Linear Models
14	SCAK603022	Data Science	3	Numerical Methods
15	SCST603101	Advanced Linear Models	3	Linear Models
16	SCAK603017	Investment Theory	3	Mathematical Finance 2
17	SCAK603024	Final Project 1	2	-
18	SCAK604025	Final Project 2	6	Final Project 1
Total			55 Credits	

After mastering the basic theory of actuarial science, the Students take Elective Courses. These Elective Courses may take the form of Courses offered by the Actuarial Science Undergraduate Study Program of the University of Indonesia, other



Study Programs at the University of Indonesia, Study Programs outside the University of Indonesia both domestically and abroad, Industry or other institutions that are reputable and related to the field of Actuarial Science. These Elective Courses are in line with the concept of Freedom to Learn which was proclaimed by the Ministry of Education and Culture of the Republic of Indonesia specifically for the Higher Education level.

Elective Courses offered by the Actuarial Science Undergraduate Study Program are set forth in Table 6.

Table 6. Elective Courses

No.	Code	Name of Courses	Credit	Prerequisite
1	SCAK603115	Accounting 1	3	-
2	SCAK603116	Accounting 2	3	Accounting 1
3	SCAK603117	Microeconomic Theory	3	-
4	SCAK603118	Macroeconomic Theory	3	-
5	SCAK603108	Financial Derivative Modeling	3	Mathematical Finance 2
6	SCAK603110	General Insurance	3	-
7	SCAK603119	Health Insurance	3	-
8	SCAK604109	Retirement Theory	3	Life Contingencies 1
9	SCAK603103	Risk Management 1	3	-
10	SCAK604106	Risk Management 2	3	Risk Management 1
11	SCAK603101	Stochastic Models 2	3	Stochastic Models 1
12	SCAK603105	Machine Learning	3	Data Science
13	SCAK604111	Actuarial Software	3	-
14	SCAK604112	Professional Internship	3	-
15	SCAK604113	Special Topics 1	3	-
16	SCAK604114	Special Topics 2	3	-

Several Elective Courses are courses that are equivalent to the Adjunct Actuary Profession Test held by the Indonesian Actuaries Association (PAI). The Elective Courses are Microeconomic Theory, Macroeconomic Theory, Accounting 1



and Accounting 2. A complete list of Courses in the Actuarial Science Undergraduate Study Program of the University of Indonesia which are equivalent to the Adjunct Actuary Profession Test held by the PAI is set forth in Table 7.

Tabel 7. PAI Adjunct Actuary Profession Test Equalization Course

No	Adjunct Actuary Profession Test held by the PAI	Study Program Courses	
		Compulsory Courses	Elective Courses
1	A10 – Mathematical Finance	Mathematical Finance 1 Mathematical Finance 2	
2	A20 – Probability and Statistics	Mathematical Statistics 1 Mathematical Statistics 2	
3	A30 - Economics		Microeconomic Theory Macroeconomic Theory
4	A40 - Accounting		Accounting 1 Accounting 2
5	A50 – Statistical Methods	Linear Models Forecasting Methods Survival Models	
6	A60 – Actuarial Mathematics	Life Contingencies 1 Life Contingencies 2	
7	A70 – Risk Modeling and Theory	Risk Modeling 1 Risk Modeling 2	

Other Elective Courses offered by the Actuarial Science Undergraduate Study Program of the University of Indonesia are Applied Actuarial Science Courses and Courses related to the latest methods for Actuarial Science problems. So that the Students can have broader expertise related to the field of applied Actuarial Science and methods for Actuarial Science. For example, Risk Management is a Course related to the application of Actuarial Science in the field of Risk Management. Meanwhile, Machine Learning is a Course related to the latest methods for solving problems in Actuarial Science or the Insurance Industry. In addition, there are Special Topics Courses for certain topics related to Actuarial Science that are not yet a course, either



related to the latest developments in Actuarial Science or the application of Actuarial Science. Several Elective Courses are Courses related to research and can be used as further study material for the Minor Thesis topic, where the Students are currently advised to write papers from Minor Thesis to be presented at national and international seminars.

Referring to the minimum curriculum developed by nine Universities in cooperation with the Risk Management, Economic Sustainability, and Actuarial Science Development in Indonesia (READI) Project and the Indonesian Mathematical Society (IndoMS), there are several Elective Courses in Table 6 which are highly recommended to be taken in meeting scientific and professional standards as developed by the IAA. A complete List of Courses in the Actuarial Science Undergraduate Study Program of the University of Indonesia that meet the minimum curriculum standards is set forth in Table 8.

Table 8. Courses in compliant with IndoMS Minimum Curriculum

Courses of Actuarial Science Undergraduate Study Program of the University of Indonesia			
Compulsory Courses	Credit	Elective Courses	Credit
Calculus 1	3	Microeconomic Theory	3
Calculus 2	3	Macroeconomic Theory	3
Advanced Calculus	3	Accounting 1	3
Analysis 1	4	Accounting 2	3
Introduction to Differential Equations	3	Financial Derivative Modeling	3
Elementary Linear Algebra	2		
Linear Algebra 1	3		
Algorithm and Programming	3		
Numerical Methods	3		
Mathematical Statistics 1	3		
Mathematical Statistics 2	3		
Mathematical Finance 1	3		



Courses of Actuarial Science Undergraduate Study Program of the University of Indonesia			
Compulsory Courses	Credit	Elective Courses	Credit
Mathematical Finance 2	3		
Linear Models	3		
Survival Models	3		
Forecasting Methods	3		
Stochastic Models 1	3		
Life Contingencies 1	3		
Life Contingencies 2	3		
Risk Modeling 1	3		
Risk Modeling 2	3		
Data Science	3		
Advanced Linear Models	3		
Investment Theory	3		
Final Project 1	2		
Final Project 2	6		
Total	80	Total	15

6. DISTRIBUTION OF COURSES PER SEMESTER

All Compulsory Courses and Elective Courses are distributed over 8 semesters which Students are expected to take for 7 to 12 Semesters. Figure 2 displays the Course Level from Semester 1 to Semester 8. The connecting arrow between the two courses indicates that there is a direct connection between the contents of the two courses. Course distribution is also given in the form of a distribution of courses as set forth in Table 9. Semester 1 to Semester 5 provides Compulsory Elective Courses. Meanwhile, Semester 5 to Semester 7 gives the Students the freedom to determine the Courses or activities that Students will choose. If the Students choose to take Elective Courses offered by the Actuarial Science Undergraduate Study Program of the University of Indonesia, then the Students can choose Courses offered in Semester 5 to Semester 7 as set forth in Table 10. Furthermore, Semester 8 is the semester for



preparing and completing the Final Project which is a Study Program Compulsory Courses.



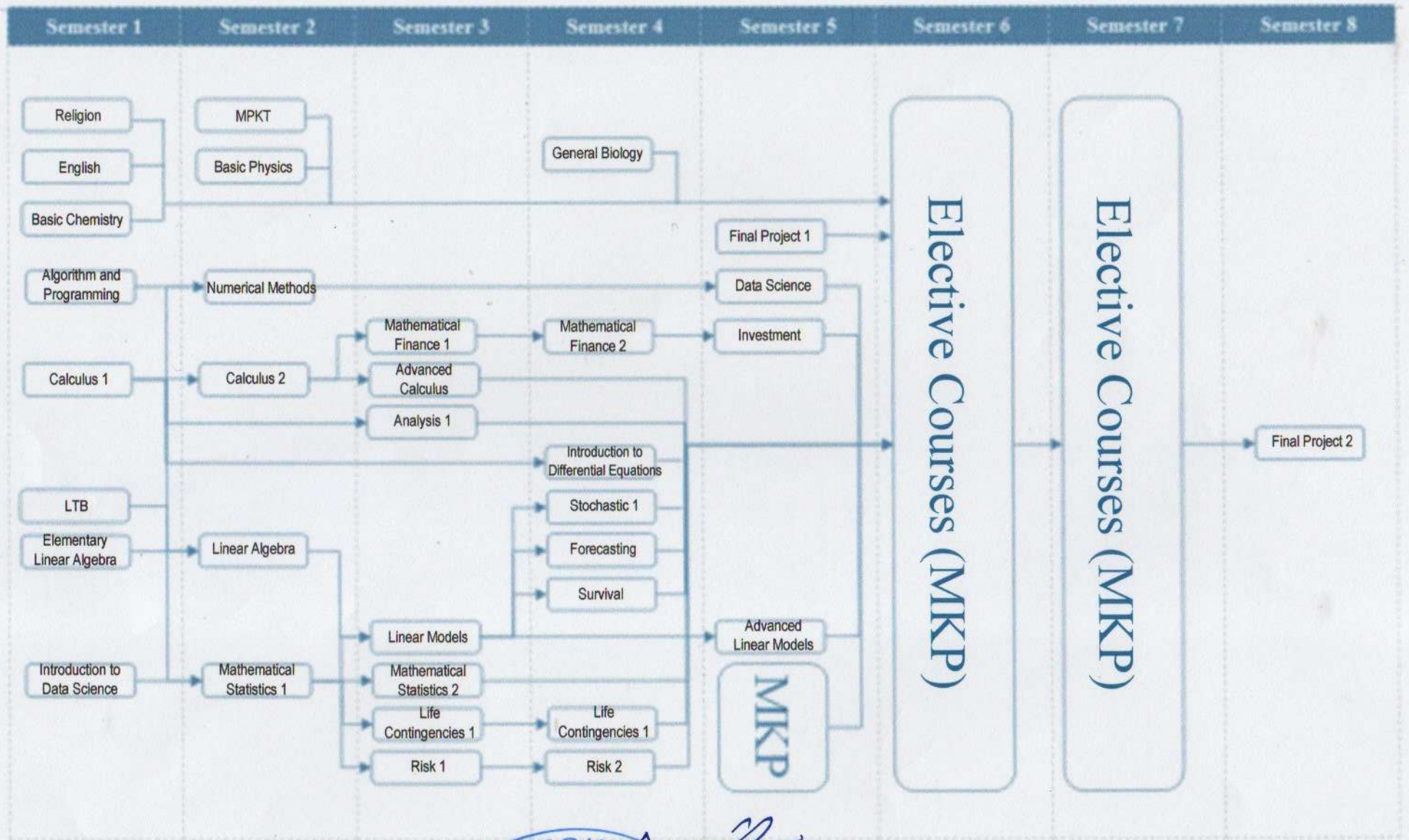


Figure 2. Courses Network



Table 9. Distribution of Courses Per Semester

SEMESTER 1			SEMESTER 2			SEMESTER 3			SEMESTER 4		
Code	COURSES	Credit	Code	COURSES	Credit	Code	COURSES	Credit	Code	COURSES	Credit
Compulsory Courses											
UIGE600004	Religion	2	UIGE600006	MPKT	5	SCMA602008	Analysis 1	4	SCBI601112	General Biology	2
UIGE600003	English	2	SCPH601110	Basic Physics	2	SCAK602002	Advanced Calculus	3	SCAK602001	Introduction to Differential Equations	2
SCCH601101	General Chemistry	2	SCMA601006	Linear Algebra 1	3	SCAK602020	Mathematical Finance 1	3	SCAK602021	Mathematical Finance 2	3
SCMF600002	Introduction to Data Science	2	SCMA601005	Calculus 2	3	SCST602006	Linear Models	3	SCST602010	Forecasting Methods	3
SCMA601001	Logic and Set	3	SCMA601007	Numerical Methods	3	SCAK602004	Life Contingencies 1	3	SCST602012	Survival Models	3
SCMA601003	Elementary Linear Algebra	2	SCST601003	Mathematical Statistics 1	3	SCST602004	Mathematical Statistics 2	3	SCAK602013	Life Contingencies 2	3
SCMA601002	Calculus 1	3				SCAK602011	Risk Modeling 1	3	SCAK602018	Risk Modeling 2	3
SCMA601004	Algorithm and Programming	3							SCAK602005	Stochastic Models 1	3
Total Credit		19	Total Credit		19	Total Credit		22	Total Credit		22
University Compulsory Course		4	University Compulsory Course		5	University Compulsory Course		0	University Compulsory Course		0
Faculty Compulsory Course		4	Faculty Compulsory Course		2	Faculty Compulsory Course		0	Faculty Compulsory Course		2
Department Compulsory Course		11	Department Compulsory Course		12	Department Compulsory Course		4	Department Compulsory Course		0
Study Program Compulsory Course		0	Study Program Compulsory Course		0	Study Program Compulsory Course		18	Study Program Compulsory Course		20
Elective Course		0	Elective Course		0	Elective Course		0	Elective Course		0
Total Credits for Semester 1		19	Total Credits for Semester 2		19	Total Credits for Semester 3		22	Total Credits for Semester 4		22

Recommendations for adding courses according to the previous semester's GPA:

Semester 2: General Biology, Introduction to Differential Equations

Semester 3: Final Project 1

Semester 4: Macroeconomic Theory, Health Insurance



Table 10. Distribution of Courses Per Semester (continued)

SEMESTER 5			SEMESTER 6			SEMESTER 7			SEMESTER 8		
Code	COURSES	Credit	Code	COURSES	Credit	Code	COURSES	Credit	Code	COURSES	Credit
Compulsory Courses											
SCAK603024	Final Project 1	2							SCAK604025	Final Project 2	6
SCAK603017	Investment Theory	3									
SCAK603022	Data Science	3									
SCST603101	Advanced Linear Models	3									
Total Credit		11	Total Credit		0	Total Credit		0	Total Credit		6
Elective Courses											
SCAK603115	Accounting 1	3	SCAK603116	Accounting 2	3	SCAK604112	Professional Internship	3			
SCAK603117	Microeconomic Theory	3	SCAK603118	Macroeconomic Theory	3	SCAK604109	Retirement Theory	3			
SCAK603103	Risk Management 1	3	SCAK604109	Risk Management 2	3	SCAK603101	Stochastic Models 2	3			
	Freedom Choice	9	SCAK603105	Machine Learning	3	SCAK604111	Actuarial Software	3			
			SCAK603110	General Insurance	3	SCAK604113	Special Topics 1	3			
			SCAK603119	Health Insurance	3	SCAK604114	Special Topics 2	3			
			SCAK603108	Financial Derivative Modeling	3		Freedom Choice	15			
				Freedom Choice	21						
University Compulsory Course		0	University Compulsory Course		0	University Compulsory Course		0	University Compulsory Course		0
Faculty Compulsory Course		0	Faculty Compulsory Course		0	Faculty Compulsory Course		0	Faculty Compulsory Course		0
Department Compulsory Course		0	Department Compulsory Course		0	Department Compulsory Course		0	Department Compulsory Course		0
Study Program Compulsory Course		11	Study Program Compulsory Course		0	Study Program Compulsory Course		0	Study Program Compulsory Course		6
Elective Course		9	Elective Course		21	Elective Course		15	Elective Course		0
Total Credits for Semester 5		20	Total Credits for Semester 6		21	Total Credits for Semester 7		15	Total Credits for Semester 8		6



Recommendations for adding courses according to the previous semester's GPA:

Semester 5: Retirement Theory, Stochastic Models 2

Semester 6: 3 – 9 Credits for Courses outside Study Program

Semester 7: Minor Thesis



7. STUDENT CREDITS LOAD PER SEMESTER

In the first semester, the Credit load is a package for all students. In the following semester, the maximum number of Credits that can be taken by the students depends on the previous Semester's GPA (SGPA) as provided for in the provisions of Article 27 point 4 of the Regulation of the Rector of the University of Indonesia Number 014 of 2016 concerning Implementation of Undergraduate Programs with the University of Indonesia. The maximum number of Credits is set forth in more detail in Table 11.

Table 11. Maximum Credits Per Semester

SGPA in the Previous Semester	Maximum Credits that can be Taken
< 2.00	12
2.00 – 2.49	15
2.50 – 2.99	18
3.00 – 3.49	21
3.50 – 4.00	24

8. EVALUATION AND STUDY DROP OUT

Based on the Regulation of the Rector of the University of Indonesia Number 014 of 2016 concerning Implementation of Undergraduate Programs with the University of Indonesia, the provisions of Article 32 states that the evaluation of study results is expressed in letters, namely using the letters A, A-, B+, B, B-, C+, C, D, and E. The minimum passing score for each course and final project is C. To convert the grades number into grades letter and the grades letter weights using the guidelines as set forth in Table 12.

Table 12. Score Conversion

Range of Grades Number	Grades Letter	Grades Letter Weights
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Range of Grades Number	Grades Letter	Grades Letter Weights
85 - 100	A	4.00
80 - <85	A-	3.70
75 - <80	B+	3.30
70 - <75	B	3.00
65 - <70	B-	2.70
60 - <65	C+	2.30
55 - <60	C	2.00
40 - <55	D	1.00
00 - <40	E	0.00

Furthermore, the provisions of Article 44 states that Regular Class students and Parallel Class students are declared to have dropped out of studies if:

- (1) In the evaluation of study results for the first 2 (two) semesters, they do not get a minimum of 24 (twenty four) credits with a minimum grade of C;
- (2) In the evaluation of study results for the first 4 (four) semesters, they do not get a minimum of 48 (forty eight) credits with a minimum grade of C;
- (3) In the evaluation of study results for the first 6 (six) semesters, they do not get a minimum of 72 (seventy two) credits with a minimum grade of C;
- (4) In the evaluation of study results for the first 8 (eight) semesters, they do not get a minimum of 96 (ninety six) credits with a minimum grade of C;
- (5) In the evaluation of study results for the first 10 (ten) semesters, they do not get a minimum of 120 (one hundred and twenty) credits with a minimum grade of C;
- (6) At the end of the study period, the students do not complete the entire study load according to the curriculum with a minimum grade of C;



- (7) If a student at the time of admission obtains a credit transfer, the evaluation will be carried out in the semester that requires the achievement of credits greater than the number of credits that have been recognized.

9. GRADUATION PREDICATE

The Students of the Actuarial Science Undergraduate Study Program who have been declared graduated will receive a graduation predicate as provided for in the provisions of Articles (4) – (7) of the Regulation of the Rector of the University of Indonesia Number 014 of 2016. The graduation predicate is determined based on the Grade Point Average (GPA) with details as set forth in Table 13.

Table 13. Graduation Predicate

GPA	Graduation Predicate
2.76 – 3.00	Satisfactory
3.01 – 3.50	Very Satisfactory
3.51 – 4.00	Cum Laude

The graduation predicate of Cum Laude can be given to graduates who complete their studies no later than 8 semesters with a minimum GPA of 3.51 obtained without repeating courses. If a graduate obtains a minimum GPA of 3.51 but does not meet the conditions above, then the graduate will receive the graduation predicate of a Very Satisfactory.



10. COURSE SYLLABUS

Code	SCMF600002
Name	INTRODUCTION TO DATA SCIENCE
Credit	2 Credits
Prerequisite	-
General Purpose	The Students are able to explain what data science is and what skills are required to become data scientists
Course Contents	Some of the probability distributions commonly used in statistical modeling, some statistical tools for data exploration, hypothesis testing, basic machine learning algorithms, simple data exploration case studies and data science processes using R tools.
References	Cathy O'Neil, C. and Schutt, R. Doing Data Science, Straight Talk From The Frontline. O'Reilly. 2014 Walpole, R. E., Myers, R. H., Myers, S. L., and Ye, K.. Probability and statistics for engineers and scientists (Vol. 5). New York: Macmillan. 1993

Code	SCMA601001
Name	LOGIC AND SET
Credit	3 Credits
Prerequisite	-
General Purpose	Students are able to explain the basic concepts of thinking mathematically



Course Contents	Propositions, Propositional connectors, Interpretation of propositional logic sentences. Valid sentences, fulfilled sentences, contradictory sentences. Truth table, Semantic tree, Equivalence of two propositional logical sentences. Schema sentence. Predicates, Universal quantification, Existence quantification, Interpretation of predicate logic sentences. Translating everyday sentences into predicate logical sentences, Equivalence of two predicate logical sentences; Inference rules, Direct proof, Indirect proof, Proof by contradiction, Mathematical Induction;
References	K. H. Rosen, Discrete Mathematics and Its Applications, McGraw-Hill, 2007

Code	SCMA601003
Name	ELEMENTARY LINEAR ALGEBRA
Credit	2 Credits
Prerequisite	-
General Purpose	Students are able to explain the basic concepts of matrix, vector space and transformation.
Course Contents	Linear equations system; Determinant; Vectors in R^2 and R^3 ; Euclidean Space; General Vector Space; Inner Product Space; Eigen Values and Vectors; Linear Transformation; Additional Topics: Applications in Differential Equations, Quadratic Forms, Least Squares Fitting to Data, LU Decomposition
References	H. Anton, Elementary Linear Algebra, John Wiley, 2005



	P. R. Halmos, Finite Dimensional Vector Spaces, Springer Verlag, 1987
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Code	SCMA601006
Name	LINEAR ALGEBRA 1
Credit	3 Credits
Prerequisite	-
General Purpose	Students are able to explain the basic concepts of matrix, vector space and transformation.
Course Contents	Linear equations system; Determinant; Vectors in R^2 and R^3 ; Euclidean Space; General Vector Space; Inner Product Space; Eigen Values and Vectors; Linear Transformation; Additional Topics: Applications in Differential Equations, Quadratic Forms, Least Squares Fitting to Data, LU Decomposition
References	H. Anton, Elementary Linear Algebra, John Wiley, 2005 P. R. Halmos, Finite Dimensional Vector Spaces, Springer Verlag, 1987

Code	SCMA601006
Name	CALCULUS 1
Credit	3 Credits
Prerequisite	-
General Purpose	Students are able to explain the basic concepts of single-variable calculus and are skilled at solving applied calculus



Course Contents	<p>problems.</p> <p>Introduction: Real Number System, Inequalities and absolute values; Single-Variable Functions: Definition and Types, Graphs (Cartesian), Operations on Functions; Limit: Definition and Limit Theorem, Continuity; Transcendent Functions, Derivative of Functions: Definition, Geometric Meaning, Derivative Formulas, Chain rule, Higher Level Derivative, Implicit Derivative, Application of Derivative: Maximum and Minimum, Average value theorem; Integrals: Definition, Indefinite and definite integrals, calculus basic theorem, Basic properties of integrals, Integration techniques, Applications of Integrals: Area and Volume of Rotating Objects</p>
References	<p>D. Varberg & E. S. Purcell, Calculus, Prentice-Hall, 2007</p> <p>G.B. Thomas & R. L. Finney, Calculus and Analytic Geometry, Addison-Wesley, 1996</p>

Code	SCMA601005
Name	CALCULUS 2
Credit	3 Credits
Prerequisite	CALCULUS 1
General Purpose	Students are able to explain the basic concepts of calculus.
Course Contents	<p>Transcendent and inverse functions (Trigonometric functions, hyperbolic functions), Integral Techniques (Trigonometric integrals, Rationalizing substitutions, Rational functions integral), indefinite forms, Parametric Equations, Polar</p>



References	<p>Coordinates, Areas in Polar Coordinates; Integral Applications: Curve Length and Surface Area of Rotating Objects; Multiple Variable Functions: Limit, Continuity, Partial Derivative, Derivative, Directional Derivative, Tangent Field, Maximum and Minimum; Bifold and Triple Integrals, Jacobian; Real Number Sequence.</p> <p>D. Varberg & E. S. Purcell, Calculus, Prentice-Hall, 2007</p> <p>G.B. Thomas & R. L. Finney, Calculus and Analytic Geometry, Addison-Wesley, 1996</p>
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Code	SCMA602008
Name	ANALYSIS 1
Credit	4 Credits
Prerequisite	CALCULUS 1
General Purpose	Students are able to explain the basic concepts of real analysis.
Course Contents	The real number system: algebraic properties, ordering, completeness, <i>supremum</i> and <i>infimum</i> and the applications thereof; Sequences: definitions, limits of sequences, limit theorems, monotone sequences, subsequences, Bolzano Weierstrass theorem, Cauchy Criterion, divergent sequences. Series recognition; Limit of function: definition, geometric meaning, limit theorem, expansion of limit concept; Continuous function: Continuity and discontinuity of a function at a point and on a set, Combination of continuous functions.
References	R. G. Bartle & D. R. Sherbert, Introduction to Real Analysis, John Wiley & Sons, 2011



	R. P. Burn, Numbers and Functions Steps into Analysis, Cambridge University Press, 2004
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Code	SCMA601004
Name	ALGORITHM AND PROGRAMMING
Credit	3 Credits
Prerequisite	-
General Purpose	Students are able to explain the basic concepts of Algorithm and Programming.
Course Contents	Introduction; Simple Structure; Conditional Structure; Recurring Structure; Array; Function; Algorithm Complexity; Programming
References	K. H. Rosen, Discrete Mathematics and Its Applications, McGraw-Hill, 2007 Deitel and Deitel, How to Program, Prentice-Hall, 1997

Code	SCMA601007
Name	NUMERICAL METHODS
Credit	3 Credits
Prerequisite	ALGORITHM AND PROGRAMMING
General Purpose	Students are able to explain the basic concepts of Numerical Methods.
Course Contents	Review of linear algebra, calculus and algorithms: vectors and vector norms, matrices and matrix norms, convergence and



References	<p>fixed point theorems, round-off error, efficiency, accuracy and stability; solution of single-variable equations; approximation and interpolation; numerical differential and integral; Direct and iterative methods for solving linear equation systems.</p> <p>R. L. Burden & J. D. Faires, Numerical Analysis, Brooks and Cole, 2011</p> <p>Atkinson, Elementary Numerical Analysis, John Wiley & Sons, 1985</p> <p>G. H. Golub & C. F. V. Loan, Matrix Computations, John Hopkins, 1995</p>
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Code	SCST601003
Name	MATHEMATICAL STATISTICS 1
Credit	3 Credits
Prerequisite	DATA SCIENCE
General Purpose	Students are able to explain the basic concepts of Statistics.
Course Contents	Probability and Distribution: Introduction, Probability Set Functions, Discrete Random Variables, Continuous Random Variables, Distribution Functions and the Characteristics thereof, Expectations of Random Variables, Multiple Special Expectations; Multivariate Distributions: Distributions of Two Random Variables, Conditional Probabilities, Conditional Distributions and Conditional Expectations, Correlation Coefficients, Independence between Random Variables, Expansion to Multiple Random Variables; Multiple Special Distributions: Binomial, Multinomial, Negative Binomial,



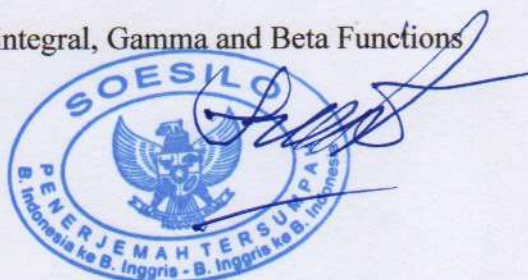
References	<p>Geometric and Hypergeometric, Poisson Distribution, Gamma and ChiSquare Distributions, Normal Distribution, Normal Bivariate Distribution, Normal Multivariate Distribution; Distribution of Random Variables Functions: Sampling Theory, Transformation of Discrete Random Variables, Transformation of Continuous Random Variables, Distribution of Beta, t and F, Expansion of Variable Change Technique, MGF Technique, Distribution of X and nS^2/σ^2, Expectations of Random Variables Functions.</p> <p>R. V. Hogg & A. T. Craig, Introduction to Mathematical Statistics, Prentice-Hall, 1995;</p> <p>S. Ross, Mathematical Statistics with Applications, Prentice-Hall, 2005</p> <p>J. Hasset.& D.G. Stewart, Probability for Risk Management, ACTEX Publications, 1999</p>
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Code	SCST602004
Name	MATHEMATICAL STATISTICS 2
Credit	3 Credits
Prerequisite	MATHEMATICAL STATISTICS 1
General Purpose	Students are able to explain the basic concepts of Statistics.
Course Contents	Distribution limits: ordered statistics, Chebyshev inequality; convergence in the distribution and in the probabilities; limit of moment generating function; the central limit arguments and other arguments related to distribution limits; Estimated point for a parameter: maximum likelihood method and moments



	<p>method, unbiasedness, consistency.; The concept of an unbiased estimator with minimum variance for a parameter. Sufficient statistics for a parameter; Sufficient statistics properties. Completeness and Uniqueness. Exponential class from pdf; An unbiased estimator with minimum variance for a function of the parameters. Unbiased estimators with minimum variance for multiple parameters; Lower limit of Rao-Cramer and Fisher information. Estimated interval for a parameter; Introduction to statistical hypothesis testing. Best test; Uniformly most powerful test. Likelihood ratio test.</p>
References	<p>R. V. Hogg & A. T. Craig, Introduction to Mathematical Statistics, Prentice-Hall, 1995;</p> <p>S. Ross, Mathematical Statistics with Applications, Prentice-Hall, 2005</p> <p>J. Hasset.& D.G. Stewart, Probability for Risk Management, ACTEX Publications, 1999</p>

Code	SCAK602002
Name	ADVANCED CALCULUS
Credit	3 Credits
Prerequisite	CALCULUS 2
General Purpose	Students are able to solve problems related to series and integration.
Course Contents	Infinite Series (series convergence test), improper integral (improper integral convergence test), Fourier series, Fourier integral, Gamma and Beta Functions



References	<p>R.Wrede & M.R.Spiegel. Advanced Calculus.Third Edition, McGrawHill, 2010.</p> <p>D. Varberg & E. S Purcell. Calculus. Ninth Edition. Prentice-Hall, 2007</p>
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Code	SCAK602001
Name	INTRODUCTION TO DEFFERENTIAL EQUATIONS
Credit	2 Credits
Prerequisite	CALCULUS 1
General Purpose	Students are able to solve problems related to differential equation.
Course Contents	Formation of Differential Equation, Solution of Differential Equation, First order Differential Equation, Second order Differential Equation, High order Differential Equation, Approximate Solution of First Order Differential Equation, Differential Equation Solving with series, Laplace Transformation
References	<p>W. E. Boyce & R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 2010, Wiley, 2010</p> <p>E. Kreyszig, Advanced Engineering Mathematics, John-Wiley & Sons, 2000</p>

Code	SCAK602020
Name	MATHEMATICAL FINANCE 1



Credit	3 Credits
Prerequisite	CALCULUS 2
General Purpose	Students are able to explain the concepts of interest & model the real problems involving interest according to the concept of interests; explain basic annuity concepts, more general annuities and model the real problems involving annuities; determine the remaining debt from an amortization, prepare amortization & sinking funds schedules; Students are able to analyze real-world problems and model the same into mathematical form. Students are able to complete mathematical models and analyze the results obtained.
Course Contents	Measuring and solving Interest problems; Basic annuity and general annuity; Amortization and sinking funds
References	S. G. Kellison, The Theory of Interest, McGraw-Hill, 1991; R. Cissel, Mathematics of Finance, Houghton Mifflin, 1969; F. Ayres, Mathematics of Finance, Mc Graw Hill, 1963; M. M. Parmenter, Theory of Interest and Life Contingencies with Pension Applications, Acted Publications, 1999

Code	SCAK602021
Name	MATHEMATICAL FINANCE 2
Credit	3 Credits
Prerequisite	MATHEMATICAL FINANCE 1
General Purpose	Students are able to determine the price of securities such as bonds and stocks; analyze financial flows and calculate



Course Contents	reinvestment rates; analyze the form of practical application of the concepts mathematical finance; perform advanced financial analysis; determine the term structure of interest rate; determine the duration, convexity, and immunization of an asset; know the various types of derivative products (C2).
References	Bond; Yield Rates; Practical application, Advanced financial analysis, Term Structure of Interest Rate, duration, convexity, and immunization, introduction to derivatives S. G. Kellison, The Theory of Interest, McGraw-Hill, 1991; R. Cissel, Mathematics of Finance, Houghton Mifflin, 1969; F. Ayres, Mathematics of Finance, Mc Graw Hill, 1963; M. M. Parmenter, Theory of Interest and Life Contingencies with Pension Applications, Acted Publications, 1999

Code	SCST602006
Name	LINEAR MODELS
Credit	3 Credits
Prerequisite	MATHEMATICAL STATISTICS 1
General Purpose	Students are able to apply statistical models for problem solving through the concept of linear regression
Course Contents	Inference statistics, one-way analysis of variance, Decomposition of total sum of squares, two-way ANOVA, Gauss Markov theory, simple and multiple linear regression, least squares method
References	D. C. Montgomery, E. A. Peck, & G. Geoffrey Vining,



Code	SCST602012
Name	SURVIVAL MODELS
Credit	3 Credits
Prerequisite	LINEAR MODELS
General Purpose	Students are able to understand the characteristics of survival data; determine the relationship between the quantity distribution of the probability model of survival time random variable; analyze the censorship scheme and/or beheading from the survival data provided; determine the non-parametric estimator of the survival function and the hazard function of survival time; analyze the comparison of several methods of hypothesis testing; describes the process of establishing the Cox Proportional Hazard regression model and construction of the partial likelihood; interpret the Cox Proportional Hazard regression model; Students are able to perform proportional hazard assumption testing.
Course Contents	Examples and Characteristics of Survival Data, Probability Model of Survival Time Random Variable, Censorship and Beheading Schemes, Non-Parametric Approach: Estimation of survival function and hazard function using Kaplan-Meier and Nelson-Aalen methods and hypothesis testing, Semi-Parametric Approach: Cox Proportional Hazard regression model
References	Klein, J.P. dan Moeschberger, M.L., Survival Analysis: Techniques for Censored and Truncated Data, 2 nd Edition,



	Springer, 2003
	D. London, Survival Models and Their Estimation, Actex Publication, 1997

Code	SCST602010
Name	FORCASTING METHODS
Credit	3 Credits
Prerequisite	LINEAR MODELS
General Purpose	Students are able to process, understand, model and predict time series data involving the insurance and financial industry.
Course Contents	Characteristics of time series data, techniques for smoothing time series data via moving average method, exponential, winter method, ARIMA (p, d, q) modeling
References	<p>Cryer, J. D., & Chan, K.-S. Time Series Analysis With Application in R, Springer Text in Statistics, Second Edition, 2008</p> <p>Box, G. E., Jenkins, G. M., & Reinsel, G. C. Time Series Analysis, 3rd Edition. Prentice Hall, 1994.</p> <p>Hanke, J. E., & Reitsch, A. G. Business Forecasting, 6th Edition, 1998.</p>

Code	SCAK602004
Name	LIFE CONTINGENCIES 1
Credit	3 Credits



Prerequisite	MATHEMATICAL STATISTICS 1
General Purpose	Students are able to understand actuarial terminology and different types of life insurance contracts; calculate and interpret the quantity distribution of future lifetime random variables; apply approximation methods for calculations relating individual survival models, such as the uniform distribution of death and constant force of mortality; solve the problem of valuation of insurance benefits payments and life annuities based on the survival parametric model and life tables given.
Course Contents	Introduction to Life Insurance, Future Lifetime Random Variables, Life Tables, Insurance Benefit Payment Models, and Life Annuity Payment Models
References	<p>Dickson, D. C., Hardy, M.R., Waters, H.R. 2013. Actuarial Mathematics for Life Contingent Risks. Second Edition. United Kingdom: Cambridge University Press.</p> <p>Bowers, N.L., Gerber, H.U., Hickman, J.C., Jones, D.A. 1997. Actuarial Mathematics. Second Edition. United States: Society of Actuaries.</p> <p>Cunningham, R J., Herzoq, T. H., London, R. L. 2006. Model for Quantifying Risks. Second Edition. Connecticut: Actex Publications, Inc.</p>

Code	SCAK602013
Name	LIFE CONTINGENCIES 2
Credit	3 Credits



Prerequisite	LIFE CONTINGENCIES 1
General Purpose	Students are able to determine the premium and reserves of several types of life insurance contracts involving single life with single state; understand the concepts related to parametric and tabular survival models for multiple-life states and multiple lives; solve payment valuation problems related to multiple state models and multiple life models
Course Contents	Premiums, Benefits Reserves (Policy Value), Multiple State Models, and Multiple Life Models
References	<p>Dickson, D. C., Hardy, M.R., Waters, H.R. 2013. Actuarial Mathematics for Life Contingent Risks. Second Edition. United Kingdom: Cambridge University Press.</p> <p>Bowers, N.L., Gerber, H.U., Hickman, J.C., Jones, D.A. 1997. Actuarial Mathematics. Second Edition. United States: Society of Actuaries.</p> <p>Cunningham, R J., Herzoq, T. H., London, R. L. 2006. Model for Quantifying Risks. Second Edition. Connecticut: Actex Publications, Inc.</p>

Code	SCAK602011
Name	RISK MODELING 1
Credit	3 Credits
Prerequisite	MATHEMATICAL STATISTICS 1
General Purpose	Students are able to determine distribution quantities from actuarial models which consist of discrete, continuous and



Course Contents	<p>aggregate models; differentiate characteristics of actuarial models; form a new distribution from a known basic distribution; apply risk measures in determining premiums and reserves.</p> <p>Actuarial model, continuous distribution, discrete distribution, mixed distribution, frequency model, severity model, aggregate loss model.</p>
References	<p>S. A. Klugman, H.H Panjer, H.H and G. E. Willmot, Loss Models: From Data to Decisions, 2004.</p> <p>Y.-K. Tse, Nonlife Actuarial Models: Theory, Methods, and Evaluation, 2009.</p>

Code	SCAK602018
Name	RISK MODELING 2
Credit	3 Credits
Prerequisite	RISK MODELING 1
General Purpose	<p>Students are able to build empirical models; estimate parametric models both for complete and incomplete data; test the estimated distribution model using graphic methods and Hypothesis Testing; master the concepts of classical credibility theory; determine credible estimated premium using Bayesian concepts and methodology as well as the Buhlmann and Bulhmann-Straub models; master the basic concepts of estimating empirical Bayes parameters</p>
Course Contents	<p>Empirical models, estimated parametric model, model selection, limited fluctuation credibility, Bayesian</p>



References	<p>methodology, Buhlmann model, Buhlmann-Straub model, empirical Bayes estimation methods</p> <p>S. A. Klugman, H.H Panjer, H.H and G. E. Willmot, Loss Models: From Data to Decisions, 2004.</p> <p>Y.-K. Tse, Nonlife Actuarial Models: Theory, Methods, and Evaluation, 2009.</p>
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Code	SCAK602005
Name	STOCHASTIC MODELS 1
Credit	3 Credits
Prerequisite	LINEAR MODELS
General Purpose	Students are able to classify problems in actuarial and financial fields into the stochastic models.
Course Contents	Random variables theory, conditional expectations and probabilities, Discrete-time Markov chains of Poisson processes and exponential distributions, continuous-time Markov chains
References	<p>M. Sheldon, W. Ross, Introduction to Probability Models, 12th Edition, Academic Press, 2019</p> <p>Richard Durrett, Essential of Stochastic Processes, Second Edition, Springer, 2012</p>

Code	SCAK603022
Name	DATA SCIENCE



Credit	3 Credits
Prerequisite	NUMERICAL METHOD
General Purpose	Students understand the concept of data science and have the skills to implement the same using software to solve problems related to actuarial science.
Course Contents	Introduction to data science and machine learning, linear regression, logistic regression, support vector machine, decision tree, ensemble learning, k-means, fuzzy c-means, latent semantic analysis, object-oriented programming, case study, representation learning, data management
References	Jake VanderPlas. Python Data Science Handbook. O'Reilly, 2016 Christopher M. Bishop. Pattern Recognition and Machine Learning. Springer, 2006

Code	SCST603101
Name	ADVANCED LINEAR MODELS
Credit	3 Credits
Prerequisite	LINEAR MODELS
General Purpose	Students are able to carry out qualitative and quantitative data analysis in the actuarial and financial fields in the form of the Generalized Linear Model (GLM).
Course Contents	This course is an extension of ordinary linear regression theory and methods to a more general framework, namely Generalized Linear Model (GLM). In this course you will be introduced to



References	<p>the concept of the exponential distribution family, link functions, GLM model construction based on response variables, hypothesis testing, good-of-fit testing, and model selection. The GLM models discussed are regression for binary/logistic data, nominal and ordinal logistic regression, polytomy logistic regression, Poisson regression and negative Binomial regression.</p>
	<p>Alan Agresti, Foundation of Linear and Generalized Linear Models, Wiley Series in Probability and Statistics, John Wiley & Sons Inc, 2015</p> <p>Annete J. Dobson, An Introduction to Generalized Linear Models, Fourth Edition, Chapman & Hall/CRC Texts in Statistical Science, 2018</p> <p>P. D. Jong, G.Z. Heller, Generalized Linear Models for Insurance Data, International Series on Actuarial Science, Cambridge University Press, 2008</p>

Code	SCAK603017
Name	INVESTMENT THEORY
Credit	3 Credits
Prerequisite	MATHEMATICAL FINANCE 2
General Purpose	<p>Students are able to master basic concepts of investment and capital markets; apply the basic concepts of investment and capital markets in securities trading; master the concept of managing risk portfolios, portfolio capital; formulate optimal portfolio; Students are able to master the theory of capital</p>



Course Contents	<p>market balance; manage a portfolio that includes bonds; conduct security analysis</p> <p>Investment environment, financial instruments, securities trading, mutual funds and other investment companies, portfolio theory (risk, return, capital allocation from risky assets, risky asset optimum portfolio), capital market balance (CAPM, arbitrage pricing theory, efficient market hypothesis, financial and technical analysis behavior), managing bond portfolios, and securities analysis (macroeconomic and industry analysis, equity valuation models, financial statement analysis)</p>
References	<p>Bodie, Zvi, Alex Kane & Alan Marcus. 2018. Investment, 11th Ed. Berkshire: McGraw-Hill Education</p> <p>Berk, Jonathan & Peter DeMarzo. 2017. Corporate Finance, 4th Edition. Edinburgh: Pearson</p> <p>Ross, Westerfield, Jaffe and Jordan. 2008. Modern Financial Management. McGraw-Hill.</p>

Code	SCAK603024
Name	FINAL PROJECT 1
Credit	2 Credits
Prerequisite	-
General Purpose	Students are able to explain the steps in carrying out research and scientific writing.
Course Contents	Research as an approach to get the truth; Various research methods and types; Determination of the topic and research



References	<p>problem; Concepts, variables and systems of variables; Formulation of the hypothesis; Research plan and steps in doing research; Data collection method: experiment and survey; sampling techniques; Validity and Reliable; Proposals preparing practice; Research results writing reports</p> <p>M. Walizer & P. L. Wunier, Research Methods and Analysis, Harper & Row, 1978</p> <p>D. Lindsay, Penuntun Penulisan Ilmiah, UI Press, 1988</p> <p>D. V. Seyler, Doing Research: The Complete Research Guide, Mc Graw Hill, 1999</p>
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Code	SCAK603117
Name	MICROECONOMIC THEORY
Credit	3 Credits
Prerequisite	-
General Purpose	Students are able to understand demand and supply theory, consumer behavior, producer behavior, analyze various types of market structures and market mechanisms.
Course Contents	Theory of demand, supply, and its application, theory of consumer behavior, theory of production and production costs, market structure and determining the balance of the company, determining the price of production factors, market mechanisms and government policies.
References	Sukirno, Sadono. 2017. Mikroekonomi: Teori Pengantar, edisi 3. Jakarta: Rajawali Pers



	Samuelson, Paul A. & William D. Nordhaus. 2003. Ilmu Mikroekonomi, edisi 17. New York: McGraw-Hill
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Code	SCAK603118
Name	MACROECONOMIC THEORY
Credit	3 Credits
Prerequisite	-
General Purpose	Students are able to apply theory in analyzing economic symptoms related to macroeconomics
Course Contents	The indicators and concepts of macroeconomics basic theory, namely inflation, economic growth and unemployment, economic activity and national income, money supply and economic activity, economic policy in a closed and open economy, economic growth and macroeconomic policy.
References	Sukirno, Sadono. Mikroekonomi: Teori Pengantar, edisi 3. Jakarta: Rajawali Pers,2017. Samuelson, Paul A. & William D. Nordhaus. Ilmu Mikroekonomi, edisi 17. New York: McGraw-Hill,2003.

Code	SCAK60311
Name	ACCOUNTING 1
Credit	3 Credits
Prerequisite	-
General Purpose	Students are able to understand accounting principles, analyze



Course Contents	financial statements, and understand company financial statements. Basic accounting principles, accounting standards and functions, accounting flow and concepts, annual reports and annual statements, accounting for investment assets and other assets, accounting for liabilities and reserves, accounting for policy benefits
References	Mulligan, Elizabeth A. & Gene Stone. Accounting and Financial Reporting in Life and Health Insurance Companies. Atlanta: Life Management Institute, LOMA, 1997. Mulligan, Elizabeth A. Financial Accounting and Reporting Requirements in Life Insurance Companies. Atlanta: Life Management Institute, LOMA, 2002. PSAK (Indonesia Statement of Financial Accounting Standards) 18 (Akuntansi Dana Pensiun), 24 (Akuntansi Biaya Manfaat Pensiun), 28 (Akuntansi Asuransi Kerugian), 36 (Akuntansi Asuransi Jiwa) dan 62 (Kontrak Asuransi)

Code	SCAK603116
Name	ACCOUNTING 2
Credit	3 Credits
Prerequisite	ACCOUNTING 1
General Purpose	Students are able to understand accounting principles, analyze financial statements, and understand company financial statements.



Course Contents	Accounting for capital and surplus, accounting for income and expenses, management and cost accounting, financial statements analysis, budgeting, accountability accounting, internal control and auditing.
References	<p>Mulligan, Elizabeth A. & Gene Stone. 1997. Accounting and Financial Reporting in Life and Health Insurance Companies. Atlanta: Life Management Institute, LOMA</p> <p>Mulligan, Elizabeth A. 2002. Financial Accounting and Reporting Requirements in Life Insurance Companies. Atlanta: Life Management Institute, LOMA</p> <p>PSAK (Indonesia Statement of Financial Accounting Standards) 18 (Akuntansi Dana Pensiun), 24 (Akuntansi Biaya Manfaat Pensiun), 28 (Akuntansi Asuransi Kerugian), 36 (Akuntansi Asuransi Jiwa) dan 62 (Kontrak Asuransi)</p>

Code	SCAK603108
Name	FINANCIAL DERIVATIVE MODELING
Credit	3 Credits
Prerequisite	MATHEMATICAL FINANCE 2
General Purpose	Students are able to understand the basic concept of derivatives; master the future market mechanism; Students are able to perform futures hedging strategies; determine forward and future prices; master the mechanisms of the options market; perform trading strategies with options; determine the option prices with the binomial tree and the Black-Schole-Merton model.



Course Contents	Basic concepts and characteristics of derivative instruments in general, forwards, futures, options, binomial pricing models, Black-Scholes option pricing models, Greek options, and the use of derivatives in risk management.
References	Hull, John C. 2015. Options, Futures, and Other Derivatives, 9 th Ed. New Jersey: Pearson Education. McDonald, Robert L. 2013. Derivatives Markets, 3 rd Ed. New Jersey: Pearson Education.

Code	SCAK603110
Name	GENERAL INSURANCE
Credit	3 Credits
Prerequisite	-
General Purpose	Students are able to understand and apply actuarial principles in general insurance
Course Contents	Property/casualty coverage, risk premium and experience rating, ratemaking and loss reserving, individual risk rating and limits factors, reinsurance.
References	Brown, R.L. and Gottleib, L.R. 2001. Introduction to Ratemaking and Loss Reserving for Property and Casualty Insurance. Second Edition. USA: Actex Publications. D. Hart, B. Buchanan, and B. Howe. 2007. Actuarial Practice of General Insurance. The Institute of Actuaries of Australia. Hossack, I.B., Pollard, J.H., Zehnirith, B. 1999. Introductory Statistics with Applications in General Insurance. Second



Edition. Cambridge University Press.

Code	SCAK603119
Name	HEALTH INSURANCE
Credit	3 Credits
Prerequisite	-
General Purpose	Students are able to explain the actuarial principles of health insurance; plan/monitor health insurance.
Course Contents	Actuarial Models: Collective Risk Models, Insurance Models Inclusive Expenses; Applications of Risk Theory, Individual Health Insurance and Group Health Insurance
References	Bowers, N.L., Gerber, H.U., Hickman, J.C., Jones, D.A. 1997. Actuarial Mathematics. Second Edition. United States: Society of Actuaries Bluhm, W.F., Individual Health Insurance, ACTEX Publications, 2007 Bluhm, W.F., Group Insurance, ACTEX Publications, 5th Ed. 2007

Code	SCAK604109
Name	RETIREMENT THEORY
Credit	3 Credits
Prerequisite	LIFE CONTINGENCIES 1
General Purpose	Students are able to explain terminology related to retirement;



Course Contents	Students are able to explain the differences between various types of retirement programs; Students are able to determine the solution of quantities related to retirement. Introduction to Retirement Terminology, Classification of Retirement Programs, Mathematics of Retirement: Cost Methods and Experience Gains/Losses.
References	W. H. Aitken. Pension Funding and Valuation, 1996 Mc Gill, Brown, Haley, Schiber. Fundamental of Private Pension. 1996

Code	SCAK603103
Name	RISK MANAGEMENT 1
Credit	3 Credits
Prerequisite	-
General Purpose	Students are able to solve problems related to company operations related to risk.
Course Contents	Risk and its treatment, insurance and risk, introduction to risk management, advanced topics in risk management, types of insurance companies and marketing systems, insurance company operations, financial operations of insurance companies, government regulations on insurance, basic legal principles, insurance contract analysis
References	G.E.Rejda. Principles of risk management and insurance. twelfth edition.pearson.2014.



Code	SCAK604106
Name	RISK MANAGEMENT 2
Credit	3 Credits
Prerequisite	RISK MANAGEMENT 1
General Purpose	Students are able to solve problems related to company operations related to risk.
Course Contents	Life insurance, provisions of life insurance contracts, buying life insurance, annuities and individual retirement calculations, individual health insurance, group life and health insurance, retirement planning, social insurance, accountability risk,
References	G.E.Rejda. Principles of risk management and insurance. twelfth edition.pearson.2014.

Code	SCAK603101
Name	STOCHATICS MODELS 2
Credit	3 Credits
Prerequisite	STOCHATICS MODELS 1
General Purpose	Students are able to apply the stochastic model to the problems in actuarial and financial fields.
Course Contents	Reform Theory and the Applications thereof, Brownian motion and Stationary Processes, Simulation of Discrete and Continuous Random Variables, Coupling
References	M. Sheldon, W. Ross, Introduction to Probability Models, 12 th Edition, Academic Press, 2019



	Richard Durrett, Essential of Stochastic Processes, Second Edition, Springer, 2012
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Code	SCAK603105
Name	MACHINE LEARNING
Credit	3 Credits
Prerequisite	DATA SCIENCE
General Purpose	Students are able to understand the concepts of big data and deep learning as well as have the skills to implement using software in solving problems related to actuarial science.
Course Contents	Introduction to big data and machine learning, neural networks, deep learning, deep learning for computer vision, deep learning for natural language processing, deep learning for structured data
References	I. Goodfellow, Y. Bengio, A. Courville. Deep Learning. MIT Press, 2016 A. Zhang, Z. C. Lipton, M. Li, and A. J. Smola. Dive into Deep Learning. 2020

Code	SCAK604111
Name	ACTUARIAL SOFTWARE
Credit	3 Credits
Prerequisite	ALGORITHM AND PROGRAMMING
General Purpose	Students are able to apply software that is related to actuarial



Course Contents	<p>problems.</p> <p>Actuarial modeling uses actuarial software (Macro Excel, Prophet or Alpha) and statistics software (Python, R, MATLAB, SAS, GLIM or S-Plus).</p>
References	<p>K. R. Baker, S. G. Powell, B. Lawson and L. Foster, Comparison of Characteristics and Practices amongs Spreadsheet Users with Different Levels of Experience. Johnson, 2006</p> <p>T. DeMarco and T. Lister. Waltzing with Bears: Managing Risk on Software Projects. Dorset House, 2003</p>

AFFIDAVIT

I, SOESILO, a Sworn Translator in the Republic of Indonesia, pursuant to the prevailing laws and regulations, hereby certify and declare, in accordance with my oath of office, that this document is a true and complete translation from Indonesian to English.

Jakarta, September 8, 2023



SOESILO
 Decree of the Minister of Law and Human Rights R.I
 No. AHU/40.AH.03.07.2022,
 Jl. Otista III No. 117 Jakarta 13340