Mathematics and Computer Science

Introduction

The contribution of interdisciplinary study is becoming increasingly integrated in our society. It's due to collect more data easier about ourselves and our environment in today's world. The interdisciplinary study concerned with the finding of insight from large volumes of unstructured data is called as Data Science. The combination of Mathematics and Computer Science into one study program is intended to maximize the capabilities of the students to get insight in data produced by current technology. This study program has high practical relevance, as the insight from abundant data is an important economic activity. For example, data science techniques can be used for maintaining an information model of the dynamic environment, based on things like real-time sensor data. The program can be completed within 4 - 4.5 years. Furthermore, to provide work experience for students, there are industrial internships, interesting research or entrepreneurship programs for 1 semester.

Vision

A World Class study program by providing excellent educational experiences in Computational Mathematics, Fostering and Empowering the Society in Serving and Building the Nation.

Mission

The mission of Computer Science and Mathematics Program is to contribute to the global community through the provision of world-class education by:

1. Educating students to effectively apply their educational experiences in Computational Mathematics to solve real-world problems.
2. Preparing our graduates to develop exemplary soft skills & technical skills required as ICT professionals, leaders and entrepreneurs in global market.
3. Promoting high impact research that contributes to the nation.
4. Fostering BINUSIAN as lifelong learners through self-enrichment.
5. Empowering BINUSIAN to continuously improve society's quality of life.

Program Objective

The objectives of the program are:

1. Graduates will become successful professionals in ICT fields;
2. Graduates will obtain employment in global companies or become entrepreneurs;
3. Graduates will obtain professional certification or continue their study to the postgraduate level;
4. Graduate will have ability to pursue higher degree of education.

Student Outcomes

After completing the study, graduates are:

1. Able to analyze a complex computing problem and to apply principles of computing and other relevant disciplines to identify solutions;
2. Able to design, implement, and evaluate a computing-based solution to meet a given set of computing requirements in the context of computer science;
3. Able to communicate effectively in a variety of professional contexts;
4. Able to recognize professional responsibilities and make informed judgments in computing practice based on legal and ethical principles;

5. Able to function effectively as a member or leader of a team engaged in activities appropriate to computer science;
6. Able to apply computer science theory and software development fundamentals to produce computing-based solutions;
7. Able to explore, logical reasoning, generalization abstraction, and formal proof in formulating and model problems with specific variables and assumptions through mathematical approach with or without mathematical software;
8. Able to develop mathematical models of problems and analyze their performance and draw contextual conclusions;
9. Able to conduct data science project flow to solve real business and industry problems;
10. Able to construct software by implementing mathematical models;
11. Able to apply interdisciplinary knowledge and skills in developing alternative solutions for problem-solving.

Prospective Career of the Graduates

The graduates of the double study program Mathematics and Computer Science can follow careers in:

1. Specialist in specific kinds of data, such as natural language text, image data, geographic data, sensor data, networked data
2. Designer of smart devices or smart services
3. Designer of data science algorithms
4. Multi-disciplinary researcher or educator
5. Data Scientist or business analyst

Curriculum

With reference to the Vision and Mission of Binus University, the role of Mathematics and Computer Science in the future and its current standing in Indonesia, the study program will contain the following elements:

1. Solid education to increase mathematical reasoning capability and ability to solve problems in other fields.
2. The academic atmosphere that will facilitate student learning in order that student will develop skills in communicating their mathematical reasoning and skill in software engineering.
3. An environment that fosters active learner independence and encourages students to be able to succeed in their professional career and in fields related to Data Science.

Furthermore, besides this department provides the means and expertise in Data Science to prepare students for a career as a Data Scientist who is able to create mathematical models to solve problems in many related fields, it also provides capability in developing Computer Science or Applied Mathematics both in Indonesia and among the nations of the world in order to pursue higher degree of education.

Course Structure

Sem	Code	Course Name	SCU	Total
1	CHAR6013016	Character Building: Pancasila	2	20
	COMP6047016	Algorithm and Programming**	4/2	
	MATH6031016	Calculus	4	
	MATH6025016	Discrete Mathematics*	4	
	STAT6152016	Introduction to Data Science**	2	
	COMP6798016	Program Design Methods*	2	

Sem	Code	Course Name	SCU	Total
2	CHAR6014016	Character Building: Kewarganegaraan	2	20
	COMP6048016	Data Structures*&**	4/2	
	MATH6189016	Advanced Calculus I*	4	
	MATH6030016	Linear Algebra*&**	2	
	STAT6171016	Basic Statistics	2	
	LANG6027016	Indonesian	2	
	ENTR6509001	Entrepreneurship: Ideation	2	
3	MATH6183016	Scientific Computing	2/1	24
	COMP6708016	Object Oriented Programming	2/2	
	MATH6190016	Advanced Calculus II*	4	
	MATH6144016	Advanced Linear Algebra*	2	
	MATH6008016	Mathematical Statistics I	4	
	SCIE6063016	Computational Physics	2/1	
	STAT6157016	Data Mining and Visualization*	2	
	English University Courses			
	ENGL6129016	English Savvy	2	
	ENGL6131016	English for Written Business Communication	2	
4	CHAR6015016	Character Building: Agama	2	24
	CPEN6247016	Computer Networks	2/1	
	COMP6799016	Database Technology**	2/1	
	MATH6146016	Complex Variable Function*&**	2	
	MATH6186016	Mathematical Statistics II	4	
	COMP6065016	Artificial Intelligence**	4	
	MATH6187016	Machine Learning*&**	2/1	
	SCIE6062016	Computational Biology	2/1	
5	COMP6737016	Geographical Information System*	2	24
	COMP6800016	Human and Computer Interaction**	2/1	
	COMP6049016	Algorithm Design and Analysis*	4	
	COMP6051016	Web Programming	2/1	
	MATH6188016	Differential Equations*&**	4	
	MATH6064016	Applied Projective Geometry	2	
	MATH6165016	Deep Learning and Optimization Methods*&**	4	
	STAT6158016	Data Management and Organization*	2	
6	MATH6021016	Real Analysis*	4	22
	COMP6697016	Operating System	2	
	MATH6151016	Computational Geometry	2	
	COMP6100016	Software Engineering**	4	
	MATH6178016	Text Mining	2	
	MATH6018016	Modern Algebra*&**	4	
	MATH6069016	Applied Mathematics Modeling*	2	
	STAT6159016	Big Data Infrastructure and Technology*	2	
7	ENTR6511001	Entrepreneurship: Market Validation	2	22
	COMP6062016	Compilation Techniques	4	
	COMP6696016	Research Methodology in Computer Science*	2	
	MATH6168016	Computer Vision	2/2	

Sem	Code	Course Name	SCU	Total
	MATH6169016	Speech and Audio Processing	2/2	
	MATH6166016	Data Security**	2	
	Free Electives		4	
8	**Enrichment Program**		20	20
9	MATH6179016	Pre-Thesis	2	6
	MATH6180016	Thesis	4	
	MATH6091016	Thesis	6	
				Total Credits 182 SCU

**) This course is delivered in English*
***) Global Learning System Course*

Free Electives:
-) For Free Electives, students are required to choose from the list of Free Electives in Appendix.

English University Courses:
-) *For English University Courses, students with Binus University English Proficiency Test scores less than 500 will take English Savvy, and students with test scores greater than or equal to 500 will take English for Written Business Communication.*
-) Students must pass English Savvy with a minimum Grade of C.

Pre-thesis (2 SCU) & Thesis (4 SCU) *can be taken in the 6th and/or 7th semester by the students who meet the requirements from the Study Program/Program*

Appendix: Free Electives (7th Semester)

Because free electives will be implemented on the 7th semester, data will be collected from Curriculum 2022

Enrichment Program (8th Semester):
-) *Student will take one of enrichment program tracks (off campus). See enrichment appendix for the tracks detail.*

Enrichment Track Scheme

Track	Semester 8						
	IN	RS	EN	CD	SA	IS	etc
1	v						
2		v					
3			v				
4				v			
5					v		
6						v	

Note:

IN	: Certified Internship	SA	: Certified Study Abroad
RS	: Certified Research	IS	: Certified Specific Independent Study
EN	: Certified Entrepreneurship	etc	: Study Program Special Purposes
CD	: Certified Community Development		

Description:
Student will take one of enrichment program tracks

Certified Internship Track

Code	Course Name	SCU	Total
MATH6073016	Internship	8	20
MATH6181016	Mathematical Modeling Solution and Applied Programming in Industry	8	
MATH6076016	EES in Mathematics Industry	4	

Certified Entrepreneurship Track

Code	Course Name	SCU	Total
ENTR6643016	Product Launching in Mathematics	8	20
ENTR6644016	Business Development in Mathematics	8	
ENPR6194016	EES in Mathematics	4	

Certified Research Track

Code	Course Name	SCU	Total
RSCH6224016	Research Experience	8	20
RSCH6530016	Scientific Writing in Mathematics	8	
RSCH6155016	Global EES in Mathematics Research	4	

Certified Community Development Track

Code	Course Name	SCU	Total
CMDV6124016	Community Outreach Project Implementation	8	20
CMDV6312016	Community Outreach in Mathematics Project Design	8	
CMDV6073016	Employability and Entrepreneurial Skills in Mathematics	4	

Certified Study Abroad Track

Code	Course Name	SCU	Total
Elective courses list for study abroad*			20
GLOB6005016	Elective Course for Study Abroad 1	4	
GLOB6006016	Elective Course for Study Abroad 2	4	
GLOB6007016	Elective Course for Study Abroad 3	4	
GLOB6008016	Elective Course for Study Abroad 4	4	
GLOB6009016	Elective Course for Study Abroad 5	2	
GLOB6010016	Elective Course for Study Abroad 6	2	
GLOB6011016	Elective Course for Study Abroad 7	2	
GLOB6012016	Elective Course for Study Abroad 8	2	
GLOB6013016	Elective Course for Study Abroad 9	2	
GLOB6014016	Elective Course for Study Abroad 10	2	
GLOB6015016	Elective Course for Study Abroad 11	2	
GLOB6016016	Elective Course for Study Abroad 12	2	
GLOB6251016	Elective Course for Study Abroad 29	4	

**) Transferred courses will be transferred based on credit transfer policies on study program with total of 20 credits.*

Certified Specific Independent Study

Code	Course Name	SCU	Total
Elective courses list for certified specific independent study*			
MICR6033016	Course Certification I	3	
MICR6034016	Technical Skill Enrichment I	4	
MICR6035016	Industrial Project I	9	
MICR6036016	Soft Skill Enrichment I	4	
MICR6001016	Elective Course for Specific Independent Study 1	8	
MICR6002016	Elective Course for Specific Independent Study 2	8	
MICR6003016	Elective Course for Specific Independent Study 3	6	
MICR6004016	Elective Course for Specific Independent Study 4	6	
MICR6005016	Elective Course for Specific Independent Study 5	6	
MICR6006016	Elective Course for Specific Independent Study 6	5	
MICR6007016	Elective Course for Specific Independent Study 7	5	
MICR6008016	Elective Course for Specific Independent Study 8	5	
MICR6009016	Elective Course for Specific Independent Study 9	5	
MICR6010016	Elective Course for Specific Independent Study 10	4	
MICR6011016	Elective Course for Specific Independent Study 11	4	
MICR6012016	Elective Course for Specific Independent Study 12	4	
MICR6013016	Elective Course for Specific Independent Study 13	4	
MICR6014016	Elective Course for Specific Independent Study 14	4	20
MICR6015016	Elective Course for Specific Independent Study 15	3	
MICR6016016	Elective Course for Specific Independent Study 16	3	
MICR6017016	Elective Course for Specific Independent Study 17	3	
MICR6018016	Elective Course for Specific Independent Study 18	3	
MICR6019016	Elective Course for Specific Independent Study 19	3	
MICR6020016	Elective Course for Specific Independent Study 20	3	
MICR6021016	Elective Course for Specific Independent Study 21	2	
MICR6022016	Elective Course for Specific Independent Study 22	2	
MICR6023016	Elective Course for Specific Independent Study 23	2	
MICR6024016	Elective Course for Specific Independent Study 24	2	
MICR6025016	Elective Course for Specific Independent Study 25	2	
MICR6026016	Elective Course for Specific Independent Study 26	2	
MICR6027016	Elective Course for Specific Independent Study 27	2	
MICR6028016	Elective Course for Specific Independent Study 28	2	
MICR6029016	Elective Course for Specific Independent Study 29	1	
MICR6030016	Elective Course for Specific Independent Study 30	1	
MICR6031016	Elective Course for Specific Independent Study 31	1	
MICR6032016	Elective Course for Specific Independent Study 32	1	

**) For students who take BINUS certified specific independent study courses, they should take the first 4 courses on the list above (20 credits). Meanwhile, electives courses 1 to 32 are transferred courses for students who take*

certified specific independent study outside BINUS University. Transferred courses will be transferred based on credit transfer policies on study program with total of 20 credits.

Student should pass all of these quality controlled courses as listed below:

No	Course Code	Course Name	Minimal Grade
1.	CHAR6013016	Character Building: Pancasila	B
2.	ENTR6511001	Entrepreneurship: Market Validation	C
3.	COMP6047016	Algorithm and Programming*	C
4.	COMP6048016	Data Structures*	C
5.	COMP6798016	Program Design Methods*	C
6.	COMP6100016	Software Engineering*	C
7.	COMP6799016	Database Technology	C
8.	COMP6697016	Operating System	C
9.	MATH6183016	Scientific Computing*	C
10.	MATH6190016	Advanced Calculus II*	C
11.	MATH6188016	Differential Equations*	C
12.	MATH6018016	Modern Algebra	C
13.	STAT6157016	Data Mining and Visualization	C
14.	MATH6187016	Machine Learning	C

*) Tutorial & Multipaper