



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

CHED MEMORANDUM ORDER (CMO)

No. 23

Series of 2008

**SUBJECT : POLICIES AND STANDARDS (PS) FOR THE DEGREE OF
BACHELOR OF SCIENCE IN CHEMICAL ENGINEERING (BSCHE)**

In accordance with the pertinent provisions of Republic Act (RA) No. 7722, otherwise known as the "Higher Education Act of 1994," and by virtue of Resolution No. 211-2008 of the Commission en banc dated May 5, 2008 and for the purpose of rationalizing the chemical engineering education in the country, this set of policies and standards is hereby adopted and promulgated by the Commission.

ARTICLE I - INTRODUCTION

Section 1. Background and Rationale

Chemical Engineering is a profession that involves the conceptualization, development, design, improvement and application of safe, healthy, ethical and economic ways of utilizing materials and energy in unit processes and operations for the benefit of society and the environment through the knowledge of mathematics, chemistry, biology, information technology and other natural, applied and social sciences, gained by study, research and practice.

Chemical Engineering is one of the broader fields of the engineering disciplines both in terms of the range of problems that fall within its purview and in the range of knowledge required to solve those problems.

The scope of the practice of Chemical Engineering is defined in the Chemical Engineering Law of 2004 or R.A. 9297 and pertains to professional services to industrial plants in terms of: consultation requiring chemical engineering knowledge, skill and proficiency; investigation; estimation and or valuation; planning, preparation of feasibility studies; designing; preparation of specifications; supervision of installation; operation including quality management; and research. The teaching, lecturing and reviewing of a professional chemical engineering subjects in the curriculum of the Bachelor of Science in Chemical Engineering degree or a subject in the Chemical Engineering licensure examination given in any school, college, university or any other educational institution is also considered as practice of Chemical Engineering.

The herein Policies and Standards (PS) have been reviewed in accordance with recently approved CMOs, industry needs, latest trends and technology in the field of chemical engineering. This PS emerged as a result of consolidated efforts of the academe, industry and other concerned agencies.

ARTICLE II - AUTHORITY TO OPERATE

- Section 2.** The BSChE program shall be operated only by higher education institutions (HEIs) with proper authority granted by the Commission on Higher Education (CHED) or by the respective Boards in case of chartered State Universities and Colleges (SUCs), and Local Colleges and Universities (LCUs).

ARTICLE III -PROGRAM SPECIFICATION

Section 3. Degree Name

The degree program herein shall be called **BACHELOR OF SCIENCE IN CHEMICAL ENGINEERING (BSChE)**.

Section 4. Program Description

4.1 Nature of the Program

The career paths available to Chemical Engineers are many and varied and can involve a wide range of activities: from conceptualization and design of industrial plants that do not yet exist to the management of operations and waste treatment facilities, total quality management, project management, teaching, research, private consulting, and to public service. A Chemical Engineer must be as well prepared for a career that traverses this considerable professional breadth as for a career focused on a single professional activity. The Chemical Engineering curriculum is designed specifically to meet this educational challenge by emphasizing fundamental principles, laboratory and computing skills, and lifelong learning.

4.2 Program Outcomes

A graduate of the Bachelor of Science in Chemical Engineering (BSChE) program must attain:

- a. An ability to apply knowledge of mathematics, physical sciences, engineering sciences to the practice of chemical engineering.
- b. An ability to design and conduct experiments to test hypotheses and verify assumptions, as well as to analyze and interpret data and to simulate processes.
- c. An ability to design, improve, innovate, and to supervise systems or processes to meet desired needs within realistic constraints.
- d. An ability to work effectively in multi-disciplinary and multi-cultural teams in diverse fields of practice.
- e. An ability to identify, formulate, and solve chemical engineering problems.
- f. An understanding of the effects and impact of the chemical engineering profession on the environment and the society, as well as the social and ethical responsibilities of the profession.

- g. The specialized knowledge in at least one field of chemical engineering practice, and the ability to apply such knowledge to provide solutions to actual problems.
- h. An ability for effective oral and written communications particularly in the English language.
- i. An ability to engage in life-long learning and to keep abreast of the current trends and development in a specific field of specialization.
- j. An ability to use the appropriate techniques, skills and tools necessary for the practice of chemical engineering.
- k. A knowledge of contemporary issues.

4.3 Fields of Specialization

The Chemical Engineering program comprises of foundation, allied, and professional courses to build a complete understanding of the profession. A plant design project, thesis, and set of electives leading to a career track or a field of specialization complete the program. The suggested career tracks are the following but not limited to:

- a) Food and Drug Manufacturing
- b) Packaging Technologies
- c) Environmental Management
- d) Petrochemical Engineering
- e) Energy Engineering
- f) Biotechnology
- g) Paints & Coating Technology
- h) Semiconductor Technology
- i) Entrepreneurship

Section 5. Allied Programs

The following programs may be considered as allied to Chemical Engineering: Chemistry; Biochemistry; Environmental Engineering; Materials Engineering; Industrial Engineering

ARTICLE IV - COMPETENCY STANDARDS

Section 6. This section defines the entry level competency standards, knowledge, attitudes, values and skills applicable to the BS Chemical Engineering graduate, which are contained in **ANNEX I** of this Memorandum.

ARTICLE V - CURRICULUM

Section 7. Curriculum Description

The Chemical Engineering curriculum is designed to develop engineers who have a background in mathematics, natural, physical and allied sciences. As such the curriculum contains courses in mathematics, physics, chemistry and statistics. The Chemical Engineering curriculum also contains language courses, social sciences and humanities. This is to ensure that the Chemical engineering graduate is articulate and understands the nature of his/her special role in society and the impact

of their work on the environment. The curriculum is designed to guarantee a certain breadth of knowledge of the Chemical Engineering disciplines through a set of core courses and to ensure depth and focus in certain disciplines through primary and secondary areas of specialization. The curriculum develops the basic engineering tools necessary to solve problems in the field of Chemical Engineering.

Section 8. Curriculum Outline

Classification/ Field / Course	Minimum No. of Hours/week		Minimum Credit Units
	Lecture	Laboratory	
I. TECHNICAL COURSES			
A. Mathematics			
College Algebra	3	0	3
Advanced Algebra	2	0	2
Plane and Spherical Trigonometry	3	0	3
Analytic Geometry	2	0	2
Solid Mensuration	2	0	2
Differential Calculus	4	0	4
Integral Calculus	4	0	4
Differential Equations	3	0	3
Probability and Statistics	3	0	3
Sub-Total	26	0	26
B. Natural/Physical Sciences			
General Chemistry	3	3	4
Physics 1	3	3	4
Physics 2	3	3	4
Sub-Total:	9	9	12
C. Basic Engineering Sciences			
Engineering Drawing	0	3	1
Computer Fundamentals and Programming	0	6	2

Classification/ Field / Course	Minimum No. of Hours /week		Minimum Credit Units
	Lecture	Laboratory	
Computer –Aided Drafting	0	3	1
Statics of Rigid Bodies	3	0	3
Dynamics of Rigid Bodies	2	0	2
Mechanics of Deformable Bodies	3	0	3
Engineering Economy	3	0	3
Engineering Management	3	0	3
Environmental Engineering	2	0	2
Safety Management	1	0	1
Sub-Total:	17	12	21
D. Allied Courses			
General Chemistry Calculations	2	3	3
Analytical Chemistry	3	6	5
Organic Chemistry	4	3	5
Industrial Chemistry	2	3	3
Basic Electrical & Electronics Engineering	2	3	3
Introduction to Biotechnology	3	0	3
Fundamentals of Materials Science And Engineering	3	0	3
Quantitative Methods in Management	3	0	3
Safety in the Process Industry	2	0	2
Sub-Total:	24	18	30
E. Professional Courses			
Advanced Engineering Mathematics in Chemical Engineering	3	0	3
Physical Chemistry for Engineers 1	3	3	4
Physical Chemistry for Engineers 2	3	3	4
ChE Calculations 1	2	3	3
ChE Calculations 2	2	3	3
ChE Thermodynamics 1	3	0	3

Classification/ Field / Course	Minimum No. of Hours /week		Minimum Credit Units
	Lecture	Laboratory	
ChE Thermodynamics 2	3	0	3
Principles of Transport Processes	3	0	3
Chemical Process Industries	3	0	3
Momentum Transfer	3	0	3
Heat and Mass Transfer	3	0	3
Separation Processes	3	0	3
Introduction to Particle Technology	2	0	2
Chemical Engineering Lab 1	0	3	1
Chemical Engineering Lab 2	0	3	1
Chemical Reaction Engineering	4	0	4
Process Dynamics and Control	3	0	3
Biochemical Engineering	3	0	3
Industrial Waste Management and Control	3	0	3
ChE Plant Design	3	0	3
Equipment Design	2	0	2
Laws and Ethics for Chemical Engineers	2	0	2
Field Trips and Seminar	0	3	1
Computer Applications in ChE	0	3	1
Methods of Research	1	0	1
Industry Immersion	0	240 hrs	2
Technical Elective 1	3	0	3
Technical Elective 2	3	0	3
Technical Elective 3	3	0	3
Sub-Total:	66	264	76
TOTAL TECHNICAL COURSES	142	303	165

Classification/ Field / Course	Minimum No. of Hours /week		Minimum Credit Units
	Lecture	Laboratory	
II NON-TECHNICAL COURSES			
A. Social Sciences			
Social Science 1	3	0	3
Social Science 2	3	0	3
Social Science 3	3	0	3
Social Science 4	3	0	3
Sub-Total:	12	0	12
B. Humanities			
Humanities 1	3	0	3
Humanities 2	3	0	3
Humanities 3	3	0	3
Sub-Total:	9	0	9
C. Languages			
English 1	3	0	3
English 2	3	0	3
English 3 (Technical Communication)	3	0	3
Pilipino 1	3	0	3
Pilipino 2	3	0	3
Sub-Total:	15	0	15
D. Mandated Course			
Life and Works of Rizal	3	0	3
Sub-Total:	3	0	3
E. Physical Education			
P.E. 1, 2, 3, 4 (2 units each)			8
Sub-Total:			8
F. National Service Training Program			
NSTP 1 & 2 (3 units each)			6
Sub-Total:			6
TOTAL NON-TECHNICAL COURSES	39	0	53
GRAND TOTAL	181	303	218

SUGGESTED TECHNICAL ELECTIVES:

A. Food and Drug Manufacturing

- Food Processing Technologies
- Pharmaceuticals
- Soaps/Detergents
- Cosmetaceuticals

B. Packaging Technologies

- Fundamental Principles of Packaging
- Packaging Materials and Components I
- Packaging Materials and Components II

C. Environmental Management

- Air Pollution Control
- Solids Waste Management
- Hazardous Waste Management

D. Petrochemical Engineering

- Introduction to Petroleum Engineering
- Polymer Engineering
- Plastics Technology

E. Energy Engineering

- Renewable Energy Technologies
- Energy Management
- Nuclear Engineering

F. Biotechnology

- Molecular Biology
- Enzyme Technologies

G. Paints & Coating Technology

- Paints and Coatings
- Ink Technology

H. Semiconductor Technology

- Microelectronic Materials for ChE
- Nanotechnology

I. Entrepreneurship

J. Emerging Technologies*

* Course Specifications for the Emerging Technologies of the Technical Electives shall be developed by the HEIs in accordance with their needs but shall likewise be submitted to CHED

SUMMARY OF THE BSCHE CURRICULUM

Classification/ Field	Total No. of Hours		Total No. of Units
	Lecture	Laboratory	
I. TECHNICAL COURSES			
A. Mathematics	26	0	26
B. Natural & Physical Sciences	9	9	12
C. Basic Engineering Sciences	17	12	21
D. Allied Courses	24	18	30
E. Professional Courses	66	264	76
Sub- Total	142	303	165
II. NON- TECHNICAL			
A. Social Sciences	12	0	12
B. Humanities	9	0	9
C. Languages	15	0	15
D. Life and Works of Rizal	3	0	3
E. Physical Education			8
F. NSTP			6
Sub-Total	39	0	53
GRAND TOTAL	181	303	218

Section 9. Relationship of the Courses to the Program Outcomes

The relationships of the identified courses in section 8 to the identified program outcomes in section 4-4.2 are contained in **ANNEX II** of this Memorandum.

Section 10. Sample/ Model 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.

FIRST YEAR

1st Year – First Semester

Subjects	No. of Hours		Units	Prerequisite/ (Co-requisite)
	Lec	Tutorial /Lab		
College Algebra	3	0	3	None
Plane and Spherical Trigonometry	3	0	3	None
General Chemistry	3	3	4	None
Engineering Drawing	0	3	1	None
Social Science 1	3	0	3	None
English 1	3	0	3	None
Pilipino 1	3	0	3	None
P.E. 1			2	None
Total	18	6	22	

1st Year – Second Semester

Subjects	No. of Hours		Units	Prerequisite/ (Co-requisite)
	Lec	Tutorial /Lab		
Advanced Algebra	2	0	2	College Algebra
Analytic Geometry	2	0	2	College Algebra, Plane and Spherical Trigonometry
Solid Mensuration	2	0	2	College Algebra, Plane and Spherical Trigonometry
English 2	3	0	3	
Pilipino 2	3	0	3	
Humanities 1	3	0	3	None
General Chemistry Calculations	2	3	3	General Chemistry
P.E. 2			2	
Total	17	3	20	

SECOND YEAR

2nd Year – First Semester

Subjects	No. of Hours		Units	Prerequisite/ (Co-requisite)
	Lec	Tutorial /Lab		
Differential Calculus	4	0	4	Analytic Geometry, Solid Mensuration , Advanced Algebra
Physics 1	3	3	4	College Algebra, Plane and Spherical Trigonometry
Computer Fundamentals and Programming	0	6	2	Second Year Standing*
Analytical Chemistry	3	6	5	General Chemistry Calculations
Humanities 2	3	0	3	
Social Science 2	3	0	3	
PE 3			2	
NSTP 1			3	
Total	16	15	26	

2nd Year – Second Semester

Subjects	No. of Hours		Units	Prerequisite/ (Co-requisite)
	Lec	Tutorial /Lab		
Integral Calculus	4	0	4	Differential Calculus
Organic Chemistry	4	3	5	General Chemistry Calculations
Physics 2	3	3	4	Physics 1
Life and Works of Rizal	3	0	3	
Humanities 3	3	0	3	
PE 4			2	
NSTP 2			3	
Total	17	6	24	

THIRD YEAR

3rd Year – First Semester

Subjects	No. of Hours		Units	Prerequisite/ (Co-requisite)
	Lec	Tutorial/ Lab		
Differential Equations	3	0	3	Integral Calculus
Physical Chemistry for Engineers 1	3	3	4	Analytical Chemistry, Integral Calculus
ChE Calculations 1	2	3	3	Analytical Chemistry, Advanced Algebra
Statics of Rigid Bodies	3	0	3	Physics 1, Integral Calculus
Probability & Statistics	3	0	3	College Algebra
Industrial Chemistry	2	3	3	Organic Chemistry
Social Science 3	3	0	3	
Total	19	9	22	

3rd Year – Second Semester

Subjects	No. of Hours		Units	Prerequisite/ (Co-requisite)
	Lec	Tutorial /Lab		
English 3 (Technical Communication)	3	0	3	
Principles of Transport Processes	3	0	3	Differential Equations Ch.E. Calculations 1
ChE Thermodynamics 1	3	0	3	Physical Chemistry for Engineers 1
Advanced Engineering Mathematics in Chemical Engineering	3	0	3	Differential Equations
Physical Chemistry for Engineers 2	3	3	4	Physical Chemistry for Engineers 1
Computer Aided - Drafting	0	3	1	Third year standing
Dynamics of Rigid Bodies	2	0	2	Statics of Rigid Bodies
Safety Management	1	0	1	Third Year standing
Total	18	6	20	

FOURTH YEAR

4th Year – First Semester

Subjects	No. of Hours		Units	Prerequisite/ (Co-requisite)
	Lec	Tutorial/ Lab		
Environmental Engineering	2	0	2	General Chemistry
ChE Thermodynamics 2	3	0	3	ChE Thermodynamics 1
Momentum Transfer	3	0	3	Principles of Transport Processes
Basic Electrical and Electronics Engineering	2	3	3	Physics 2
Heat and Mass Transfer	3	0	3	Principles of Transport Processes
Engineering Economy	3	0	3	Third year Standing
Fundamentals of Materials Science and Engineering	3	0	3	Organic Chemistry
Methods of Research	1	0	1	Fourth year standing
Total	20	3	21	

4th Year – Second Semester

Subjects	No. of Hours		Units	Prerequisite/ (Co-requisite)
	Lec	Tutorial/ Lab		
Engineering Management	3	0	3	Third year Standing*
Introduction to Biotechnology	3	0	3	Organic Chemistry
Separation Processes	3	0	3	Heat and Mass Transfer, Ch.E Thermodynamics 2
Ch. Engineering Lab 1	0	3	1	Heat and Mass Transport, Momentum Transfer
Mechanics of Deformable Bodies	3	0	3	Statics of Rigid Bodies
Chemical Reaction Engineering	4	0	4	ChE Thermodynamics 2, Advanced Engineering Mathematics in Chemical Engineering
Chemical Process Industries	3	0	3	Organic Chemistry
ChE Calculations 2	2	3	3	ChE Calculations 1
Total	21	6	23	

4th Year – Summer

Subjects	No. of Hours		Units	Prerequisite/ (Co-requisite)
	Lec	Tutorial/Lab		
Industry Immersion	0	240 hrs	2	Fifth Year Standing*

FIFTH YEAR

5th Year – First Semester

Subjects	No. of Hours		Units	Prerequisite/ (Co-requisite)
	Lec	Tutorial/ Lab		
Ch. Engineering Lab 2	0	3	1	Ch.Engineering Lab 1
Process Dynamics and Control	3	0	3	Advanced Engineering Mathematics in Chemical Engineering
Biochemical Engineering	3	0	3	Introduction to Biotechnology, Chemical Reaction Engineering
Equipment Design	2	0	2	Separation Processes
Quantitative Methods in Management	3	0	3	Engineering Management
ChE Elective 1**	3	0	3	5 th Year Standing*
Computer Applications in ChE	0	3	1	5 th Year Standing*
Introduction to Particle Technology	2	0	2	Momentum Transfer
Social Science 4	3	0	3	
Total	19	6	21	

5th Year – Second Semester

Subjects	No. of Hours		Units	Prerequisite/ (Co-requisite)
	Lec	Tutorial/ Lab		
Industrial Waste Management and Control	3	0	3	Biochemical Engineering
ChE Plant Design	3	0	3	Equipment Design, Engineering Economy
ChE Elective 2**	3	0	3	5 th Year Standing*
ChE Elective 3**	3	0	3	5 th Year Standing*
Laws and Ethics for Chemical Engineers	2	0	2	5 th Year Standing
Safety in the Process Industry	2	0	2	5 th Year Standing*
Field Trips and Seminars	0	3	1	5 th Year Standing*
Total	16	3	17	

Total = 218 Units

* The nth Year Standing means that the student must have completed at least 75% of the load requirements of the previous year level.

** At least two of the Technical Electives must be under the same track or area of specialization

Section 11. Industry Immersion requirement

Industry Immersion shall focus on any of the following:

- 11.1 On-the-job-training in Industrial Plants as defined by RA 9297:
 - a. Any plant involving any unit process and /or operations
 - b. Pollution control and abatement processes or operations
- 11.2 Industry-based projects to solve specific concerns in Chemical Engineering

ARTICLE VI – COURSE SPECIFICATIONS

Section 12. The course specifications for the BS Chemical Engineering program are contained in **ANNEX III** of this Memorandum. **ANNEX IV** shall contain the summary of the laboratory requirements.

ARTICLE VII – GENERAL REQUIREMENTS

Section 13. The following general requirements for the BS Chemical Engineering program, contained in **CMO No. 25, s. 2005, otherwise known as “Revised Policies, Standards and Guidelines (PSG) for Engineering Education”**, shall be complied with:

1. Instructional Program Quality
2. Research
3. Community Involvement
4. Administration and Support

ARTICLE VIII - TRANSITORY PROVISION

Section 14. HEIs that have been granted permit or recognition for the Bachelor of Science in Chemical Engineering program are hereby given a non-extendable period of four (4) years from the date of effectivity hereof, within which to fully comply with State Universities and Colleges (SUCs) and Local Colleges and Universities (LCUs) shall also comply with the requirements herein set forth.

Students currently enrolled in the Bachelor of Science in Chemical Engineering program shall be allowed to graduate under the old curriculum. However, students enrolling for the abovementioned program beginning school year 2008-2009 shall be covered by this CMO.

ARTICLE IX- SANCTIONS

Section 15. For violation of this Order, the Commission may impose such administrative sanction as it may deem appropriate pursuant to the pertinent provisions of Republic Act No. 7722, in relation to Section 69 of BP 232 otherwise known as the Higher Education Act of 1982, and Sections 24 and 101 of the Manual of Regulations for Private Schools (MRPS), and other related laws.

ARTICLE X – SEPARABILITY AND REPEALING CLAUSE

Section 16. Any provision of this Order, which may thereafter be held invalid, shall not effect the remaining provisions.

Section 17. All issuances, including but not limited to CMO No. 49, s. 1997, and CMO 34, s. 2001 and/ or any part thereof inconsistent herewith, are deemed repealed or modified accordingly.

ARTICLE X – EFFECTIVITY CLAUSE

Section 18. This CMO shall take effect starting 1st semester of SY 2008-2009, after publication in an official gazette or in a newspaper of general circulation.

Section 19. An HEI applying to offer new BSChE program shall likewise comply with all the provisions of this CMO.

Pasig City, Philippines June 2, 2008

For the Commission:



ROMULO L. NERI
Chairman