# Data Science

## Introduction

As the world has entered the era of big data, the need for processing big data is required. The use of Big Data will become the basis of competition and growth for industry and business. Data Science is the secret recipe here. Data Science is a blend of various technology tools, statistics, and machine learning with the goal of discovering hidden patterns from the raw data. It can enhance productivity and create significant value for the world economy by increasing the quality of products and services and reducing waste. The students will solve complex data problems with their strong Data Science expertise. They will use the latest technologies in finding solutions and reaching conclusions. The program can be completed within 3.5-4 years. Furthermore, to provide one-year work experience for students, there are industrial internships, interesting research, or entrepreneurship programs.

## 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 Data Science 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.

## 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 conduct data science project flow to solve real business and industry problems;
8. Able to use big data technology to get business insight in digital era.

## Prospective Career of the Graduates

The graduates of Data Science program can follow careers in:

1. Data Architect
2. Data Engineer
3. Data Analyst
4. Data Visualizer
5. Database Administrator
6. Machine Learning Scientist

## Curriculum

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

1. Solid knowledge of Big Data technology as a framework and solutions to store data.
2. Robust education to increase logical reasoning capability for mastering Data Analytics and ability to solve problems in other fields.
3. The academic atmosphere that will facilitate student learning in order that student will develop skills in communicating their solutions based on Data.
4. 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, this department provides the means and expertise in Data Science to prepare students for a career as a Data Scientist who is able to use the latest technologies in finding solutions and reaching conclusions based on Data. It also provides capability in developing Data Science expertise 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 | CHAR6013001 | Character Building: Pancasila | 2 | 20 |
| | MATH6025001 | Discrete Mathematics | 4 | |
| | MATH6031001 | Calculus | 4 | |
| | COMP6047001 | Algorithm and Programming** **(AOL)** | 4/2 | |
| | DTSC6001001 | Introduction to Data Science** | 2 | |
| | COMP6798001 | Program Design Methods* **(AOL)** | 2 | |
| | **Foreign Language Courses** | | 0 | |
| 2 | CHAR6014001 | Character Building: Kewarganegaraan | 2 | 20 |
| | MATH6030001 | Linear Algebra | 2 | |
| | COMP6048001 | Data Structures*&** **(AOL)** | 4/2 | |
| | STAT6171001 | Basic Statistics | 2 | |
| | ENTR6509001 | Entrepreneurship: Ideation | 2 | |
| | DTSC6013001 | Data Mining and Visualization*&** **(AOL)** | 2 | |

| Sem | Code | Course Name | SCU | Total |
|---|---|---|---|---|
| | COMP6065001 | Artificial Intelligence** **(AOL)** | 4 | |
| | **Foreign Language Courses** | | 0 | |
| 3 | CHAR6015001 | Character Building: Agama | 2 | 19 |
| | LANG6027001 | Indonesian | 2 | |
| | CPEN6247001 | Computer Networks **(AOL)** | 2/1 | |
| | DTSC6014001 | Machine Learning*&** **(AOL)** | 2 | |
| | MATH6183001 | Scientific Computing **(AOL)** | 2/1 | |
| | DTSC6002001 | Data Management and Organization* | 2 | |
| | COMP6799001 | Database Technology** **(AOL)** | 2/1 | |
| | DTSC6010001 | Bayesian Data Analysis | 2 | |
| | **Foreign Language Courses** | | 0 | |
| 4 | COMP6049001 | Algorithm Design and Analysis* **(AOL)** | 4 | 20 |
| | DTSC6011001 | Survey and Sampling Methods | 2 | |
| | DTSC6012001 | Model Deployment | 2 | |
| | COMP6800001 | Human and Computer Interaction** **(AOL)** | 2/1 | |
| | SCIE6063001 | Computational Physics **(AOL)** | 2/1 | |
| | COMP6697001 | Operating System **(AOL)** | 2 | |
| | DTSC6007001 | Deep Learning | 2 | |
| | DTSC6003001 | Big Data Infrastructure and Technology* | 2 | |
| | **Foreign Language Courses** | | 0 | |
| 5 | ENTR6511001 | Entrepreneurship: Market Validation | 2 | 21 |
| | SCIE6062001 | Computational Biology | 2/1 | |
| | COMP6062001 | Compilation Techniques | 4 | |
| | COMP6696001 | Research Methodology in Computer Science* **(AOL)** | 2 | |
| | DTSC6008001 | Text Mining | 2 | |
| | DTSC6004001 | Data Security | 2 | |
| | COMP6100001 | Software Engineering** **(AOL)** | 4 | |
| | DTSC6015001 | Prescriptive Data Science | 2 | |
| 6 | **Enrichment Program I** | | 20 | 20 |
| 7 | **Enrichment Program II** | | 20 | 20 |
| 8 | COMP6743001 | Pre-Thesis | 2 | 6 |
| | COMP6744001 | Thesis | 4 | |
| | COMP6862001 | Thesis | 6 | |
| | | | | **Total Credits 146 SCU** |

**) 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 6th and/or 7th 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 (6th Semester) & Enrichment Program II (7th 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 | : 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:**

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 |
|---|---|---|---|
| **Enrichment Program I** | | | 20 |
| COMP6771001 | Industrial Experience in Data Science | 8 | |
| COMP6772001 | Data Science Practice in Industrial Experience | 8 | |
| COMP6773001 | EES in Data Science | 4 | |
| **Enrichment Program II** | | | 20 |
| COMP6774001 | Professional Experience in Data Science | 8 | |
| COMP6775001 | Data Science Practice in Professional Experience | 8 | |
| COMP6776001 | Professional Development in Data Science | 4 | |

## Certified Entrepreneurship Track

| Code | Course Name | SCU | Total |
|---|---|---|---|
| **Enrichment Program I** | | | 20 |
| ENTR6958001 | New Venture Initiation in Data Science | 8 | |
| ENTR6959001 | Product Development Process in Data Science | 8 | |
| ENTR6960001 | EES in New Data Science Business | 4 | |
| **Enrichment Program II** | | | 20 |
| ENTR6961001 | Product Launching in Data Science | 8 | |
| ENTR6639001 | Business Development in Data Science | 8 | |
| ENTR6640001 | EES in Data Science Business Experience | 4 | |

## Certified Research Track

| Code | Course Name | SCU | Total |
|---|---|---|---|
| **Enrichment Program I** | | | 20 |
| RSCH6562001 | Research Experience I | 8 | |
| RSCH6580001 | Scientific Writing I in Data Science | 8 | |
| RSCH6581001 | Global EES I (Team Work, Communication, Problem Solving & Decision Making) | 4 | |
| **Enrichment Program II** | | | 20 |
| RSCH6582001 | Research Experience II | 8 | |
| RSCH6583001 | Scientific Writing II in Data Science | 8 | |
| RSCH6584001 | Global EES II (Self-Management, Planning & Organizing, Initiative & Enterprise) | 4 | |

**Certified Community Development Track**

| Code | Course Name | SCU | Total |
|---|---|---|---|
| **Enrichment Program I** | | | |
| CMDV6352001 | Community Outreach Project Implementation | 8 | 20 |
| CMDV6353001 | Community Outreach Project Design in Data Science | 8 | |
| CMDV6354001 | Employability and Entrepreneurial Skills in Data Science Community | 4 | |
| **Enrichment Program II** | | | |
| CMDV6355001 | Community Development Project Implementation | 8 | 20 |
| CMDV6356001 | Community Development Project Design in Data Science | 8 | |
| CMDV6357001 | Employability and Entrepreneurial Skills in Data Science in Community Development | 4 | |

**Certified Study Abroad Track**

| Code | Course Name | SCU | Total |
|---|---|---|---|
| **Elective courses list for study abroad*** | | | |
| **Enrichment Program I** | | | |
| GLOB6005001 | Elective Course for Study Abroad 1 | 4 | 20 |
| 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 | |
| **Enrichment Program II** | | | |
| GLOB6017001 | Elective Course for Study Abroad 13 | 4 | 20 |
| 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 | |

*) *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*** | | | |
| 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 | 20 |
| 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 |
|---|---|---|---|
| **Enrichment Program II** | | | 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. | COMP6798001 | Program Design Methods* | C |
| 4. | COMP6048001 | Data Structures* | C |
| 5. | COMP6799001 | Database Technology | C |
| 6. | COMP6697001 | Operating System | C |
| 7. | COMP6100001 | Software Engineering* | C |
| 8. | ENTR6511001 | Entrepreneurship: Market Validation | C |

*) Tutorial & Multipaper