

## Cyber Security

### Introduction

Cyber attack is raising and threaten ubiquitous world on internet today. Industry and government need cyber security expert to counter and defend from this threat. Cyber Security Program offer dedicated degree in cyber security assurance and defence by giving students technical expertise they need to confidently enter cyber war. Cyber Security is designed specifically by Computer Science, BINUS UNIVERSITY to provide students with knowledge and expertise to penetrate testing system and network, design and implementation of cyber defense architecture in the field of cyber security. Cyber Security Program was found in 2015, under BINUS UNIVERSITY, it became one of the best programs under coordination of School of Computer Science and supported by government.

Cyber Security Program designed to adapt to changing cyber attack and defend landscape while ensuring a solid academic foundation and aligned to industry and government expectation. Cyber Security focuses on cyber security assurance and cyber defense. Course structures its program to allow students to gain valuable concept and practical experience in conducting penetration test and also to apply knowledge in building cyber defense architecture and technology. Cyber Security Program has a strong base in computer science foundation subject as well as offering theoretical and critical thinking behind the current cyber technology. Students learn in a project-orientated environment that encourages collaboration with industries and government and helps them to discover cyber threat challenge and build system defense. Students are encouraged to collaborate, work to deadlines, maintain attendance levels and develop strong communication skills. As a result, the graduates are internationally renowned for their expertise and confidence to enter the workplace as entry-level skilled professionals rather than technicians.

### Vision

A world class study program by providing excellent educational experiences in Computer Science, which focuses on developing creative technology solutions, fostering and empowering the society in building and serving the nation.

### Mission

The mission of Cyber Security 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 developing creative solutions in computer science, to solve real-world problems.
2. Preparing graduates to develop exemplary soft skills & technical skills required as computer science professionals, leaders, and entrepreneurs in global market.
3. Promoting high impact computer science research that contributes to the nation.
4. Fostering BINUSIAN as computer science lifelong learners through self-enrichment.
5. Empowering BINUSIAN to continuously improve society's quality of life through knowledge in computer science.

## 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;
4. Graduates will become successful security researcher in Cyber Security fields.

## 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 implement security framework to obtain defense-in-depth on multiple technology layers
8. Able to implement system defense on network and infrastructure

## Prospective Career of the Graduates

After finishing the Program, the graduate of Cyber Security Program could follow a career as:

1. Penetration Tester
2. Secure Software Developer
3. Network Security Administrator
4. Information Security Analyst
5. Computer Security Architect
6. Cyber Intelligence Officer
7. Academician in cyber security (Lecturer, Trainer, Researcher)

## Curriculum

The present curriculum used in the Cyber Security Program has been developed in line with the National Curriculum. Also, the local content has been developed in line with the Computer Science Curriculum standard of ACM (Association for Computing Machinery), several local and foreign universities, national and international game industry (developer, publisher), up-to-date cyber attack and threat trends, so that the graduates of the Cyber Security Program are expected to be able to face cyber security challenge at both a national and international level. Generally, the subjects of the curriculum are divided into these following groups of subjects:

### Core Computer Science Group

The objective of this group is to provide grounding in Cyber Security Program through practice as well as applied theory which is required by business both now and in the future. The subjects that are included in this group are

programming, algorithm design and analysis, software engineering, databases, computer graphs, interactive multimedia, computer and human interaction, operation system, Cyber Security Analysis, Secure Web Technology and Cyber Forensic.

### Science

The objective of this group is to provide an understanding of mathematics as one of the principal foundations of computer science. Another objective is to give an understanding of scientific methodology (data collection, hypothesis, research methodology, analysis) in problem solving.

### Character Building Group (Professional Practices)

The objective of this group is to develop the personal strengths of the student and to provide him or her with a professional character, professionalism in their field, management skills, oral and written communication skills, understanding of business ethic, ability to work as a team, and to develop a “Binusian” Character.

### The Field of Cyber Security Subject

The objective of building the field of subject in Cyber Security is to give the students a solid foundation of secure software development skills and to introduce the specific skills needed for cyber security assurance and cyber defense. The students are expected to develop their skills and master the techniques which will allow them to conduct research for both their thesis and/or to continue their studies.

The field of Cyber Security subjects:

1. Network Security: to explore the various methodologies and techniques of penetration testing and defense in network technology.
2. System Defense: to explore the various methodologies and techniques of secure software engineering, secure computer network, and operating system.

All students of Cyber Security Program must follow these two fields to become Cyber Security graduates. The objective of these two fields is to provide the students with the knowledge and skills required by industry and government who want to defend their computer network and system.

### Course Structure

| Sem | Code                            | Course Name                         | SCU | Total |
|-----|---------------------------------|-------------------------------------|-----|-------|
| 1   | CHAR6013001                     | Character Building: Pancasila       | 2   | 20    |
|     | MATH6025001                     | Discrete Mathematics                | 4   |       |
|     | MATH6030001                     | Linear Algebra                      | 2   |       |
|     | COMP6047001                     | Algorithm and Programming** (AOL)   | 4/2 |       |
|     | COMP6542001                     | Computer Security Fundamental**     | 2   |       |
|     | LANG6027001                     | Indonesian                          | 2   |       |
|     | STAT6171001                     | Basic Statistics                    | 2   |       |
|     | <b>Foreign Language Courses</b> |                                     | 0   |       |
| 2   | CHAR6014001                     | Character Building: Kewarganegaraan | 2   | 20    |
|     | MATH6031001                     | Calculus                            | 4   |       |
|     | COMP6048001                     | Data Structures*&*** (AOL)          | 4/2 |       |
|     | ENTR6509001                     | Entrepreneurship: Ideation          | 2   |       |

| Sem                             | Code                            | Course Name                                     | SCU                          | Total |
|---------------------------------|---------------------------------|---|------------------------------|-------|
|                                 | MATH6183001                     | Scientific Computing (AOL)                      | 2/1                          |       |
|                                 | CPEN6247001                     | Computer Networks (AOL)                         | 2/1                          |       |
|                                 | <b>Foreign Language Courses</b> |   | 0                            |       |
| 3                               | CHAR6015001                     | Character Building: Agama                       | 2                            | 23    |
|                                 | COMP6065001                     | Artificial Intelligence** (AOL)                 | 4                            |       |
|                                 | COMP6798001                     | Program Design Methods* (AOL)                   | 2                            |       |
|                                 | COMP6544001                     | Network Penetration Testing** (AOL)             | 2/2                          |       |
|                                 | SCIE6063001                     | Computational Physics (AOL)                     | 2/1                          |       |
|                                 | COMP6049001                     | Algorithm Design and Analysis* (AOL)            | 4                            |       |
|                                 | COMP6062001                     | Compilation Techniques                          | 4                            |       |
| <b>Foreign Language Courses</b> |                                 | 0   |                              |       |
| 4                               | COMP6842001                     | Server and Network Administration*&***          | 2                            | 20    |
|                                 | COMP6799001                     | Database Technology** (AOL)                     | 2/1                          |       |
|                                 | COMP6100001                     | Software Engineering** (AOL)                    | 4                            |       |
|                                 | COMP6549001                     | Software Security*&***                          | 2                            |       |
|                                 | SCIE6062001                     | Computational Biology                           | 2/1                          |       |
|                                 | COMP6844001                     | Mobile Penetration Testing**                    | 2/2                          |       |
|                                 | LAWS6110001                     | Cyber Law                                       | 2                            |       |
| <b>Foreign Language Courses</b> |                                 | 0   |                              |       |
| 5                               | ENTR6511001                     | Entrepreneurship: Market Validation             | 2                            | 17    |
|                                 | COMP6697001                     | Operating System (AOL)                          | 2                            |       |
|                                 | COMP6800001                     | Human and Computer Interaction** (AOL)          | 2/1                          |       |
|                                 | COMP6696001                     | Research Methodology in Computer Science* (AOL) | 2                            |       |
|                                 | COMP6695001                     | Secure Programming*&*** (AOL)                   | 2                            |       |
|                                 | COMP6843001                     | Reverse Engineering and Binary Exploitation     | 2                            |       |
|                                 | COMP6646001                     | Computer Forensic*&*** (AOL)                    | 2                            |       |
|                                 | COMP6873001                     | Blockchain Fundamental                          | 2                            |       |
| 6                               | <b>Enrichment Program I</b>     |   | 20                           | 20    |
| 7                               | <b>Enrichment Program II</b>    |   | 20                           | 20    |
| 8                               | COMP6749001                     | Pre-Thesis                                      | 2                            | 6     |
|                                 | COMP6750001                     | Thesis  | 4                            |       |
|                                 | COMP6192001                     | Thesis  | 6                            |       |
|                                 |                                 |   | <b>Total Credits 146 SCU</b> |       |

\*) This course is delivered in English

\*\*) Global Learning System Course

-) (AOL) - Assurance of Learning Process System

#### Foreign Language Courses:

Students will take foreign language courses according to BINUS University English proficiency test results. See foreign language courses appendix for the details. Students must pass with a minimum Grade of C.

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

**Appendix Foreign Language Courses**

| Foreign Language Courses |                               | SCU |
|--------------------------|-------------------------------|-----|
| ENGL6253001              | English for Frontrunners      | 0   |
| ENGL6254001              | English for Independent Users | 0   |
| ENGL6255001              | English for Professionals     | 0   |
| JAPN6190001              | Basic Japanese Language*      | 0   |
| CHIN6163001              | Basic Chinese Language*       | 0   |

\*) This course is optional for students

1. Students with Binus University English Proficiency Test score less than 437 are required to take English for Frontrunners and English for Independent Users.
2. Students with Binus University English Proficiency Test score less than 520 are required to take English for Independent Users and English for Professionals.
3. Students with Binus University English Proficiency Test score equal to or greater than 520 are required to take English for Professionals. Additionally, students may choose to take either Basic Japanese Language or Basic Chinese Language.
4. Students are required to pass the foreign language courses before they take enrichment.
5. Students can see the requirements to pass the foreign language courses at BINUSMAYA – Beelingua.

**Enrichment Program I (6<sup>th</sup> Semester) & Enrichment Program II (7<sup>th</sup> Semester):**

-) Student will take one of enrichment program tracks (off campus). See enrichment appendix for the tracks detail.

**Enrichment Track Scheme**

| Track | Semester 6 |    |    |    |    |    |     | Semester 7 |    |    |    |    |    |    |     |
|-------|------------|----|----|----|----|----|-----|------------|----|----|----|----|----|----|-----|
|       | IN         | RS | EN | CD | SA | IS | etc | IN         | RS | EN | CD | SA | IS | FS | etc |
| 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  |    |    |     |

**Note:**

IN : Certified Internship

SA : Certified Study Abroad

|    |                                   |     |  |
|----|-----------------------------------|-----|--|
| RS | : Certified Research              | IS  | : Certified Specific Independent Study |
| EN | : Certified Entrepreneurship      | FS  | : Further Study                        |
| CD | : Certified Community Development | etc | : Study Program Special Purposes       |

**Description:**

1. Students will take only one track in each Enrichment Program.
2. Students who failed in Enrichment Program I can retake according to the table above.
3. As for Enrichment Program II, students who failed should retake the same track, except Certified Specific Independent Study.
4. For those who failed in the Certified Study Abroad track will retake the courses from the home campus.

**Certified Internship Track**

| Code                         | Course Name   | SCU | Total |
|------------------------------|---|-----|-------|
| <b>Enrichment Program I</b>  |   |     | 20    |
| COMP6561001                  | Industrial Experience in Cyber Security Domain      | 8   |       |
| COMP6758001                  | Cyber Security Practice in Industrial Experience    | 8   |       |
| COMP6698001                  | EES in Cyber Security Industry                      | 4   |       |
| <b>Enrichment Program II</b> |   |     | 20    |
| COMP6564001                  | Professional Experience in Cyber Security Domain    | 8   |       |
| COMP6759001                  | Cyber Security Practice in Professional Experience  | 8   |       |
| COMP6566001                  | Professional Development in Cyber Security Industry | 4   |       |



**Certified Entrepreneurship Track**

| Code                         | Course Name  | SCU | Total |
|------------------------------|--|-----|-------|
| <b>Enrichment Program I</b>  |  |     | 20    |
| ENTR6649001                  | New Venture Initiation in Cyber Security               | 8   |       |
| ENTR6650001                  | Product Development Process in Cyber Security          | 8   |       |
| ENTR6540001                  | EES Cyber Security Professional in New Business        | 4   |       |
| <b>Enrichment Program II</b> |  |     | 20    |
| ENTR6651001                  | Product Launching in Cyber Security                    | 8   |       |
| ENTR6652001                  | Business Development in Cyber Security                 | 8   |       |
| ENPR6239001                  | EES Cyber Security Professional in Business Experience | 4   |       |

**Certified Research Track**

| Code                         | Course Name   | SCU | Total |
|------------------------------|---|-----|-------|
| <b>Enrichment Program I</b>  |   |     | 20    |
| RSCH6212001                  | Research Experience I                                 | 8   |       |
| RSCH6528001                  | Scientific Writing I in Cyber Security                | 8   |       |
| RSCH6458001                  | Global EES I in Cyber Security Research Project Team  | 4   |       |
| <b>Enrichment Program II</b> |   |     | 20    |
| RSCH6216001                  | Research Experience II                                | 8   |       |
| RSCH6529001                  | Scientific Writing II in Cyber Security               | 8   |       |
| RSCH6171001                  | Global EES II in Cyber Security Research Project Team | 4   |       |

**Certified Community Development Track**

| Code                         | Course Name  | SCU | Total |
|------------------------------|--|-----|-------|
| <b>Enrichment Program I</b>  |  |     | 20    |
| CMDV6126001                  | Community Outreach Project Implementation                        | 8   |       |
| CMDV6310001                  | Community Outreach Cyber Security Project Design                 | 8   |       |
| CMDV6257001                  | Employability and Entrepreneurial Skills in Cyber Security Field | 4   |       |
| <b>Enrichment Program II</b> |  |     | 20    |
| CMDV6140001                  | Community Development Project Implementation                     | 8   |       |
| CMDV6311001                  | Community Development Cyber Security Project Design              | 8   |       |
| CMDV6090001                  | Employability and Entrepreneurial Skills in Cyber Security Field | 4   |       |

**Certified Study Abroad Track**

| Code   | Course Name                        | SCU | Total |
|--|------------------------------------|-----|-------|
| <b>Elective courses list for study abroad*</b> |                                    |     | 20    |
| <b>Enrichment Program I</b>                    |                                    |     |       |
| GLOB6005001                                    | Elective Course for Study Abroad 1 | 4   |       |
| GLOB6006001                                    | Elective Course for Study Abroad 2 | 4   |       |
| GLOB6007001                                    | Elective Course for Study Abroad 3 | 4   |       |
| GLOB6008001                                    | Elective Course for Study Abroad 4 | 4   |       |
| GLOB6009001                                    | Elective Course for Study Abroad 5 | 2   |       |



| Code                         | Course Name                         | SCU | Total |
|------------------------------|-------------------------------------|-----|-------|
| GLOB6010001                  | Elective Course for Study Abroad 6  | 2   | 20    |
| GLOB6011001                  | Elective Course for Study Abroad 7  | 2   |       |
| GLOB6012001                  | Elective Course for Study Abroad 8  | 2   |       |
| GLOB6013001                  | Elective Course for Study Abroad 9  | 2   |       |
| GLOB6014001                  | Elective Course for Study Abroad 10 | 2   |       |
| GLOB6015001                  | Elective Course for Study Abroad 11 | 2   |       |
| GLOB6016001                  | Elective Course for Study Abroad 12 | 2   |       |
| GLOB6251001                  | Elective Course for Study Abroad 29 | 4   |       |
| <b>Enrichment Program II</b> |                                     |     |       |
| GLOB6017001                  | Elective Course for Study Abroad 13 | 4   |       |
| GLOB6018001                  | Elective Course for Study Abroad 14 | 4   |       |
| GLOB6019001                  | Elective Course for Study Abroad 15 | 4   |       |
| GLOB6020001                  | Elective Course for Study Abroad 16 | 4   |       |
| GLOB6021001                  | Elective Course for Study Abroad 17 | 2   |       |
| GLOB6022001                  | Elective Course for Study Abroad 18 | 2   |       |
| GLOB6023001                  | Elective Course for Study Abroad 19 | 2   |       |
| GLOB6024001                  | Elective Course for Study Abroad 20 | 2   |       |
| GLOB6025001                  | Elective Course for Study Abroad 21 | 2   |       |
| GLOB6026001                  | Elective Course for Study Abroad 22 | 2   |       |
| GLOB6027001                  | Elective Course for Study Abroad 23 | 2   |       |
| GLOB6028001                  | Elective Course for Study Abroad 24 | 2   |       |
| GLOB6253001                  | Elective Course for Study Abroad 31 | 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 |
|--|---|-----|-------|
| <b>Elective courses list for certified specific independent study*</b> |   |     | 20    |
| CSIS6001001  | Course Certification                              | 3   |       |
| CSIS6002001  | Technical Skill Enrichment                        | 4   |       |
| CSIS6003001  | Industrial Project                                | 9   |       |
| CSIS6004001  | Soft Skill Enrichment                             | 4   |       |
| CSIS6005001  | Elective Course for Specific Independent Study 1  | 8   |       |
| CSIS6006001  | Elective Course for Specific Independent Study 2  | 8   |       |
| CSIS6007001  | Elective Course for Specific Independent Study 3  | 6   |       |
| CSIS6008001  | Elective Course for Specific Independent Study 4  | 6   |       |
| CSIS6009001  | Elective Course for Specific Independent Study 5  | 6   |       |
| CSIS6010001  | Elective Course for Specific Independent Study 6  | 5   |       |
| CSIS6011001  | Elective Course for Specific Independent Study 7  | 5   |       |
| CSIS6012001  | Elective Course for Specific Independent Study 8  | 5   |       |
| CSIS6013001  | Elective Course for Specific Independent Study 9  | 5   |       |
| CSIS6014001  | Elective Course for Specific Independent Study 10 | 4   |       |
| CSIS6015001  | Elective Course for Specific Independent Study 11 | 4   |       |
| CSIS6016001  | Elective Course for Specific Independent Study 12 | 4   |       |



| Code        | Course Name                                       | SCU | Total |
|-------------|---|-----|-------|
| CSIS6017001 | Elective Course for Specific Independent Study 13 | 4   |       |
| CSIS6018001 | Elective Course for Specific Independent Study 14 | 4   |       |
| CSIS6019001 | Elective Course for Specific Independent Study 15 | 3   |       |
| CSIS6020001 | Elective Course for Specific Independent Study 16 | 3   |       |
| CSIS6021001 | Elective Course for Specific Independent Study 17 | 3   |       |
| CSIS6022001 | Elective Course for Specific Independent Study 18 | 3   |       |
| CSIS6023001 | Elective Course for Specific Independent Study 19 | 3   |       |
| CSIS6024001 | Elective Course for Specific Independent Study 20 | 3   |       |
| CSIS6025001 | Elective Course for Specific Independent Study 21 | 2   |       |
| CSIS6026001 | Elective Course for Specific Independent Study 22 | 2   |       |
| CSIS6027001 | Elective Course for Specific Independent Study 23 | 2   |       |
| CSIS6028001 | Elective Course for Specific Independent Study 24 | 2   |       |
| CSIS6029001 | Elective Course for Specific Independent Study 25 | 2   |       |
| CSIS6030001 | Elective Course for Specific Independent Study 26 | 2   |       |
| CSIS6031001 | Elective Course for Specific Independent Study 27 | 2   |       |
| CSIS6032001 | Elective Course for Specific Independent Study 28 | 2   |       |
| CSIS6033001 | Elective Course for Specific Independent Study 29 | 1   |       |
| CSIS6034001 | Elective Course for Specific Independent Study 30 | 1   |       |
| CSIS6035001 | Elective Course for Specific Independent Study 31 | 1   |       |
| CSIS6036001 | 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.

### Further Study Track

| Code                         | Course Name                               | SCU | Total |
|------------------------------|---|-----|-------|
| <b>Enrichment Program II</b> |   |     | 20    |
| COMP6815001                  | IT Disaster Recovery                      | 4   |       |
| COMP6816001                  | Wireless and Cloud Computing Technologies | 4   |       |
| COMP6817001                  | Internet Tools and Services               | 4   |       |
| COMP6818001                  | Cyber Risk Management                     | 4   |       |
| COMP6819001                  | Knowledge Engineering                     | 4   |       |

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

| No. | Course Code | Course Name                         | Minimal Grade |
|-----|-------------|-------------------------------------|---------------|
| 1.  | CHAR6013001 | Character Building: Pancasila       | B             |
| 2.  | COMP6047001 | Algorithm and Programming*          | C             |
| 3.  | COMP6048001 | Data Structures*                    | C             |
| 4.  | COMP6798001 | Program Design Methods*             | C             |
| 5.  | COMP6100001 | Software Engineering*               | C             |
| 6.  | COMP6799001 | Database Technology                 | C             |
| 7.  | COMP6697001 | Operating System                    | C             |
| 8.  | ENTR6511001 | Entrepreneurship: Market Validation | C             |

\*) Tutorial &amp; Multipaper

