



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT



Republic of the Philippines
OFFICE OF THE PRESIDENT
COMMISSION ON HIGHER EDUCATION



CHED MEMORANDUM ORDER

No. 87
Series of 2017

SUBJECT: POLICIES, STANDARDS AND GUIDELINES FOR THE BACHELOR OF SCIENCE IN COMPUTER ENGINEERING (BSCpE) EFFECTIVE (AY) 2018-2019

In accordance with the pertinent provisions of Republic Act (RA) No. 7722, otherwise known as the "Higher Education Act of 1994," in pursuance of an outcomes-based quality assurance system as advocated under CMO 46 s. 2012 (Policy-Standard to Enhance Quality Assurance (QA) in Philippine Higher Education through an Outcomes-Based and Typology-Based Quality Assurance) and as addendum to CMO 37, s. 2012 (Establishment of an Outcomes-Based Educational System in Higher Education Institutions offering Engineering Programs), and by virtue of Commission en banc Resolution No. 788-2017 dated October 24, 2017 the following Policies, Standards and Guidelines (PSG) are hereby adopted and promulgated by the Commission.

**ARTICLE I
INTRODUCTION**

Section 1. Rationale

Based on the *Guidelines for the Implementation of CMO No. 46 series of 2012* and CMO 37 s. 2012, this PSG implements shift to outcomes based education leading to competency based standards. It specifies the "core competencies" expected of BS Computer Engineering graduates "regardless of the type of Higher Education Institutions (HEI) they graduate from." However, in recognition of outcomes-based education (OBE) and the typology of HEIs, this PSG also provide ample space for HEIs to innovate in the curriculum in line with the assessment of how best to achieve learning outcomes in their particular contexts and their respective missions.

**ARTICLE II
AUTHORITY TO OPERATE**

Section 2. Government Recognition

All private higher education institutions (PHEIs) intending to offer BS Computer Engineering must first secure proper authority from the Commission in accordance with this PSG. All PHEIs with an existing BS Computer Engineering program are required to shift to an outcomes-based approach based on CMO 37, s. 2012 and guided by this PSG. State universities and colleges (SUCs), and local universities and

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POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

colleges (LUCs) should likewise strictly adhere to the provisions in these policies and standards.

**ARTICLE III
GENERAL PROVISIONS**

Per Section 13 of RA 7722, the higher education institution shall exercise academic freedom in its curricular offerings but must comply with the minimum requirements for specific academic programs, the general education distribution requirements and the specific professional courses.

Section 3. Minimum Standards

The Articles that follow give minimum standards and other requirements and guidelines. The minimum standards are expressed as a minimum set of desired program outcomes which are given in Article IV Section 6. CHED designed a curriculum to attain such outcomes. This curriculum is shown in Article V Section 10 and Section 11 as **sample curriculum**. The number of units of this curriculum is here prescribed as the "minimum unit requirement" under Section 13 of RA 7722. To assure alignment of the curriculum with the program outcomes, this PSG provides a sample curriculum map in Article V Section 12 for the HEI to refer to in compliance with the implementing guidelines of CMO 37, s.2012.

Using a learner-centered/outcomes-based approach, CHED provided a description of Outcomes-Based Teaching and Learning delivery method in Article V Section 13. A sample course syllabus is also given in Article V Section 14 as support to the outcomes-based delivery method. Based on the curriculum and the means of its delivery, CHED determines the physical resource requirements for the library, laboratories and other facilities and the human resource requirements in terms of Administration and faculty. These are provided for in Article VI.

Section 4. Curriculum Design

The HEIs are allowed to design curricula suited to their own contexts and missions provided that they can demonstrate that the same leads to the attainment of the required minimum set of outcomes, albeit by a different route. In the same vein, they have latitude in terms of curriculum delivery and in terms of specification and deployment of human and physical resources as long as they can show that the attainment of the program outcomes and satisfaction of program educational objectives can be assured by the alternative means they propose.

The HEIs can use the **CHED Implementation Handbook for Outcomes-Based Education (OBE) and the Institutional Sustainability Assessment (ISA)** as a guide in making their submissions for Sections 19 to 24 of Article VII.





POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

**ARTICLE IV
PROGRAM SPECIFICATIONS**

Section 5. Program Description

5.1 Degree Name

The degree program described herein shall be called Bachelor of Science in Computer Engineering (BSCpE).

5.2 Nature of the Field of Study

The Bachelor of Science in Computer Engineering (BSCpE) is a program that embodies the science and technology of design, development, implementation, maintenance and integration of software and hardware components in modern computing systems and computer-controlled equipment.

5.3 Characteristics of Computer Engineering Graduates

With the ubiquity of computers, computer-based systems and networks in the world today, computer engineers must be versatile in the knowledge drawn from standard topics in computer science and electrical engineering as well as the foundations in mathematics and sciences. Because of the rapid pace of change in the computing field, computer engineers must be life-long learners to maintain their knowledge and skills within their chosen discipline.

An important distinction should be made between computer engineers, electrical engineers, other computer professionals, and engineering technologists. While such distinctions are sometimes ambiguous, computer engineers generally should satisfy the following three characteristics.

1. Possess the ability to design computers, computer-based systems and networks that include both hardware and software and their integration to solve novel engineering problems, subject to trade-offs involving a set of competing goals and constraints. In this context, "design" refers to a level of ability beyond "assembling" or "configuring" systems.
2. Have a breadth of knowledge in mathematics and engineering sciences, associated with the broader scope of engineering and beyond that narrowly required for the field.
3. Acquire and maintain a preparation for professional practice in engineering.





POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

5.4 Program Educational Objectives

Program Educational Objectives (PEOs) are broad statements that describe the career and professional accomplishments that the program is preparing graduates to achieve within 3–5 years from graduation. PEOs are based on the needs of the program's constituencies and these shall be determined, articulated, and disseminated to the general public by the unit or department of the HEI offering the BSCpE program. The PEOs should also be assessed and evaluated periodically for continuing improvement.

5.5 Knowledge Areas

The knowledge areas include the following but not limited to:

- a) Circuits and Electronics
- b) Computing Algorithms
- c) Computer Architecture and Organization
- d) Digital Design
- e) Embedded Systems
- f) Computer Networks
- g) Professional Practice
- h) Information Security
- i) Signal Processing
- j) Systems and Project Engineering
- k) Software Design
- l) Occupational Health and Safety
- m) Technopreneurship

5.6 Allied Programs

The allied programs of the BSCpE program are the following:

- a) Electrical Engineering
- b) Electronics Engineering
- c) Software Engineering
- d) Computer Science
- e) Information Technology

These programs are those that may be considered as equivalent to the program for the purpose of determining faculty qualifications to handle allied and related courses to the program.

Section 6. Institutional and Program Outcomes

The minimum standards for the BS Computer Engineering program are expressed in the following minimum set of institutional and BSCpE program outcomes.

6.1 Institutional outcomes

- a) Graduates of professional institutions must demonstrate a service orientation in one's profession,





POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

- b) Graduates of colleges must participate in various types of employment, development activities, and public discourses, particularly in response to the needs of the communities one serves
- c) Graduates of universities must participate in the generation of new knowledge or in research and development projects
- d) Graduates of State Universities and Colleges must, in addition, have the competencies to support "national, regional and local development plans." (RA 7722).
- e) Graduates of higher educational institutions must preserve and promote the Filipino historical and cultural heritage.

6.2. BSCpE Program Outcomes

By the time of graduation, the students of the program shall have the ability to:

- a) Ability to apply knowledge of mathematics and science to solve complex engineering problems;
- b) Ability to design and conduct experiments, as well as to analyze and interpret data;
- c) 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, in accordance with standards;
- d) Ability to function on multidisciplinary teams;
- e) Ability to identify, formulate, and solve complex engineering problems;
- f) Understanding of professional and ethical responsibility;
- g) Ability to communicate effectively;
- h) Broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context;
- i) Recognition of the need for, and an ability to engage in life-long learning
- j) Knowledge of contemporary issues;
- k) Ability to use techniques, skills, and modern engineering tools necessary for engineering practice; and
- l) Knowledge and understanding of engineering and management principles as a member and leader in a team, to manage projects and in multidisciplinary environments.

A PHEI, SUC, or LUC, at its option, may adopt mission-related program outcomes that are not included in the minimum set

Annex I presents the Competency Standards, Attributes and competencies of a Computer Engineer which should result from the program outcomes stated above.





Section 7. Sample Performance Indicators

Performance Indicators (PIs) are specific, measurable statements identifying the performance(s) required to meet the outcome; confirmable through evidence.

Table 1. Sample Performance Indicators of a Program Outcome

Performance Outcomes		Performance Indicators	
f	Understanding of professional and ethical responsibility	1	Demonstrate knowledge of professional code of ethics
		2	Evaluate the ethical and societal implications of a design solution to a problem in CpE

Section 8. Program Assessment and Evaluation

Program Assessment refers to one or more processes that identify, collect, and prepare data to evaluate the attainment of Program Outcomes and Program Educational Objectives.

Program Evaluation pertains to one or more processes for interpreting the data and evidence accumulated from the assessment. Evaluation determines the extent at which the Program Outcomes and the Program Educational Objectives are achieved by comparing actual achievement versus set targets and standards. Evaluation results in decisions and actions regarding the continuous improvement of the program.

All HEIs are encouraged to form a Consultative Body to be part of the assessment and evaluation processes to be represented by the stakeholders.

8.1 Assessments and Evaluation of PEOs

The Assessment of Program Educational Objectives may include the following: the stakeholders of the program have to be contacted through surveys or focus group discussion to obtain feedback data on the extent of the achievement of the PEOs.

8.2. Assessment and Evaluation of POs

In the case of Program Outcomes Assessment, the defined Performance Indicators shall be connected to Key Courses (usually the Demonstrating or "D" courses in the Curriculum map), and an appropriate Assessment Methods (AM) may be applied. These methods may be direct or indirect depending on whether the demonstration of learning was measured by actual observation and authentic work of the student or through gathered opinions from the student or his peers. Refer to Table 2.





POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

Table 2. Sample Matrix Linking Performance Indicators with Key Courses, Assessment Methods, Set Targets and Standards

Performance Indicators	Key Courses	Assessment Tools	Targets and Standards
1 Demonstrate knowledge of professional code of ethics	OJT	Employer Assessment Form (EAF)	60% of students enrolled in the course shall get at least a rating of 70%
2 Evaluate the ethical and societal implications of a design solution to a problem in CpE	Design Project 2 (Project Implementation)	Rubric for Design Presentation (RDP)	60% of students enrolled in the course shall get at least a rating of 70%

Other Methods of Program Assessment and Evaluation may be found in the *CHED Implementation Handbook for Outcomes-Based Education (OBE)* and *Institutional Sustainability Assessment (ISA)*.

Section 9. Continuous Quality Improvement

There must be a documented process for the assessment and evaluation of program educational objectives and program outcomes.

The comparison of achieved performance indicators with declared targets or standards of performance should serve as basis for the priority projects or programs for improving the weak performance indicators. Such projects and programs shall be documented as well as the results of its implementation. This regular cycle of documentation of projects, programs for remediation and their successful implementation shall serve as the evidence for Continuous Quality Improvement.

ARTICLE V
CURRICULUM

Section 10. Curriculum Description

The BSCpE curriculum is designed to meet the SOs/POs stated in Article IV Section 6. This is articulated in a curriculum map discussed in Section 12 to develop graduates of the program to have a strong background in mathematics,





**POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT**

natural, physical and allied sciences. Also, it contains complementary courses such as general education courses to ensure that the graduates are articulate and understands the nature of their role and impact of their work in the society and environment.

The BSCpE curriculum is designed to guarantee breadth of knowledge of the discipline through a set of professional courses and to ensure depth and focus in certain disciplines through cognates/tracks. Also, it develops student's ability to use modern tools necessary to solve problems in the field of computer engineering.

The curriculum has a minimum total of 166 credit units, comprising of 115 units of technical courses. These technical courses include 12 units of mathematics, 8 units of natural/physical sciences, 6 units of basic engineering sciences, 8 units of allied courses, 72 units of professional courses, and 9 units of elective/cognate courses.

The general education courses in accordance with CMO 20 s. 2013 - The New General Education Curriculum consists of 24 units of general education courses, 12 units of GEC electives/mandated courses, 8 units of Physical Education (PE), and 6 units of National Service Training Program (NSTP).

Section 11. Sample Curriculum

11.1. Components:

Below is a sample curriculum of the BSCpE program. The institution may enrich the sample curriculum depending on the needs of the industry and community, provided that all prescribed courses are offered and pre-requisite and co-requisite are observed.

Classification/Field/Course	Minimum no. of hours / week		Minimum Credit Units
	Lecture	L/F/D	
I. TECHNICAL COURSES			
A. Mathematics			
Calculus 1	3	0	3
Calculus 2	3	0	3
Engineering Data Analysis	3	0	3
Differential Equations	3	0	3
Subtotal	12	0	12
B. Natural/Physical Sciences			
Chemistry for Engineers	3	3	4
Physics for Engineers	3	3	4
Subtotal	6	6	8
C. Basic Engineering Sciences			
Computer-Aided Drafting	0	3	1
Engineering Economics	3	0	3
Technopreneurship101	3	0	3
Subtotal	6	3	7





POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

Classification/Field/Course	Minimum no. of hours / week		Minimum Credit Units
	Lecture	L/F/D	
D. Allied Courses			
Fundamentals of Electrical Circuits	3	3	4
Fundamentals of Electronic Circuits	3	3	4
Subtotal	6	6	8
E. Professional Courses			
Discrete Mathematics	3	0	3
Numerical Methods	3	0	3
Computer Engineering as a Discipline	1	0	1
Fundamentals of Mixed Signals and Sensors	3	0	3
Computer Engineering Drafting and Design	0	3	1
Programming Logic and Design	0	6	2
Data Structures and Algorithms	0	6	2
Object Oriented Programming	0	6	2
Software Design	3	3	4
Microprocessors	3	3	4
Logic Circuits and Design	3	3	4
Methods of Research	2	0	2
Operating Systems	3	0	3
Computer Architecture and Organization	3	3	4
Data and Digital Communications	3	0	3
Computer Networks and Security	3	3	4
Embedded Systems	3	3	4
Digital Signal Processing	3	3	4
Feedback and Control Systems	3	0	3
Introduction to HDL	0	3	1
Seminars and Fieldtrips	0	3	1
Basic Occupational Health and Safety	3	0	3
CpE Laws and Professional Practice	2	0	2
Emerging Technologies in CpE	3	0	3
CpE Practice and Design 1	0	3	1
CpE Practice and Design 2	0	6	2
On the Job Training	3	240	3
Subtotal	53	297	72
F. Cognates/Electives (Please refer to Suggested Electives)			
Cognate/Track Course 1			3
Cognate/Track Course 2			3
Cognate/Track Course 3			3
Subtotal			9
II. NON - TECHNICAL COURSES			
A. General Education Courses			
Science, Technology, and Society	3	0	3
The Contemporary World	3	0	3



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

Classification/Field/Course	Minimum no. of hours / week		Minimum Credit Units
	Lecture	L/F/D	
Readings in Philippine History	3	0	3
Understanding the Self	3	0	3
Art Appreciation	3	0	3
Purposive Communication	3	0	3
Mathematics for the Modern World	3	0	3
Ethics	3	0	3
Subtotal	24	0	24
B. GEC Electives/Mandated Courses			
GEC Elective 1	3	0	3
GEC Elective 2	3	0	3
GEC Elective 3	3	0	3
Life and Works of Rizal	3	0	3
Subtotal	12	0	12
C. Physical Education			
PE 1	2	0	2
PE 2	2	0	2
PE 3	2	0	2
PE 4	2	0	2
Subtotal	8	0	8
D. National Service Training Program			
NSTP 1	3	0	3
NSTP 2	3	0	3
Subtotal	6	0	6
GRAND TOTAL	133	312	166

SUMMARY OF THE BSCpE CURRICULUM

Classification/Field/Course	Total No. of Hours / Week		Minimum Credit Units
	Lecture	Lab	
I. TECHNICAL COURSES			
A. Mathematics	12	0	12
B. Natural/Physical Sciences	6	6	8
C. Basic Engineering Sciences	6	3	7
D. Allied Courses	6	6	8
E. Professional Courses	53	297	72
F. Cognates/Electives			9
Subtotal	83	312	116
II. NON-TECHNICAL COURSES			
A. General Education Courses	24	0	24
B. GEC Electives/Mandated Courses	12	0	12
C. Physical Education	8	0	8
D. NSTP	6	0	6
Subtotal	50	0	50
GRAND TOTAL (including PE and NSTP)	133	312	166





**POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT**

11.2. Program of Study

The institution may enrich the sample/model program of study depending on the needs of the industry, provided that all prescribed courses required in the curriculum outlines are offered and pre-requisites and co-requisites are complied with.

The sample Program of Study listed below is meant for HEIs operating on a Semestral System. HEIs with CHED approved trimester or quarter term systems may adjust their courses and course specifications accordingly to fit their delivery system, as long as the minimum requirements are still satisfied.

The HEIs are also encouraged to include other courses to fulfill their institutional outcomes, as long as the total units for the whole program shall not be less than **166 units**, including P.E., and NSTP.

SAMPLE SEMESTRAL PROGRAM OF STUDY

FIRST YEAR

1st year – 1st semester

Courses	No. of Hours		Units	Prerequisites
	Lec	Lab/Field/Drafting		
Calculus 1	3	0	3	
Chemistry for Engineers	3	3	4	
Computer Engineering as a Discipline	1	0	1	
Programming Logic and Design	0	6	2	
Mathematics for the Modern World	3	0	3	
Science, Technology, and Society	3	0	3	
Understanding the Self	3	0	3	
Physical Education 1	2	0	2	
NSTP 1	3	0	3	
TOTAL	21	9	24	





POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
 COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

1st year – 2nd semester

Courses	No. of Hours		Units	Prerequisites
	Lec	Lab/Field/Drafting		
Calculus 2	3	0	3	Calculus 1
Physics for Engineers	3	3	4	Calculus 1
Object Oriented Programming	0	6	2	Programming Logic and Design
Engineering Data Analysis	3	0	3	Calculus 1
Discrete Mathematics	3	0	3	Calculus 1
Readings in Philippine History	3	0	3	
Physical Education 2	2	0	2	Physical Education 1
NSTP 2	3	0	3	NSTP 1
TOTAL	20	9	23	

SECOND YEAR

2nd year – 1st Semester

Courses	No. of Hours		Units	Prerequisites
	Lec	Lab/Field/Drafting		
Differential Equations	3	0	3	Calculus 2
Art Appreciation	3	0	3	
Data Structures and Algorithms	0	6	2	Object Oriented Programming
Engineering Economics	3	0	3	2 nd Year Standing*
Fundamentals of Electrical Circuits	3	3	4	Physics for Engineers
GEC Elective 1	3	0	3	
Computer-Aided Drafting	0	3	1	2 nd Year Standing*
Physical Education 3	2	0	2	Physical Education 2
TOTAL	17	12	21	





POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

2nd year – 2nd semester

Courses	No. of Hours		Units	Prerequisites
	Lec	Lab/Field/Drafting		
Numerical Methods	3	0	3	Differential Equations
Software Design	3	3	4	Data Structures and Algorithms
Purposive Communication	3	0	3	
Fundamentals of Electronic Circuits	3	3	4	Fundamentals of Electrical Circuits
Life and Works of Rizal	3	0	3	
Physical Education 4	2	0	2	
The Contemporary World	3	0	3	
TOTAL	20	6	22	

THIRD YEAR

3rd year – 1st Semester

Courses	No. of Hours		Units	Prerequisites
	Lec	Lab/Field/Drafting		
Logic Circuits and Design	3	3	4	Fundamentals of Electronic Circuits
Operating Systems	3	0	3	Data Structures and Algorithms
Data and Digital Communications	3	0	3	Fundamentals of Electronic Circuits
Introduction to HDL	0	3	1	Programming Logic and Design; Fundamentals of Electronic Circuits
Feedback and Control Systems	3	0	3	Numerical Methods; Fundamentals of Electrical Circuits
Fundamentals of Mixed Signals and Sensors	3	0	3	Fundamentals of Electronic Circuits
Computer Engineering Drafting and Design	0	3	1	Fundamentals of Electronic Circuits
Cognate / Elective Course 1**			3	3 rd Year Standing*
TOTAL	15	9	21	





POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

3rd year – 2nd semester

Courses	No. of Hours		Units	Prerequisites
	Lec	Lab/Field/Drafting		
Basic Occupational Health and Safety	3	0	3	3 rd Year Standing*
Computer Networks and Security	3	3	4	Data and Digital Communications
Microprocessors	3	3	4	Logic Circuits and Design
Methods of Research	2	0	2	Engineering Data Analysis; Purposive Communication; Logic Circuits and Design
Technopreneurship	3	0	3	3 rd Year Standing*
Ethics	3	0	3	
CpE Laws and Professional Practice	2	0	2	3 rd Year Standing*
Cognate/Elective Course 2**			3	Cognate/Track Course 1
TOTAL	19	6	24	

FOURTH YEAR

4th year – 1st semester

Courses	No. of Hours		Units	Prerequisites
	Lec	Lab/Field/Drafting		
Embedded Systems	3	3	4	Microprocessors
Computer Architecture and Organization	3	3	4	Microprocessors
Emerging Technologies in CpE	3	0	3	4 th Year Standing*
CpE Practice and Design 1	0	3	1	Microprocessors; Methods of Research
Digital Signal Processing	3	3	4	Feedback and Control Systems
GEC Elective 2	3	0	3	
Cognate/Elective Course 3**			3	Cognate/Track Course 2
TOTAL	15	12	22	





POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

4th year – 2nd semester

Courses	No. of Hours		Units	Prerequisites
	Lec	Lab/Field/Drafting		
CpE Practice and Design 2	0	6	2	CpE Practice and Design 1
Seminars and Fieldtrips	0	3	1	4 th Year Standing*
On the Job Training	3	240***	3	4 th Year Standing*
GEC Elective 3	3	0	3	
TOTAL	6	246	9	

Suggested Cognates/Electives

(The program has an option to include additional cognates/electives.)

Courses	No. of Hours		No. of Hours
	Lab	Lab/Field/Drafting	
Embedded Systems			
Embedded Systems 1			3
Embedded Systems 2			3
Embedded Systems 3			3
	Lab	Lab/Field/Drafting	
Microelectronics			
Microelectronics 1			3
Microelectronics 2			3
Microelectronics 3			3
	Lab	Lab/Field/Drafting	
Software Development			
Software Development 1			3
Software Development 2			3
Software Development 3			3
	Lab	Lab/Field/Drafting	
System and Network Administration			
System and Network Administration 1			3
System and Network Administration 2			3
System and Network Administration 3			3
	Lab	Lab/Field/Drafting	
Machine Learning			
Machine Learning 1			3
Machine Learning 2			3
Machine Learning 3			3
	Lab	Lab/Field/Drafting	
Big Data Analytics			
Big Data Analytics 1			3
Big Data Analytics 2			3
Big Data Analytics 3			3
	Lab	Lab/Field/Drafting	
Augmented Reality			
Augmented Reality 1			3
Augmented Reality 2			3
Augmented Reality 3			3





Technopreneurship

Courses	No. of Hours		No. of Hours
	Lab	Lab/Field/Drafting	
Technopreneurship 1			3
Technopreneurship 2			3
Technopreneurship 3			3

- * The n^{th} year standing means that the student must have completed at least 75% of the load requirements of the previous year level.
- ** The courses in track specializations should be related.
- *** 80 hours per unit of field work.

Section 12. Sample Curriculum Map

Refer to **Annex II** for the Minimum Program Outcomes and a Sample Curriculum Map. The HEI may develop own Curriculum Map.

Section 13. Description of Outcomes-Based Teaching and Learning

Outcomes-based teaching and learning (OBTL) is an approach where teaching and learning activities are developed to support the learning outcomes (University of Hong Kong, 2007). It is a student-centered approach for the delivery of educational programs where the curriculum topics in a program and the courses contained in it are expressed as the intended outcomes for students to learn. It is an approach in which teachers facilitate and students find themselves actively engaged in their learning.

Its primary focus is the clear statement of what students should be able to do after taking a course, known as the Intended Learning Outcomes (ILOs). The ILOs describe what the learners will be able to do when they have completed their course or program. These are statements, written from the students' perspective, indicating the level of understanding and performance they are expected to achieve as a result of engaging in teaching and learning experience (Biggs and Tang, 2007). Once the ILOs have been determined, the next step in OBTL is to design the Teaching / Learning Activities (TLAs) which require students to actively participate in the construction of their new knowledge and abilities. A TLA is any activity which stimulates, encourages or facilitates learning of one or more intended learning outcome. The final OBTL component is the Assessment Tasks (ATs), which measure how well students can use their new abilities to solve real-world problems, design, demonstrate creativity, and communicate effectively, among others. An AT can be any method of assessing how well a set of ILO has been achieved.

A key component of a course design using OBTL is the constructive alignment of ILOs, TLAs, and ATs. This design methodology requires the Intended Learning Outcomes to be developed first, and then the Teaching / Learning Activities and Assessment Tasks are developed based on the ILOs. (Biggs, 1999)





POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

BACHELOR OF SCIENCE IN COMPUTER ENGINEERING (Curriculum 2011)

FIRST YEAR

First Semester

Subject Code	Prereq	Co-req	Description	Lec Hours	Lab Hours	Credited Units	Tuition Hours
ENGL 1013			Study and Thinking Skills in English	3	0	3	3
FILI 1013			Komunikasyon sa Akademikong Filipino	3	0	3	3
MATH 2013			College Algebra	3	0	3	3
MATH 2033			Plane and Spherical Trigonometry	3	0	3	3
CHEM 2035			General Chemistry (4/1)	4	3	5	7
PHIL 1013			Logic	3	0	3	3
ENSC 2012			Engineering Drawing 1	0	6	2	6
NSTP 1013			CWTS/ROTC	3	0	3	0
PHED 1			Physical Fitness and Self-Testing	2	0	2	2
TOTAL UNITS						27/(0)	30

Second Semester

Subject Code	Prereq	Co-req	Description	Lec Hours	Lab Hours	Credited Units	Tuition Hours
PHED 2			Rhythmic Activities	2	0	2	2
MATH 2122	MATH 2013		Advanced Algebra	2	0	2	2
MATH 2042	MATH 2013, MATH 2033		Analytic Geometry	2	0	2	2
MATH 2052	MATH 2013, MATH 2033		Solid Mensuration	2	0	2	2
NASC 2054	MATH 2013, MATH 2033		College Physics 1	3	3	4	6
ENGL 1023	ENGL 1013		Writing in the Discipline	3	0	3	3
FILI 1023	FILI 1013		Pagbasa at Pagsulat Tungo sa Pananaliksik	3	0	3	3
ENSC 2032	ENSC 2012		Engineering Drawing 2 with CAD	0	6	2	6
HUMA 1013			Introduction to the Humanities	3	0	3	3
NSTP 1023			CWTS/ROTC	3	0	3	0
TOTAL UNITS						26/(0)	29



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

SECOND YEAR

First Semester

Subject Code	Prereq	Co-req	Description	Lec Hours	Lab Hours	Credited Units	Tuition Hours
PHED 3			Individual/Dual/Combative Sports	2	0	2	2
ENGL 1103	ENGL 1023		Technical Communication	3	0	3	3
COEN 3313	MATH 2013		Discrete Mathematics	3	0	3	3
MATH 2074	MATH 2122, MATH 2042, MATH 2052		Differential Calculus	4	0	4	4
NASC 2064	NASC 2054		College Physics 2 (Lec & Lab)	3	3	4	6
HIST 1013			Heyograpiya at Kasaysayan ng Pilipinas	3	0	3	3
SOCI 1013			Sosyolohiya, Kultura at Pagpapamilya	3	0	3	3
COEN 3322			Computer Fundamentals and Programming	0	6	2	6
TOTAL UNITS						24/(0)	30

Second Semester

Subject Code	Prereq	Co-req	Description	Lec Hours	Lab Hours	Credited Units	Tuition Hours
MATH 2094	MATH 2074		Integral Calculus	4	0	4	4
COEN 3054	COEN 3322		Data Structures and Algorithm Analysis	3	3	4	6
LITE 1013			Philippine Literature	3	0	3	3
HIST 1023			Buhay, Mga Gawain at Sinulat ni Rizal	3	0	3	3
PSYC 1013			General Psychology	3	0	3	3
POSC 1013			Politics and Governance with Philippine Constitution	3	0	3	3
COEN 3332			Computer Hardware and Fundamentals	0	6	2	6
STAT 2053	MATH 2013		Statistics and Probability	3	0	3	3
PHED 4			Team Sports	2	0	2	2
TOTAL UNITS						27/(0)	33



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

THIRD YEAR

First Semester

Subject Code	Prereq	Co-req	Description	Lec Hours	Lab Hours	Credited Units	Tuition Hours
MATH 2103	MATH 2094		Elementary Differential Equations	3	0	3	3
ENSC 2043	NASC 2054, MATH 2094		Static of Rigid Bodies	3	0	3	3
COEN 3064	NASC 2064, MATH 2094		Circuits 1	3	3	4	6
COEN 3344			Electronics Devices and Circuits	3	3	4	6
COEN 3351			Computer Engineering Drafting and Design	0	3	1	3
COEN 3114	COEN 3054		Computer System Organization with Assembly Language	3	3	4	6
ENSC 2063			Engineering Economy	3	0	3	3
ECON 1013	MATH 2013		Basic Economics with Taxation and Agrarian Reform	3	0	3	3
TOTAL UNITS						25/(0)	33

Second Semester

Subject Code	Prereq	Co-req	Description	Lec Hours	Lab Hours	Credited Units	Tuition Hours
ENSC 2083	ENSC 2043		Dynamics of Rigid Bodies	3	0	3	3
ENSC 2103	ENSC 2043		Mechanics of Deformable Bodies	3	0	3	3
ENSC 2112	CHEM 2035		Environmental Engineering	2	0	2	2
COEN 3363	MATH 2103		Advanced Engineering Mathematics for Computer Engineering	3	0	3	3
COEN 3493			Numerical Methods for Engineering with Programming Applications	2	3	3	5
COEN 3094	COEN 3064		Circuits 2	3	3	4	6
COEN 3374	COEN 3344		Electronics Circuits Analysis and Design	3	3	4	6
COEN 3134	COEN 3344		Logic Circuits and Switching Theory	3	3	4	6
TOTAL UNITS						26/(0)	34

Summer Semester

Subject Code	Prereq	Co-req	Description	Lec Hours	Lab Hours	Credited Units	Tuition Hours
COEN 4012	NASC 2064, COEN 3322, MATH 2074, COEN 3313, HIST 1013, SOCI 1013, ENGL 1103, HIST 1023, COEN		Practicum 1	2	0	2	2



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

	3332, COEN 3054, PSYC 1013, MATH 2094, LITE 1013, POSC 1013, STAT 2053							
TOTAL UNITS							2/(0)	2

FOURTH YEAR
First Semester

Subject Code	Prereq	Co-req	Description	Lec Hours	Lab Hours	Credited Units	Tuition Hours
COEN 3153	COEN 3094, COEN 3374		Principle of Communication	3	0	3	3
COEN 3164	COEN 3094, COEN 3374		Control System	3	3	4	6
COEN 3174	COEN 3134		Advanced Logic Circuits Design	3	3	4	6
COEN 3204	COEN 3363		Digital Signal Processing	3	3	4	6
COEN 3382			Computer Engineering Safety Management	2	0	2	2
COEN 3394	COEN 3134, COEN 3114		Microprocessor Systems	3	3	4	6
COEN 4153			Methods of Engineering Research	3	0	3	3
TOTAL UNITS						24/(0)	32

Second Semester

Subject Code	Prereq	Co-req	Description	Lec Hours	Lab Hours	Credited Units	Tuition Hours
BSCOE-ELEC1			BSCOE ELECTIVE 1	3	0	3	3
COEN 3193	COEN 3153		Data Communications	3	0	3	3
COEN 3253	COEN 3394		Design Project 1	3	0	3	3
COEN 3404	COEN 3174, COEN 3114		Computer Systems Architecture	3	3	4	6
COEN 3414	COEN 3114		Operating Systems	3	3	4	6
ENSC 2073			Engineering Management	3	0	3	3
TOTAL UNITS						20/(0)	24

Summer Semester

Subject Code	Prereq	Co-req	Description	Lec Hours	Lab Hours	Credited Units	Tuition Hours
COEN 4022			Practicum 2	2	0	2	2
TOTAL UNITS						2/(0)	2



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

FIFTH YEAR

First Semester

Subject Code	Prereq	Co-req	Description	Lec Hours	Lab Hours	Credited Units	Tuition Hours
BSCOE-ELEC2			BSCOE ELECTIVE 2	3	0	3	3
COEN 3273	COEN 3253		Design Project 2	1	6	3	7
COEN 3423			Computer Systems Administration	2	3	3	5
COEN 3433			Systems Analysis and Design	2	3	3	5
COEN 3444	COEN 3054		Object Oriented Programming	3	3	4	6
COEN 3453			Computer Project Management	2	3	3	5
TOTAL UNITS						19/(0)	31

Second Semester

Subject Code	Prereq	Co-req	Description	Lec Hours	Lab Hours	Credited Units	Tuition Hours
BSCOE-ELEC3			BSCOE ELECTIVE 3	2	3	3	5
BSCOE-ELEC4			BSCOE ELECTIVE 4	3	0	3	3
COEN 3212			Computer Engineering Ethics and Computer Laws	2	0	2	2
COEN 3284	COEN 3193		Computer Networks	3	3	4	6
COEN 3291			Computer Seminar and Field Trips	0	3	1	3
COEN 3463	COEN 3054		Software Engineering	2	3	3	5
COEN 3473			Computer Technopreneurship	3	0	3	3
COEN 3483			Total Quality Management in Computer Engineering	3	0	3	3
TOTAL UNITS						22/(0)	30



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

First Year

First Semester

Subject Code	Prerequisite	Description	Units
MATH 20043		Calculus 1	3
CHEM 20024		Chemistry for Engineers	4
CMPE 30011		Computer Engineering as a Discipline	1
CMPE 40012		Computer Engineering Technology 1	2
NSTP 10013		CWTS/ROTC	3
GEED 10053		Mathematics in the Modern World	3
PHED 01		Physical Education 1	2
CMPE 30022		Programming Logic and Design	2
GEED 10083		Science, Technology and Society	3
GEED 10023		Understanding the Self	3

Second Year

First Semester

Summer Semester

Subject Code	Prerequisite	Description	Units
GEED 10073		Art Appreciation	3
GEED 10013		Buhay at Mga Sinulat ni Rizal	3
CMPE 40032		Computer Engineering Technology 3	2
CMPE 30052	CMPE 30032	Data Structures and Algorithms	2
MATH 20063	MATH 20053	Differential Equations	3
GEED 10103		Filipinohiya at Pambansang Kaunlaran	3
ELEN 20044	MATH 20053	Fundamentals of Electrical Circuits	4
PHED 03		Physical Education 3	2
GEED 20023		Politics, Governance and Citizenship	3

First Semester

Subject Code	Prerequisite	Description	Units
CMPE 30083		On The Job Training (OJT) 1	3

First Semester

Subject Code	Prerequisite	Description	Units
CMPE 30141	ECEN 20034	Computer Engineering Drafting and Design	1
CMPE 40062		Computer Engineering Technology 5	2
CMPE 30114	ECEN 20034	Data and Digital Communications	4
ENSC 20093		Engineering Economics	3
CMPE 30133	CMPE 30063, ELEN 20044	Feedback and Control Systems	3
CMPE 30153	ECEN 20034	Fundamentals of Mixed Signals and Sensors	3
GEED 20033		Gender and Society	3
CMPE 30121	CMPE 30022, ECEN 20034	Introduction to Hardware Description Language (HDL)	1
CMPE 30094	ECEN 20034	Logic Circuits and Design	4
CMPE 30103	CMPE 30052	Operating Systems	3

Second Semester

Subject Code	Prerequisite	Description	Units
MATH 20053	MATH 20043	Calculus 2	3
CMPE 40022		Computer Engineering Technology 2	2
NSTP 10023		CWTS/ROTC	3
CMPE 30043	GEED 10053	Discrete Mathematics	3
STAT 20023	GEED 10053	Engineering Data Analysis	3
CMPE 30032	CMPE 30022	Object-oriented Programming	2
PHED 02		Physical Education 2	2
PHYS 20034	MATH 20043	Physics for Engineers	4
GEED 10063		Purposive Communication	3

Second Semester

Subject Code	Prerequisite	Description	Units
CMPE 40042		Computer Engineering Technology 4	2
ENSC 20011		Computer-Aided Drafting	1
ECEN 20034	ELEN 20044	Fundamentals of Electronic Circuits	4
CMPE 30063	MATH 20063	Numerical Methods	3
GEED 10113	GEED 10103	Pagsasalin sa Kontekstong Filipino	3
PHED 04		Physical Education 4	2
GEED 10033		Readings in Philippine History	3
CMPE 30074	CMPE 30032	Software Design	4
GEED 10043		The Contemporary World	3

Third Year

Second Semester

Summer Semester

Fourth Year

Subject Code	Prerequisite	Description	Units
CMPE 30163		Basic Occupational Health and Safety	3
CMPE 30202		Computer Engineering Laws and Professional Practice	2
CMPE 30174	CMPE 30114	Computer Networks and Security	4
CMPE-E1		CpE Elective 1	3
CMPE 30193	STAT 20023, CMPE 30184, GEED 10063	Methods of Research	3
CMPE 30184	CMPE 30094	Microprocessors	4
GEED 10133		Panitikang Filipino	3
ENSC 20103		Technopreneurship 101	3

Subject Code	Prerequisite	Description	Units
CMPE-E2		CpE Elective 2	3
CMPE 30213		On The Job Training (OJT) 2	3



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

Subject Code	Prerequisite	Description	Units
CMPE 30224	CMPE 30184	Computer Architecture and Organization	4
CMPE 30231	CMPE 30184, CMPE 30193	Computer Engineering Practice and Design 1	1
CMPE-E3		CpE Elective 3	3
CMPE 30244		Digital Signal Processing	4
GEED 10093		Ethics	3

Second Semester

Subject Code	Prerequisite	Description	Units
CMPE 30252	CMPE 30231	Computer Engineering Practice and Design 2	2
CMPE-E4		CpE Elective 4	3
CMPE 30274	CMPE 30184	Embedded Systems	4
CMPE 30283		Emerging Technologies in Computer Engineering	3
CMPE 30261		Field Study and Seminars	1
GEED 20093		Reading Visual Arts	3



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

The Integration Of Recent Trends And Developments

On the revision of the curriculum, the Department of Computer Engineering considered the vision, mission of the university, the newly released CMOs and the implementation of the K to 12 programs. There were subjects which were added, repositioned, combined and renamed to conform with the needs of the time as well as to accommodate the suggested curriculum from the Commission on Higher Education. Please find below some of the modifications:

MATRIX COMPARING THE OLD AND REVISED CURRICULUM

Course Title	Old Curriculum	Revised Curriculum	Change*
General Education Courses:			
Art Appreciation	0	3	AC
Basic Economics with Taxation and Agrarian Reform	3	0	DC
Buhay at Mga Sinulat ni Rizal	3	3	CCT
Ethics	0	3	AC
Filipinolohiya at PambansangKaunlaran	0	3	AC
General Psychology	3	0	DC
Heograpiya at Kasaysayan ng Pilipinas	3	0	DC
KomunikasyongsaAkademikong Filipino	3	0	DC
Logic	3	0	DC
Mathematics for the Modern World	0	3	AC
Pagbasa at PagsulatTungosaPananaliksik	3	0	DC
PagsasalinsaKonstektong Filipino	0	3	AC
Panitikang Filipino	0	3	AC
Philippine Literature	3	0	DC
Purposive Communication	0	3	AC
Readings in Philippine History	0	3	AC
Science, Technology, and Society	0	3	AC
Sosyolohiya, Kultura at Pagpapamilya	3	0	DC
Study and Thing Skills in English	3	0	DC
Technical Communication	3	0	DC
The Contemporary World	0	3	AC
Understanding the Self	0	3	AC
Writing in Discipline	3	0	DC
Total	36	36	



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

Basic/Core Courses:			
Advanced Algebra	2	0	DC
Analytic Geometry	2	0	DC
Calculus 1	4	4	CCT
Calculus 2	4	4	CCT
Chemistry for Engineers	5	4	CCT/CCC
College Algebra	3	0	DC
College Physics 1	4	0	CCT/CCC/DC
College Physics 2	4	0	CCT/CCC/DC
Computer-Aided Drafting	1	1	CCT/RC
Differential Equations	3	3	CCT
Dynamics of Rigid Bodies	3	0	DC
Engineering Data Analysis	3	3	CCT
Engineering Drawing 1	2	0	DC
Engineering Drawing 2 with CAD	2	0	DC
Engineering Economics	3	3	CCT
Engineering Management	3	0	DC
Environmental Engineering	2	0	DC
Mechanics of Deformable Bodies	3	0	DC
Physics for Engineers	0	4	CCT/CCC/MC
Plane Trigonometry	3	0	DC
Solid Mensuration	2	0	DC
Static of Rigid Bodies	3	0	DC
Technopreneurship	3	3	CCT/RC
Total	67	27	
General Education Elective:			
Politics, Governance and Citizenship	3	3	CCT/RC
Gender and Society	0	3	AC
Reading Visual Arts	0	3	AC
Total	3	9	
Practicum/Internship:			
On-the-Job Training (OJT) 1	2	3	CCT/CCC/RC
On-the-Job Training (OJT) 2	2	3	CCT/CCC/RC
Total	4	6	
Allied Courses:			
Fundamentals of Electrical Circuits	0	4	AC
Fundamentals of Electronic Circuits	0	4	AC
Electronics Devices and Circuits	4	0	DC
Electronics Circuits Analysis and Design	4	0	DC
Circuits I	4	0	DC
Circuits II	4	0	DC
Total	16	8	



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

Other General Education Mandated Courses:			
Physical Education 1	2	2	
Physical Education 2	2	2	
Physical Education 3	2	2	
Physical Education 4	2	2	
National Service Training Program 1	3	3	
National Service Training Program 2	3	3	
Total	14	14	
Professional/Major Courses:			
Advanced Engineering Mathematics for CoE	3	0	DC
Advanced Logic Circuits and Design	4	0	DC
Basic Occupational Health and Safety	0	3	AC
Computer Architecture and Organization	4	4	CCT/MC/RC
Computer Engineering as a Discipline	0	1	AC
Computer Engineering Drafting and Design	1	1	
Computer Engineering Safety Management	2	0	DC
Computer Fundamentals and Programming	2	0	DC
Computer Hardware and Fundamentals	2	0	DC
Computer Project Management	3	0	DC
Computer Networks and Security	4	4	CCT/RC
Computer System Administration	3	0	DC
Computer System Organization with Assembly Language	4	0	DC
Computer System Architecture	4	0	DC
CpE Laws and Professional Practice	0	2	AC
CpE Practice and Design 1	0	1	AC
CpE Practice and Design 2	0	2	AC
Data and Digital Communications	3	4	CCT/CCC/RC
Data Structures and Algorithms	2	2	RC
Digital Signal Processing	4	4	
Discrete Mathematics	3	3	
Engineering Ethics and Computer Laws	2	0	DC
Embedded Systems	0	4	AC
Emerging Technologies in CpE	0	3	AC
Feedback and Control Systems	4	3	CCT/CCC/RC
Field Study and Seminars	1	1	CCT/RC



POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT

Fundamentals of Mixed Signals and Sensors	0	3	AC
Introduction to Hardware Description Language (HDL)	0	1	AC
Logic Circuits and Design	4	4	CCC/MC/RC
Logic Circuits and Switching Theory	4	0	DC
Methods of Research	3	3	CCT/RC
Microprocessors	4	4	CCT/RC
Numerical Methods	3	3	CCT/RC
Object-oriented Programming	4	2	CCC/RC
Operating Systems	4	3	CCC/RC
Programming Logic and Design	0	2	CCT/RC
Software Design	3	4	CCT/CCC/RC
Software Engineering	3	0	DC
System Analysis and Design	3	0	DC
Total Quality Management in Engineering	3	0	DC+-
Total	93	77	
Elective Courses/Cognate:			
CpE Technology 1	0	2	AC
CpE Technology 2	0	2	AC
CpE Technology 3	0	2	AC
CpE Technology 4	0	2	AC
CpE Technology 5	0	2	AC
Total	0	10	
Professional Elective Courses:			
CpE Elective 1	3	3	CCT/RC
CpE Elective 2	3	3	CCT/RC
CpE Elective 3	3	3	CCR/RC
CpE Elective 4	3	3	CCT/RC
Total	12	12	

CHANGE* Change of Course Title (CCT), change in Course Credit (CCC), Added (AC) and Deleted Courses (DC), Merged Courses (MC), Repositioned Courses (RC) of the Proposed Curriculum with existing curriculum.



**POLYTECHNIC UNIVERSITY OF THE PHILIPPINES
COLLEGE OF ENGINEERING
COMPUTER ENGINEERING DEPARTMENT**

**BACHELOR OF SCIENCE IN COMPUTER ENGINEERING
REVISED 2018 CURRICULUM**

	Proposed Curriculum 2018	Old Curriculum 2011-2017	CHED Curriculum	COE/COD			OTHER SCHOOLS			
				DLSU De LaSalle University	TIP Technological Institute of the Philippines	MIT Mapua Institute of Technology	NSYU National Sun Yat-sen University, Taiwan	AdU Adamson University	FEUTECH Far Eastern University Institute of Technology	DBTC Don Bosco Technical College
General Education	33	39	24	63	64	49		72	81	70
Non-Academic	20	17	14	14	14	14		14	14	14
Professional Courses	132 (66%)	188 (77%)	116 (58%)	107 (58%)	111 (58%)	126 (67%)	144 (100%)	105 (55%)	119 (55%)	74 (40%)
Total	195 <i>185</i>	244	160	184	189	189	144	191	214	184
Number of Terms	8	10	8	12	8	13	8	8	12	8
No. of Years	4	5	4	4	4	4	4	4	4	4

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