Computer Science

Introduction

In this fast-moving era, Computer Science (CS) has gone beyond the simple use of computer software. With the third wave of computing (pervasive computing), the most recent advancement in the computing and technology field, graduates need the ability to understand, create, and support applied computing solutions for their own businesses, their clients, or their employers. This program encourages and challenges students in the areas of:

- General Computer Science, and
- Pervasive Games Technology

In becoming familiar with a broad range of information technologies and how they are used, the students develop the ability to specify and manage the implementation of a wide range of applications to support various needs and the ability to design, develop, and implement viable technological solutions using appropriate platforms, tools, and techniques. The program provides the students with the technical, entrepreneurial, and specialized skills needed to develop and design applications across modern platforms, such as Cloud, the Web, and mobile, in a rapidly changing IT environment.

The Computer Science program has an 'A' grade accreditation - the highest level of accreditation that can be given to a private higher education program in Indonesia - and it is designed to provide graduates with a thorough understanding of the theories, methods, and systems used by the computing industry. It produces graduates who are knowledgeable and creative, who have excellent programming skills, who are capable of designing, implementing, and maintaining innovative software systems, and who are readily adaptable to new advances in the rapidly changing IT environment. The program provides double degree and intensive specialist courses in interesting computing areas such as:

- Pervasive Software Engineering
- Cloud and Distributed Systems
- Multimedia and Human Computer Interaction
- Web Application Development and Computer Security
- Computer Networks and Security
- Ethical Hacking and Penetration Testing
- Network Forensics
- Games Design and Programming
- Advanced Games Design and Programming
- Technopreneurship
- Data Science
- Artificial Intelligence
- Computational Mathematics (Biology, Physics)

Students experience a vast range of innovative learning processes, from blended learning to experiential; student centered, flipped classroom, and Hackerspace/Makerspace. Students get the opportunity to be future entrepreneurs by getting engaged in a series of entrepreneurial courses (Project Hatchery and Entrepreneurship Hatchery), which focus on technology and provide them the necessary skills and knowledge to create and market their work.

The curriculum also provides a scheme and platform whereby through the 3+1 program, students may choose from creating a startup company, internship, research, or community development work that is suitable for their future goals in the final year of their studies. Students benefit from having an internationally recognized curriculum in an internationally diverse environment, get an opportunity to work on international projects, and

attain professional certifications in major areas of the IT industry that will enable them to be successful in their careers.

Vision

A world class study program by providing excellent educational experiences in computer science, fostering and empowering the society in building and serving the nation.

Mission

The mission of Computer Science Department 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 computer science 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 Objectives

The objectives of the program are:

1. To produce graduates who will become successful professionals in ICT fields.
2. To produce graduates who will obtain employment in global companies or become entrepreneurs.
3. To produce graduates who will obtain professional certification or continue their study to the postgraduate level.
4. To produce reputable professionals with the skills to develop creative and impactful software products and services, including but not limited to computer networks and security and games technology.
5. To produce reputable professionals with a solid foundation of mathematical, algorithms, and principles related to computing that will be needed in problem solving practice.
6. To equip graduates with the six (6) key skills (self-management, planning and organizing, team work, problem solving, decision making, initiative and enterprise), adept knowledge and use of a foreign language as well as using information technology and to be of value in the workplace and society.

Student Outcomes

After successful completion of the four-year program, students are expected to be able to:

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 apply the skills and knowledge needed to design and implement various computer networking environments using different security techniques and routing theories to produce secured and robust networks.
8. Able to apply the necessary skills to design and develop interactive (i.e. games, simulation, etc.) applications by combining technology with creative art and design concepts to produce an exceptional interactive application that is able to run in multi-platform environments.
9. Able to apply the 6 key skills (self-management, planning and organizing, teamwork, problem solving, decision making, initiative and enterprise) and a foreign language as well as using information technology and to be of value in the workplace and society.
10. Able to apply interdisciplinary knowledge and skills in developing alternative solutions for problem-solving.

Prospective Careers of the Graduates

Computer Science graduates are able to gain employment as computing professionals in a number of fields, such as systems analysis and design, software engineering, applications software development (enterprise and mobile), network computing (forensics and security), and multimedia production, including graphics, animation, and games. Graduates may join commercial organizations, government institutions, financial institutions, telecommunications companies, IT companies, or other organizations. The career opportunities are unlimited for Computer Science graduates.

A wide range of career opportunities in IT and the computer industry are introduced in which students will be prepared throughout the four years of study. The integrated curriculum is designed and developed to support students in building on their technical and non-technical skills as well as engaging with the industry. Typical starting career positions include:

- Web developer
- Software engineer
- Network administrator
- Computer security professional
- Multimedia systems developer
- Games developer
- Technical artist
- Database developer
- IT sales engineer
- Data Scientist
- Business application developer
- IT project planner

Since computer science graduates are considered as engineers, they are also able to obtain employment as professionals in non-IT fields, including sales, marketing, and management. Thus, the career opportunities are unlimited for computer science graduates.

The single-degree program streams provide an internship program for each student, wherein the student may conduct real projects as a practical study within an industrial context. The program develops the student's ability to be involved in professional practices, and ethical and organizational responsibilities. Furthermore, the industrial internship program provides students with real experience in the workplace and teaches them to cope with the work environment. In addition, a series of study/field trips to visiting professionals and industries will be conducted to provide good grounds for having a broad overview of the industry. These experiences support individual career aspirations and may provide social and professional networks.

BINUS UNIVERSITY International also provides career support for students by disseminating information on the latest job vacancies, internships, and workshops. This support service can be accessed at: www.binuscareer.com.

Award/Degree

- *Sarjana Komputer* from BINUS UNIVERSITY
- Double Degree with Bachelor of Computer Science (B.Com.Sc.) from La Trobe University, Australia
- Double Degree with Bachelor of Information Technology from RMIT University at Melbourne, Australia
- Double Degree with Bachelor of Computer Science from the University of Wollongong at New South Wales, Australia
- Double Degree with Bachelor of Science (Hons.) from the University of Nottingham, United Kingdom

Major and Stream

Stream	Degree				Partner
	Single	Title	Double	Title	
Computer Science	√	S.Kom.			
Pervasive Games Technology	√	S.Kom.			
Software Engineering			√	S.Kom. & B.Comp.Sc.	La Trobe
Information Technology			√	S.Kom. & B.Info.Tech	RMIT
Computer Science			√	S.Kom. & B.Comp.Sc.	Wollongong
Computer Science			√	S.Kom. & B.Sc. (Hons)	Nottingham
Artificial Intelligence			√	S.Kom. & B.Sc. (Hons)	Nottingham

Title: S.Kom. (Sarjana Komputer)
B.Sc. (Hons) (Bachelor of Science (Honors))
B.Info.Tech (Bachelor of Information Technology)
B.Comp.Sc.(Bachelor of Computer Science)

Double Degree in Computer Science

In cooperation with La Trobe University, this unique program allows students to gain two degrees while staying full time in Jakarta. In the first part of the program, students undertake courses offered by BINUS and in the second part of the program, students undertake the La Trobe University courses either in Jakarta or have an option to study in Melbourne for at least one semester. This new arrangement of indicates that Binus students are entitled to received two bachelor certificates from Binus University International and La Trobe University without traveling to Australia. Upon satisfactory completion of all course requirements, students are awarded a Bachelor of Science in Computer Science Major in Software Engineering degree from La Trobe University, Melbourne, Australia and a Sarjana Komputer (SKom) degree from BINUS UNIVERSITY.

Double Degree in Information Technology

In cooperation with RMIT University, this double-degree program is designed to provide students with knowledge and practical skills to analyze, design, and implement complex computer software. Students have the opportunity to broaden their horizons and experiences by studying abroad at RMIT University in Australia. The available

majors at RMIT include Web and Mobile Computing, Security and Cloud Computing, Data Management, Software Systems Development, Software Systems Analysis, Artificial Intelligence, and Systems Administration. At the end of the program, students will receive S.Kom. and B.Info.Tech. degrees. Students who would like to pursue careers in the challenging area of Information Technology are ideal candidates for this program.

Double Degree in Computer Science

In cooperation with the University of Wollongong (UoW), this double-degree program is designed to provide students with knowledge and practical skills to solve real-world problems using computers. The students have the opportunity to broaden their horizons and experiences by studying abroad at the University of Wollongong in Australia. The students who take the double-degree program at the University of Wollongong will receive S.Kom. and B.Comp.Sc. degrees at the end of the program. The available majors at the University of Wollongong include Big Data, Digital Systems Security, Cyber Security, Game and Mobile Development and Software Engineering. Students who would like to pursue careers in the IT industry and business in general are the ideal candidates for this program.

Double Degree in Computer Science (Honors)

In cooperation with the University of Nottingham, this double-degree program is designed to provide students with knowledge and practical skills to solve real world problems using computers. The students have the opportunity to broaden their horizons and experiences by studying abroad at the University of Nottingham, in the United Kingdom. Students shall initially complete three years of study at BINUS in its Computer Science program. Upon successful completion of the three years at BINUS, students shall enroll in year three at one of Nottingham's three-year undergraduate degree programs. Students may progress to the United Kingdom campus. Upon successful completion of the four years of study, students shall receive a degree award from Nottingham, which is either B.Sc. (Hons.) Computer Science or B.Sc. (Hons.) Computer Science with Artificial Engineering, Students will also receive an S.Kom. degree from BINUS UNIVERSITY. Students who would like to pursue careers in the IT industry and business in general are the ideal candidates for this program.

Computer Science (Single Degree)

The General Computer Science stream is a single degree program which is designed to provide students with knowledge, as well as practical and creative skills to design, develop, and implement Cloud, Web, Enterprise, Pervasive, and Mobile applications. Students also learn how to design, build, administer, and secure pervasive computer networks. This stream also provides students with the opportunity to become certified ethical hackers, network associates, and professionals.

Pervasive Games Technology (Single Degree)

The Games Technology stream is a single degree program that is designed to provide students with knowledge, as well as practical and creative skills to design and create computer graphics, animations, and interactive games. Students gain competence in the design and development of Interactive and Pervasive games in different platforms. This stream also provides students with an opportunity to become certified developers in 3D software packages such as Maya, 3DsMax, and Blender, among others. Students who would like to pursue careers in the rapidly expanding games, animation, and creative industries are ideal candidates for this stream.

Teaching, Learning, and Assessment Strategies

- Students experience a vast range of innovative learning processes, from experiential; student-centered, flipped classroom, to Hackerspace/Makerspace.

- Students get the opportunity to be future entrepreneurs by becoming engaged in a series of entrepreneurial courses which focus on technology and provide them with the necessary skills and knowledge to create and market their work.
- The curriculum also provides a scheme and platform whereby, through the 3+1 program, students may choose from doing Entrepreneurship, Internship, Research, or Study Abroad work that is suitable for their future goals in the final year of the study.
- Students enjoy the internationally-recognized curriculum in an internationally diverse environment, receive an opportunity to work on international projects, and attain professional certifications in major areas of the IT industry that will enable them to be successful in their careers.

Study Completion Requirements

Major in Computer Science

To complete a major in Computer Science at BINUS UNIVERSITY INTERNATIONAL, students must complete a minimum of 146 scu of academic credit.

Course Structure

Semester	Code	Course Name	SCU	Total
1	COMP6798001	Program Design Methods	2	20
	COMP6800001	Human and Computer Interaction	3	
	COMP6047001	Algorithm and Programming	6	
	MATH6025001	Discrete Mathematics	4	
	MATH6183001	Scientific Computing	3	
	Pancasila Courses*			
	CHAR6013001	Character Building: Pancasila	2	
	CHAR6039001	Pancasila and Indonesian Culture	2	
2	COMP6048001	Data Structures	6	20
	ENGL6171001	Academic English I	3	
	ENTR6091005	Project Hatchery	2	
	COMP6699001	Object Oriented Programming	3	
	MATH6031001	Calculus	4	
	MATH6030001	Linear Algebra	2	
3	ENGL6172001	Academic English II	3	19
	CHAR6014001	Character Building: Kewarganegaraan	2	
	COMP6049001	Algorithm Design and Analysis	4	
	COMP6784001	Fundamentals of Data Science	2	
	STAT6171001	Basic Statistics	2	
	ENTR6486005	Entrepreneurship Hatchery	3	

Semester	Code	Course Name	SCU	Total
	COMP6799001	Database Technology	3	
4	LANG6027001	Indonesian	2	19
	CHAR6015001	Character Building: Agama	2	
	CPEN6247001	Computer Networks	3	
	COMP6703001	Web Application Development and Security	4	
	COMP6697001	Operating Systems	2	
	SCIE6063001	Computational Physics	3	
	Stream: Computer Science			
	COMP6210001	Ethical Hacking and Penetration Testing	3	
	Stream: Pervasive Games Technology			
	GAME6048001	Games Design and Programming	3	
5	SCIE6062001	Computational Biology	3	22
	COMP6062001	Compilation Techniques	4	
	COMP6065001	Artificial Intelligence	4	
	COMP6100001	Software Engineering	4	
	COMP6705001	Distributed Systems	2	
	COMP6696001	Research Methodology in Computer Science	2	
	Stream: Computer Science			
	COMP6348001	Network Forensics	3	
	Stream: Pervasive Games Technology			
	GAME6046001	Advanced Games Design and Programming	3	
6	**Enrichment Program I**		20	20
7	**Enrichment Program II**		20	20
8	**Thesis****			6
	COMP6753001	Pre-Thesis	2	
	COMP6754001	Thesis	4	
	COMP6128001	Thesis	6	
				TOTAL CREDITS 146 SCU

***)** *For **Character Building: Pancasila** course is offered for Indonesian citizen students, while **Pancasila and Indonesian Culture** course is offered for foreign students.*

***) Student may choose to take either **Thesis (6 scu)** or **Pre-thesis (2 scu) & Thesis (4 scu)**. The **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 Program.*

Enrichment Program I (6th Semester) & Enrichment Program II (7th Semester):

-) *Students will take one of the enrichment programs tracks (off campus).*

Enrichment Track Scheme

Track	Semester 6						Semester 7					
	I	RS	ENTR	CD	SA	IS	I	RS	ENTR	CD	SA	IS
1	v						v					
2	v							v				
3	v								v			
4	v										v	
5		v					v					
6		v							v			
7		v									v	
8		v						v				
9			v				v					
10			v					v				
11			v						v			
12			v								v	
13					v		v					
14					v			v				
15					v				v			
16						v	v					
17						v		v				
18						v			v			
19						v					v	
20	v											v
21		v										v
22			v									v
23					v							v

Notes:

I : Certified Internship
RS : Certified Research
ENTR : Certified Entrepreneurship
CD : Certified Community Development
SA : Certified Study Abroad
IS : Certified Specific Independent Study

Notes:
Student can choose one of the available tracks.

Enrichment Certified Internship Track

Code	Course Name	SCU	Total
Enrichment Program I			20
COMP6706001	Industry Experience in Information Technology	8	
COMP6751001	Software Development Practice	8	
COMP6351001	Information Technology in Industry	4	
Enrichment Program II			20
COMP6707001	Professional Experience in Information Technology	8	
COMP6752001	Software Quality Practice	8	
COMP6354001	Information Technology Project Practice	4	

Enrichment Certified Entrepreneurship Track

Code	Course Name	SCU	Total
Enrichment Program I			20
ENTR6092001	Business Model Innovation	8	
ENTR6588001	Product and Service Development	8	
ENTR6097001	Managing Teams and Cultures	4	
Enrichment Program II			20
ENTR6093001	Sustainable Startup Creation	8	
ENTR6587001	Business Presentation and Negotiation	8	
ENTR6098001	Business Networking	4	

Enrichment Certified Research Track

Code	Course Name	SCU	Total
Enrichment Program I			20
RSCH6063001	Research Exposure	8	
RSCH6504001	Scientific Writing	8	
RSCH6462001	Research Ethics	4	
Enrichment Program II			20
RSCH6463001	Data Analytics and Testing	8	
RSCH6505001	Scientific Publication	8	
RSCH6465001	Communications Research	4	

Enrichment Certified Study Abroad Track*

Code	Course Name	SCU	Total
GLOB6085001	Elective Course for Study Abroad 1	4	20
GLOB6086001	Elective Course for Study Abroad 2	4	
GLOB6087001	Elective Course for Study Abroad 3	4	
GLOB6088001	Elective Course for Study Abroad 4	4	
GLOB6089001	Elective Course for Study Abroad 5	4	
GLOB6043001	Elective Course for Study Abroad 1	2	
GLOB6044001	Elective Course for Study Abroad 2	2	
GLOB6117001	Elective Course for Study Abroad 3	2	
GLOB6046001	Elective Course for Study Abroad 4	2	
GLOB6047001	Elective Course for Study Abroad 5	2	
GLOB6048001	Elective Course for Study Abroad 6	2	
GLOB6049001	Elective Course for Study Abroad 7	2	
GLOB6050001	Elective Course for Study Abroad 8	2	
GLOB6051001	Elective Course for Study Abroad 9	2	
GLOB6052001	Elective Course for Study Abroad 10	2	
GLOB6241001	Elective Course for Study Abroad 1	3	
GLOB6242001	Elective Course for Study Abroad 2	3	
GLOB6243001	Elective Course for Study Abroad 3	3	
GLOB6075001	Elective Course for Study Abroad 4	3	
GLOB6076001	Elective Course for Study Abroad 5	3	
GLOB6260001	Elective Course for Study Abroad 6	3	
GLOB6261001	Elective Course for Study Abroad 7	3	

*) *The elective courses for study abroad will be transferred to Binus University International's SCU systems based on credit transfer policies.*

Enrichment Certified Specific Independent Study Track

Code	Course Name	SCU	Total
MICR6033001	Course Certification I	3	20
MICR6034001	Technical Skill Enrichment I	4	
MICR6035001	Industrial Project I	9	
MICR6036001	Soft Skill Enrichment I	4	
MICR6001001	Elective Course for Specific Independent Study 1	8	
MICR6002001	Elective Course for Specific Independent Study 2	8	
MICR6003001	Elective Course for Specific Independent Study 3	6	
MICR6004001	Elective Course for Specific Independent Study 4	6	
MICR6005001	Elective Course for Specific Independent Study 5	6	
MICR6006001	Elective Course for Specific Independent Study 6	5	
MICR6007001	Elective Course for Specific Independent Study 7	5	
MICR6008001	Elective Course for Specific Independent Study 8	5	
MICR6009001	Elective Course for Specific Independent Study 9	5	
MICR6010001	Elective Course for Specific Independent Study 10	4	
MICR6011001	Elective Course for Specific Independent Study 11	4	
MICR6012001	Elective Course for Specific Independent Study 12	4	
MICR6013001	Elective Course for Specific Independent Study 13	4	
MICR6014001	Elective Course for Specific Independent Study 14	4	
MICR6015001	Elective Course for Specific Independent Study 15	3	
MICR6016001	Elective Course for Specific Independent Study 16	3	
MICR6017001	Elective Course for Specific Independent Study 17	3	
MICR6018001	Elective Course for Specific Independent Study 18	3	
MICR6019001	Elective Course for Specific Independent Study 19	3	
MICR6020001	Elective Course for Specific Independent Study 20	3	
MICR6021001	Elective Course for Specific Independent Study 21	2	
MICR6022001	Elective Course for Specific Independent Study 22	2	
MICR6023001	Elective Course for Specific Independent Study 23	2	
MICR6024001	Elective Course for Specific Independent Study 24	2	
MICR6025001	Elective Course for Specific Independent Study 25	2	
MICR6026001	Elective Course for Specific Independent Study 26	2	
MICR6027001	Elective Course for Specific Independent Study 27	2	
MICR6028001	Elective Course for Specific Independent Study 28	2	
MICR6029001	Elective Course for Specific Independent Study 29	1	
MICR6030001	Elective Course for Specific Independent Study 30	1	
MICR6031001	Elective Course for Specific Independent Study 31	1	
MICR6032001	Elective Course for Specific Independent Study 32	1	

**) This list of courses can be selected as Enrichment Program I or Enrichment Program II.*

The Table of Prerequisite for Computer Science Program

Course		SCU	Sem	Course Prerequisite		SCU	Sem
COMP6049001	Algorithm Design and Analysis	4	3	COMP6047001	Algorithm and Programming	6	1
COMP6784001	Fundamentals of Data Science	2	3	COMP6047001	Algorithm and Programming	6	1
COMP6062001	Compilation Techniques	4	5	COMP6048001	Data Structures	6	2
COMP6703001	Web Application Development and Security	4	4	COMP6699001	Object Oriented Programming	3	2
COMP6065001	Artificial Intelligence	4	5	COMP6049001	Algorithm Design and Analysis	4	3

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

No	Code	Course Name	Minimum Passing Grade
1	CHAR6013001	Character Building: Pancasila	B
2	ENTR6486005	Entrepreneurship Hatchery	C
3	COMP6047001	Algorithm and Programming	C
4	COMP6798001	Program Design Methods	C
5	COMP6048001	Data Structures	C
6	COMP6799001	Database Technology	C
7	COMP6697001	Operating Systems	C
8	COMP6100001	Software Engineering	C