

## Artificial Intelligence

### Introduction

In the contemporary landscape of technological advancement, Artificial Intelligence (AI) has emerged as a pivotal force, catalyzing innovation and enhancing operational efficiency across a multitude of sectors. Artificial Intelligence Program represents a pioneering development in this domain, offering a sophisticated solution that integrates seamlessly into diverse fields, including healthcare, finance, education, and beyond. The inception of this program was driven by the increasing demand for intelligent, adaptive, and user-centric AI systems. Grounded in extensive research and development within the realms of machine learning, natural language processing, and neural network architectures, this program is meticulously designed to bridge the divide between human cognitive processes and machine capabilities. It embodies the collective expertise of leading researchers, data scientists, and engineers who are committed to advancing the frontiers of AI technology. A key differentiator of the program is its advanced capacity for real-time learning and adaptation, ensuring sustained relevance and efficacy in dynamically changing environments. Through the implementation of cutting-edge algorithms, the program excels in areas such as pattern recognition, predictive analytics, and decision-making processes. These capabilities collectively ensure that users benefit from an unprecedented level of accuracy and dependability, whether the application involves automating routine processes, analyzing extensive datasets, or delivering personalized recommendations. The distinctiveness of Artificial Intelligence Program is rooted in its human-centric design philosophy. In contrast to conventional AI systems, which can often be perceived as impersonal or inflexible, our program emphasizes user experience by offering intuitive interfaces and interactive features that render it accessible to users irrespective of their technical proficiency. Moreover, this program is constructed with a foundational commitment to ethical considerations, ensuring transparency, fairness, and accountability throughout its operations. This ethical orientation not only cultivates user trust but also positions this program as a leader within the domain of responsible AI development.

### 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 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 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.

### **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 Artificial Intelligence (AI) to solve existing problems in various industries.

### **Prospective Career of the Graduates**

1. Machine Engineer/Developer
2. Computer Vision Engineer/Developer
3. Natural Language Processing Engineer/Developer
4. Data Engineer
5. Software Engineer/Developer
6. System Analyst/Developer
7. Artificial Intelligence Specialist/Consultant
8. Data Scientist
9. IT Support/Consultant
10. Researcher
11. Lecturer/Trainer
12. Entrepreneur

### **Curriculum**

The curriculum for the Artificial Intelligence Program has been meticulously crafted to align with the Indonesian National Curriculum. Additionally, the program's local content has been developed in accordance with the standards set forth by the Association for Computing Machinery (ACM), as well as the curricular frameworks of various esteemed local and international universities, and prevailing market trends. This alignment is intended to equip graduates of the Computer Science Program with the skills and knowledge necessary to compete effectively on both national and international stages. This program is certified by The Accreditation Agency for Study Programmes in Engineering, Informatics, Natural Sciences and Mathematics (ASIN) from Germany and The Euro-Inf Quality seal for academic quality assurance. The curriculum is structured to deliver a profound understanding of the foundational principles of AI, complemented by extensive hands-on experience with contemporary tools and technologies. Students will progress through a comprehensive exploration of essential theories, including machine learning, neural networks, natural language processing, and robotics. The curriculum is intentionally sequenced to

allow for cumulative learning, enabling students to build on both theoretical and practical knowledge in a coherent and integrated manner. The curriculum is systematically organized into the following categories of subjects:

### **Core Artificial Intelligence Group**

At the core of the curriculum is an introductory course on artificial intelligence, where students will examine the historical development, ethical implications, and societal impact of AI. This foundational course is followed by specialized modules such as machine and deep learning, where students will engage in the design and implementation of algorithms that empower machines to learn from and adapt to data inputs. Further courses on neural networks and deep learning will provide students with an in-depth understanding of the architectures underlying advanced AI systems, including those employed in image and speech recognition. The curriculum also includes courses on natural language processing and computer vision, equipping students with the skills to develop systems capable of understanding, interpreting, and generating human language and vision—skills applicable in translation, sentiment analysis, affective computing, object recognition and more.

### **Mathematics Group (Science)**

The primary aim of this group is to cultivate a comprehensive understanding of mathematics as a fundamental cornerstone of computer science. Additionally, it seeks to impart a thorough grasp of the scientific methodology—encompassing data collection, hypothesis formulation, research, and analysis—essential for effective problem-solving.

### **Character Building Group (Professional Practices)**

The objective of this group is to foster the development of the student's personal strengths and to cultivate a professional demeanor, encompassing expertise in their respective field. It also aims to equip students with essential management skills, proficiency in both oral and written communication, an understanding of business ethics, and the ability to collaborate effectively within a team. Furthermore, it seeks to instill the distinctive "BINUSIAN" character.

### **Computer Science Core Group**

As a part of Computer Science group, Artificial Intelligence program also imbued Computer Science core courses into this program. The objective of this group is to establish a solid foundation in Computer Science, combining practical application with theoretical knowledge, to meet the current and future demands of the business sector. The subjects encompassed within this group include programming, algorithm design and analysis, software engineering, database systems, computer graphics, multimedia technology, human-computer interaction, operating systems, computer architecture, and computer networks.

### **Entrepreneur and Employability Skill**

The aim of this group of subjects is to equip students with professional experience, a strong work ethic, and exposure to real-world working environments. Students are expected to apply and integrate their academic knowledge in practical settings such as industry, research laboratories, and entrepreneurial startups. Furthermore, they are required to document and report on their experiences and outcomes in these subjects.

### **Course Structure**

| Sem | Code        | Course Name                   | SCU | Total |
|-----|-------------|-------------------------------|-----|-------|
| 1   | CHAR6013001 | Character Building: Pancasila | 2   | 20    |
|     | MATH6025001 | Discrete Mathematics          | 4   |       |

| Sem                  | Code                            | Course Name   | SCU                                 | Total |   |    |
|----------------------|---------------------------------|---|-------------------------------------|-------|---|----|
|                      | MATH6031001                     | Calculus  | 4                                   |       |   |    |
|                      | COMP6047001                     | Algorithm and Programming <sup>2</sup> (AOL)                | 4/2                                 |       |   |    |
|                      | COMP6798001                     | Program Design Methods <sup>1</sup> (AOL)                   | 2                                   |       |   |    |
|                      | COSC6058001                     | Intelligent Automation                                      | 2                                   |       |   |    |
|                      | <b>Foreign Language Courses</b> |   | 0                                   |       |   |    |
| 2                    | CHAR6014001                     | Character Building: Kewarganegaraan                         | 2                                   | 20    |   |    |
|                      | MATH6030001                     | Linear Algebra  | 2                                   |       |   |    |
|                      | COMP6048001                     | Data Structures <sup>1&amp;2</sup> (AOL)                    | 4/2                                 |       |   |    |
|                      | STAT6171001                     | Basic Statistics  | 2                                   |       |   |    |
|                      | ENTR6510001                     | Entrepreneurship: Prototyping                               | 2                                   |       |   |    |
|                      | COMP6065001                     | Artificial Intelligence <sup>2</sup> (AOL)                  | 4                                   |       |   |    |
|                      | COMP6983001                     | Machine Learning  | 2                                   |       |   |    |
|                      | <b>Foreign Language Courses</b> |   | 0                                   |       |   |    |
| 3                    | CHAR6015001                     | Character Building: Agama                                   | 2                                   | 19    |   |    |
|                      | LANG6027001                     | Indonesian  | 2                                   |       |   |    |
|                      | MATH6183001                     | Scientific Computing (AOL)                                  | 2/1                                 |       |   |    |
|                      | COMP6984001                     | Machine Learning Operations (AOL)                           | 2/1                                 |       |   |    |
|                      | COSC6051001                     | Deep Learning (AOL)   | 2/1                                 |       |   |    |
|                      | SCIE6063001                     | Computational Physics (AOL)                                 | 2/1                                 |       |   |    |
|                      | COMP6799001                     | Database Technology <sup>2</sup> (AOL)                      | 2/1                                 |       |   |    |
|                      | <b>Foreign Language Courses</b> |   | 0                                   |       |   |    |
| 4                    | COMP6049001                     | Algorithm Design and Analysis <sup>1</sup> (AOL)            | 4                                   | 21    |   |    |
|                      | COMP6986001                     | Artificial Intelligence Solution (AOL)                      | 2                                   |       |   |    |
|                      | COMP6800001                     | Human and Computer Interaction <sup>2</sup> (AOL)           | 2/1                                 |       |   |    |
|                      | <b>Foreign Language Courses</b> |   | 0                                   |       |   |    |
| 4                    | CPEN6247001                     | Computer Networks (AOL)                                     | 2/1                                 | 21    |   |    |
|                      | SCIE6062001                     | Computational Biology                                       | 2/1                                 |       |   |    |
|                      | COMP6965001                     | Applied Natural Language Processing <sup>1&amp;2</sup>      | 2/1                                 |       |   |    |
|                      | COMP6966001                     | Applied Computer Vision <sup>1&amp;2</sup>                  | 2/1                                 |       |   |    |
|                      | <b>Foreign Language Courses</b> |   | 0                                   |       |   |    |
|                      | 5                               | ENTR6511001   | Entrepreneurship: Market Validation |       | 2 | 20 |
|                      |                                 | COMP6697001   | Operating System (AOL)              |       | 2 |    |
| COMP6062001          |                                 | Compilation Techniques                                      | 4                                   |       |   |    |
| COMP6696001          |                                 | Research Methodology in Computer Science <sup>1</sup> (AOL) | 2                                   |       |   |    |
| COMP6967001          |                                 | Internet of Things and Robotics                             | 2/2                                 |       |   |    |
| COMP6100001          |                                 | Software Engineering <sup>2</sup> (AOL)                     | 4                                   |       |   |    |
| COMP6987001          |                                 | Signal Processing   | 2                                   |       |   |    |
| 6                    | <b>Enrichment Program I</b>     |   | 20                                  | 20    |   |    |
| 7                    | <b>Enrichment Program II</b>    |   | 20                                  | 20    |   |    |
| 8                    | COMP6833001                     | Pre-Thesis  | 2                                   | 6     |   |    |
|                      | COMP6834001                     | Thesis  | 4                                   |       |   |    |
|                      | COMP6881001                     | Thesis  | 6                                   |       |   |    |
| <b>Total Credits</b> |                                 |   | <b>146 SCU</b>                      |       |   |    |



| Track | Semester 6 |    |    |    |    |    |     | Semester 7 |    |    |    |    |    |    |     |
|-------|------------|----|----|----|----|----|-----|------------|----|----|----|----|----|----|-----|
|       | IN         | RS | EN | CD | SA | IS | etc | IN         | RS | EN | CD | SA | IS | FS | etc |
| 18    |            | v  |    |    |    |    |     |            |    |    |    |    |    | v  |     |
| 19    |            |    |    |    |    | v  |     | v          |    |    |    |    |    |    |     |
| 20    |            |    |    |    |    | v  |     |            |    |    | v  |    |    |    |     |
| 21    |            |    |    |    |    | v  |     |            |    |    |    | v  |    |    |     |

**Note:**

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

**Description:**

- Students will take only one track in each Enrichment Program.
- Students who failed in Enrichment Program I can retake according to the table above.
- As for Enrichment Program II, students who failed should retake the same track, except Certified Specific Independent Study.
- 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>  |   |     |       |
| COSC6052001                  | Industrial Experience in Information Technology             | 8   | 20    |
| COSC6053001                  | Information Technology Practice in Industrial Experience    | 8   |       |
| COSC6054001                  | EES in Information Technology Industry                      | 4   |       |
| <b>Enrichment Program II</b> |   |     |       |
| COSC6055001                  | Professional Experience in Information Technology           | 8   | 20    |
| COSC6056001                  | Information Technology Practice in Professional Experience  | 8   |       |
| COSC6057001                  | Professional Development in Information Technology Industry | 4   |       |

**Certified Entrepreneurship Track**

| Code                         | Course Name                                  | SCU | Total |
|------------------------------|--|-----|-------|
| <b>Enrichment Program I</b>  |  |     |       |
| ENPR6284001                  | New Venture Initiation in Computer Science   | 8   | 20    |
| ENPR6285001                  | Computer Science Product Development Process | 8   |       |
| ENPR6286001                  | EES in New Computer Science Business I       | 4   |       |
| <b>Enrichment Program II</b> |  |     |       |
| ENPR6287001                  | Computer Science Product Launching           | 8   | 20    |
| ENPR6288001                  | Computer Science Business Development        | 8   |       |
| ENPR6289001                  | EES in New Computer Science Business II      | 4   |       |

**Certified Research Track**

| Code                         | Course Name  | SCU | Total |
|------------------------------|--|-----|-------|
| <b>Enrichment Program I</b>  |  |     | 20    |
| RSCH6731001                  | Research Experience I in Computer Science  | 8   |       |
| RSCH6732001                  | Scientific Writing I in Computer Science   | 8   |       |
| RSCH6733001                  | Global EES I (Team Work, Communication, Problem Solving & Decision Making) in Computer Science | 4   |       |
| <b>Enrichment Program II</b> |  |     | 20    |
| RSCH6734001                  | Research Experience II in Computer Science   | 8   |       |
| RSCH6735001                  | Scientific Writing II in Computer Science  | 8   |       |
| RSCH6736001                  | Global EES II (Self-Management, Planning & Organizing, Initiative & Enterprise)                | 4   |       |

**Certified Community Development Track**

| Code                         | Course Name  | SCU | Total |
|------------------------------|--|-----|-------|
| <b>Enrichment Program I</b>  |  |     | 20    |
| CMDV6481001                  | Community Outreach Project Implementation  | 8   |       |
| CMDV6482001                  | Community Outreach IT Project Design   | 8   |       |
| CMDV6483001                  | Employability and Entrepreneurial Skills in Computer Science Community             | 4   |       |
| <b>Enrichment Program II</b> |  |     | 20    |
| CMDV6484001                  | Community Development Project Implementation                                       | 8   |       |
| CMDV6485001                  | Community Development IT Project Design  | 8   |       |
| CMDV6486001                  | Employability and Entrepreneurial Skills in Computer Science Community Development | 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   |       |
| GLOB6010001                                    | Elective Course for Study Abroad 6  | 2   |       |
| 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>                   |                                     |     | 20    |
| GLOB6017001                                    | Elective Course for Study Abroad 13 | 4   |       |
| GLOB6018001                                    | Elective Course for Study Abroad 14 | 4   |       |

| Code        | Course Name                         | SCU | Total |
|-------------|-------------------------------------|-----|-------|
| 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   |       |
| 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   |       |



| Code        | Course Name                                       | SCU | Total |
|-------------|---|-----|-------|
| 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

*Students will receive information about Further Study Track courses during the registration period.*

### 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.  | COMP6798001 | Program Design Methods*             | C             |
| 4.  | COMP6048001 | Data Structures*                    | C             |
| 5.  | COMP6799001 | Database Technology                 | C             |
| 6.  | COMP6100001 | Software Engineering*               | C             |
| 7.  | COMP6697001 | Operating System                    | C             |
| 8.  | ENTR6511001 | Entrepreneurship: Market Validation | C             |

*\*) Tutorial*