

## Computer Engineering

### Introduction

The Computer Engineering (CEN) Study Program was established in September 1987 under the Faculty of Computer Studies and since 2011 are under Faculty of Engineering BINUS UNIVERSITY. The CEN Study Program is **accredited Grade “A” by the National Board of Higher Education (BAN-PT)** in 2013 and also **accredited by the Engineering Accreditation Commission of ABET**, [www.abet.org](http://www.abet.org) in 2015. It has various alumni who have gone on to take part in various domains of the business industry. The CEN Study Program was founded to meet the demand of knowledge about computer systems encompassing computer hardware, software and computer networks. The Institute of Electrical & Electronic Engineers (IEEE) and the Association for Computing Machinery (ACM), the well established and world-famous organizations, use the following definition: "Computer Engineering embodies the science and the technology of design, construction, implementation and maintenance of the hardware and the software components of modern computing systems and computer-controlled equipment," and its graduates stated: "Computer Engineers are solidly grounded in the theories and principles of computing, mathematics, and engineering; and apply these theoretical principles to design hardware, software, networks, and computerized equipment and instruments to solve problems in diverse application domains."

Hence, graduates of the CEN Study Program will enjoy the knowledge of computer software as well as computer hardware. This will allow graduates to contribute to any application wherever computers are used. The development of Information Technology and the need for experienced computer systems professionals is behind the innovative CEN Program. Currently, the Program covers expertise in understanding to build completed computer system solution that consists of hardware and software, ranging from communication system to intelligent embedded systems.

### Vision

A study program of choice in Computer Engineering, which focuses on Intelligence, Mobility, and Secure Communication technologies, is recognized internationally, champions innovation and produces graduates with international qualification.

### Mission

The mission of Computer Engineering Department is to contribute to the global community through the provision of world-class education by:

1. Educating students with the knowledge and skills in science and technology in the design, analysis and application of intelligent, mobile, and secure connectivity technologies. We prepare graduates to be ethical professionals and technopreneurs, as well as to continue for advanced degrees in computer engineering or related disciplines in global community.
2. Providing a vibrant learning and research environment that nurtures the most creative, value-added and leadership talents of our graduates for the global community.
3. Improving quality of life by conducting professional services and high impact applied research in Computer Engineering related disciplines.

## Program Objectives

The objectives of the program are:

1. Excel in methodological and computational skills within their professional and communities.
2. Employ effective team player and professional responsibilities to benefit the organizations and society.
3. Sustainably updating their knowledge to meet evolving global requirements.

## Student Outcomes

After completing the study, graduates are:

1. An ability to apply knowledge of math, science, and engineering.
2. An ability to design and conduct experiments, as well as to analyze and interpret data.
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
4. An ability to identify, formulate, and solve computer engineering problems.
5. An ability to use the techniques, skills, and modern computer engineering tools necessary for engineering practice.
6. An ability to function on multidisciplinary teams.
7. An understanding of professional and ethical responsibility.
8. An ability to communicate effectively.
9. The broad education necessary to understand the impact of computer engineering solutions in a global, economic, environmental, and societal context.
10. A recognition of the need for, and an ability to engage in life-long learning.
11. A knowledge of contemporary issues.

## Prospective Career of the Graduates

At the career level, computer engineering offers two principle paths – hardware and software engineering – and multiple sub specialty or areas of concentration, such as the following:

- Intelligence
- Operating System & Networks
- Telecommunication
- Robotics
- Software Application
- Computer Design & Architecture

Computer engineering exist at the intersection of electrical engineering and computer science, but its impact stretches well beyond these two areas. It has become part of a larger interdisciplinary field, integrating with areas ranging from biology to medicine, environmental engineering to physics. Indeed, computer engineering is part of numerous emerging industries. Below is a list of five emerging industries creating new opportunities for computer engineers.

- Big Data
- Nano Technology
- Cyber security
- Energy Efficient Computing
- Green Information and Communication Technology
- Internet of Things

## Curriculum

The Computer Engineering curriculum is developed based on the IEEE-ACM international curriculum as well as the APTIKOM national curriculum. Both are curricula developed by professional engineers and educators in their fields who are members of a professional association. Concerning the two curriculums above, the curriculum used by the Computer Engineering Study Program can produce graduates who can answer local and global challenges.

The curriculum structure of the Computer Engineering Study Program consists of five parts. The first part is the mathematics and basic science composed of 32 credits. The second part is engineering science consisting of 31 credits. The third part is engineering design consisting of 32 credits. The fourth part is the design consisting of 6 credits, and the last part is the university courses consisting of 45 credits. Enrichment 3 + 1 program is in the university courses part that expect the students to face real computer engineering problems that exist in the area of research, industry, community development and entrepreneurship.

## Course Structure

| Sem      | Code                                       | Course Name                                | SCU | Total |  |
|----------|--|--|-----|-------|--|
| 1        | CHAR6013                                   | Character Building: Pancasila              | 2   | 20    |  |
|          | SCIE6004                                   | Physics I                                  | 4   |       |  |
|          | MATH6006                                   | Chemistry                                  | 4   |       |  |
|          | MATH6093                                   | Calculus                                   | 4   |       |  |
|          | CPEN6078                                   | Introduction to Computer Engineering*      | 4   |       |  |
|          | <b>English University Courses I</b>        |  |     |       |  |
|          | ENGL6128                                   | English in Focus                           | 2   |       |  |
| ENGL6130 | English for Business Presentation          | 2  |     |       |  |
| 2        | CHAR6014                                   | Character Building: Kewarganegaraan        | 2   | 21    |  |
|          | SCIE6005                                   | Physics II                                 | 4/2 |       |  |
|          | COMP6154                                   | Algorithm and Programming Fundamentals     | 4   |       |  |
|          | MATH6005                                   | Engineering Mathematics I                  | 4   |       |  |
|          | ENTR6003                                   | Entrepreneurship I                         | 2   |       |  |
|          | LANG6061                                   | Indonesian                                 | 1   |       |  |
|          | <b>English University Courses II</b>       |  |     |       |  |
| ENGL6129 | English Savvy                              | 2  |     |       |  |
| ENGL6131 | English for Written Business Communication | 2  |     |       |  |
| 3        | MATH6007                                   | Engineering Mathematics II                 | 4   | 23    |  |
|          | MATH6036                                   | Discrete Mathematics                       | 2   |       |  |
|          | STAT6026                                   | Probability and Statistics                 | 2   |       |  |
|          | MATH6044                                   | Numerical Methods                          | 2   |       |  |
|          | CPEN6123                                   | Circuits and Signals**                     | 4/1 |       |  |
|          | CPEN6215                                   | Electronics Devices*,**,***                | 5/1 |       |  |
| CHAR6015 | Character Building: Agama                  | 2  |     |       |  |
| 4        | CPEN6034                                   | Computer Organization and Architecture*,** | 4   | 24    |  |
|          | CPEN6216                                   | Digital System*,***                        | 5/1 |       |  |
|          | CPEN6083                                   | Digital Signal Processing*                 | 2/1 |       |  |
|          | CPEN6124                                   | Digital Communication Systems**            | 4   |       |  |
|          | CPEN6046                                   | Computer Networks                          | 4/1 |       |  |
| COMP6083 | Operation Systems                          | 2  |     |       |  |

| Sem                         | Code   | Course Name                                  | SCU | Total |  |
|-----------------------------|--|--|-----|-------|--|
| 5                           | CPEN6065                                     | Microcontroller Design and Application**     | 4/1 | 21    |  |
|                             | ISYS6078                                     | Database Design and Application              | 2/1 |       |  |
|                             | ENTR6493                                     | Entrepreneurship II                          | 2   |       |  |
|                             | CPEN6075                                     | Computer System Development and Methodology* | 2   |       |  |
|                             | <b>Stream : Intelligent Embedded Systems</b> |  |     |       |  |
|                             | CPEN6125                                     | Computational Intelligence                   | 4/1 |       |  |
|                             | CPEN6126                                     | Cross Platform Application Development**     | 4   |       |  |
|                             | <b>Stream : Communication System</b>         |  |     |       |  |
|                             | CPEN6127                                     | Network Infrastructure Technology            | 4/1 |       |  |
| CPEN6128                    | Mobile Communications and Cyber Security**   | 4  |     |       |  |
| 6                           | <b>Enrichment Program I</b>                  |  | 15  | 15    |  |
| 7                           | <b>Enrichment Program II</b>                 |  | 16  | 16    |  |
| 8                           | CPEN6110                                     | Final Project                                | 6   | 6     |  |
| <b>TOTAL CREDIT 146 SCU</b> |  |  |     |       |  |

\*) This course is delivered in English

\*\*) Entrepreneurship Embedded

\*\*) Global Learning System Course

#### English University Courses:

- ) For 1<sup>st</sup> Semester: English University Courses I, student with score BINUS UNIVERSITY English Proficiency Test less than 500 will take English in Focus, and student with score test greater than or equal to 500 will take English for Business Presentation
- ) For 2<sup>nd</sup> Semester: English University Courses II, student with score BINUS UNIVERSITY English Proficiency Test less than 500 will take English Savvy, and student with score test greater than or equal to 500 will take English for Written Business Communication

#### 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 | etc | IN         | RS | EN | CD | SA | 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  |    |    |     |



| Code   | Course Name   | SCU | Total |
|--|---|-----|-------|
| <b>For students who take Entrepreneurship track in semester 6 and 7, should take these courses:</b>                        |   |     |       |
| <b>Enrichment Program I</b>  |   |     |       |
| ENTR6188   | Computer Engineering Practical Experience I : For Entrepreneurship - Business Start Up              | 8   | 15    |
| ENTR6189   | Computer Engineering Technical Analysis I : For Entrepreneurship - Business Model & Validation      | 2   |       |
| ENTR6190   | Computer Engineering Technical Analysis I : For Entrepreneurship - Launching New Venture            | 2   |       |
| ENTR6191   | Computer Engineering EES Experience I: For Entrepreneurship – EES in New Business                   | 3   |       |
| <b>Enrichment Program II</b>   |   |     |       |
| ENTR6192   | Computer Engineering Practical Experience II : For Entrepreneurship - Growing a Business            | 8   | 16    |
| ENTR6193   | Computer Engineering Practical Experience II : For Entrepreneurship - Lean Start Up & Business Plan | 2   |       |
| ENTR6194   | Computer Engineering Practical Experience II : For Entrepreneurship - Venture Capital               | 2   |       |
| ENTR6195   | Computer Engineering Practical Experience II : For Entrepreneurship - EES in Business Experience    | 4   |       |
| <b>Enrichment Program II: (For students who only take Entrepreneurship track in semester 7, should take these courses)</b> |   |     |       |
| ENTR6241   | Computer Engineering Practical Experience II : For Entrepreneurship - Business Start Up             | 8   |       |
| ENTR6242   | Computer Engineering Technical Analysis II : For Entrepreneurship - Business Model & Validation     | 2   |       |
| ENTR6243   | Computer Engineering Technical Analysis II : For Entrepreneurship - Launching New Venture           | 2   |       |
| ENTR6196   | Computer Engineering EES Experience II: For Entrepreneurship – EES in New Business                  | 4   |       |

### Enrichment Research Track

| Code                         | Course Name  | SCU | Total |
|------------------------------|--|-----|-------|
| <b>Enrichment Program I</b>  |  |     |       |
| RSCH6139                     | Computer Engineering Practical Experience I : For Research Practice  | 8   | 15    |
| RSCH6140                     | Computer Engineering Technical Analysis I : For Research Practice    | 4   |       |
| RSCH6141                     | Computer Engineering EES Experience I : For Research Practice        | 3   |       |
| <b>Enrichment Program II</b> |  |     |       |
| RSCH6142                     | Computer Engineering Practical Experience II : For Research Practice | 8   | 16    |
| RSCH6143                     | Computer Engineering Technical Analysis II : For Research Practice   | 4   |       |
| RSCH6144                     | Computer Engineering EES Experience II : For Research Practice       | 4   |       |

### Enrichment Community Development Track

| Code                         | Course Name  | SCU | Total |
|------------------------------|--|-----|-------|
| <b>Enrichment Program I</b>  |  |     |       |
| CMDV6059                     | Computer Engineering Practical Experience I : For Community Development Project  | 8   | 15    |
| CMDV6060                     | Computer Engineering Technical Analysis I : For Community Development Project    | 4   |       |
| CMDV6061                     | Computer Engineering EES Experience I: For Community Development Project         | 3   |       |
| <b>Enrichment Program II</b> |  |     |       |
| CMDV6062                     | Computer Engineering Practical Experience II : For Community Development Project | 8   | 16    |
| CMDV6063                     | Computer Engineering Technical Analysis II : For Community Development Project   | 4   |       |
| CMDV6064                     | Computer Engineering EES Experience II: For Community Development Project        | 4   |       |

### Enrichment Study Abroad Track

| Code   | Course Name                         | SCU | Total |
|--|-------------------------------------|-----|-------|
| <b>Elective courses list for study abroad*</b> |                                     |     |       |
| <b>Enrichment Program I</b>                    |                                     |     |       |
| GLOB6005                                       | Elective Course for Study Abroad 1  | 4   | 15    |
| GLOB6006                                       | Elective Course for Study Abroad 2  | 4   |       |
| GLOB6007                                       | Elective Course for Study Abroad 3  | 4   |       |
| GLOB6008                                       | Elective Course for Study Abroad 4  | 4   |       |
| GLOB6009                                       | Elective Course for Study Abroad 5  | 2   |       |
| GLOB6010                                       | Elective Course for Study Abroad 6  | 2   |       |
| GLOB6011                                       | Elective Course for Study Abroad 7  | 2   |       |
| GLOB6012                                       | Elective Course for Study Abroad 8  | 2   |       |
| GLOB6013                                       | Elective Course for Study Abroad 9  | 2   |       |
| GLOB6014                                       | Elective Course for Study Abroad 10 | 2   |       |
| GLOB6015                                       | Elective Course for Study Abroad 11 | 2   |       |
| GLOB6016                                       | Elective Course for Study Abroad 12 | 2   |       |
| GLOB6041                                       | Elective Course for Study Abroad 25 | 3   |       |
| GLOB6042                                       | Elective Course for Study Abroad 26 | 1   |       |
| <b>Enrichment Program II</b>                   |                                     |     |       |
| GLOB6017                                       | Elective Course for Study Abroad 13 | 4   | 16    |
| GLOB6018                                       | Elective Course for Study Abroad 14 | 4   |       |
| GLOB6019                                       | Elective Course for Study Abroad 15 | 4   |       |
| GLOB6020                                       | Elective Course for Study Abroad 16 | 4   |       |
| GLOB6021                                       | Elective Course for Study Abroad 17 | 2   |       |
| GLOB6022                                       | Elective Course for Study Abroad 18 | 2   |       |
| GLOB6023                                       | Elective Course for Study Abroad 19 | 2   |       |
| GLOB6024                                       | Elective Course for Study Abroad 20 | 2   |       |
| GLOB6025                                       | Elective Course for Study Abroad 21 | 2   |       |
| GLOB6026                                       | Elective Course for Study Abroad 22 | 2   |       |
| GLOB6027                                       | Elective Course for Study Abroad 23 | 2   |       |
| GLOB6028                                       | Elective Course for Study Abroad 24 | 2   |       |

\*)Transferred courses will be transferred based on credit transfer policies on study program with total of 15 credits for Enrichment Program I and 16 credits for Enrichment Program II.

**The Table of Prerequisite for Computer Engineering (S1)**

| Subject  |  | Credits | Sem | Prerequisite |  | Credits | Sem |
|----------|--|---------|-----|--------------|--|---------|-----|
| MATH6007 | Engineering Mathematics II             | 4       | 3   | MATH6093     | Calculus                               | 4       | 1   |
| CPEN6034 | Computer Organization and Architecture | 4       | 4   | COMP6154     | Algorithm and Programming Fundamentals | 4       | 2   |
| CPEN6065 | Microcontroller Design and Application | 4/1     | 5   | CPEN6123     | Circuits and Signals                   | 4/1     | 3   |

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

| No  | Course Code | Course Name                              | Minimal Grade |
|---|-------------|--|---------------|
| 1   | CHAR6013    | Character Building: Pancasila            | B             |
| 2   | ENTR6493    | Entrepreneurship II                      | C             |
| 3   | MATH6093    | Calculus*                                | C             |
| 4   | COMP6154    | Algorithm and Programming Fundamentals*  | C             |
| 5   | CPEN6123    | Circuits and Signals*                    | C             |
| 6   | CPEN6065    | Microcontroller Design and Application   | C             |
| <b>Stream: Intelligent Embedded Systems</b> |             |  |               |
| 7   | CPEN6125    | Computational Intelligence               | C             |
| 8   | CPEN6126    | Cross Platform Application Development   | C             |
| <b>Stream: Communication System</b>         |             |  |               |
| 7   | CPEN6127    | Network Infrastructure Technology        | C             |
| 8   | CPEN6128    | Mobile Communications and Cyber Security | C             |

\*) Tutorial & Multipaper