



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

**CHED MEMORANDUM ORDER**

**No. 46  
Series of 2007**

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

---

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. 507-2007** of the Commission en banc dated **July 21, 2007** and for the purpose of rationalizing the ceramic engineering education in the country, the following policies shall be hereby adopted and promulgated by the Commission.

**ARTICLE I - INTRODUCTION**

**Section 1. Background and Rationale**

**Ceramic Engineering** is the branch of engineering that pertains to traditional and advanced inorganic and non-metallic materials, otherwise known as ceramics, that are typically processed at an elevated temperature into useful products. It can be considered as being part of the broad field of Materials Science and Engineering with particular focus on ceramic materials. Ceramic engineering involves the study of the relationships among the structure, and properties of ceramics and how all of these can be modified by processing in order to eventually manufacture useful ceramic products from their raw material sources as well as formulate and develop more superior ceramic materials for future use. For a ceramic engineer to become innovative in the practice of his profession, a sufficient level of knowledge in mathematics, chemistry, physics, engineering sciences and other relevant natural, applied sciences and social sciences must be attained.

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

## ARTICLE II - AUTHORITY TO OPERATE

**Section 2.** All private higher education institutions (PHEIs) intending to offer **Bachelor of Science in Ceramic Engineering** must first secure proper authority from the Commission in accordance with existing rules and regulations. state universities and colleges (SUCs), and local colleges and universities (LCUs) should likewise strictly adhere to the provisions in this policies and standards.

## ARTICLE III - PROGRAM SPECIFICATION

### **Section 3. Degree Name**

The degree program herein shall be called **BACHELOR OF SCIENCE IN CERAMIC ENGINEERING (BSCerE)**

### **Section 4. Program Description**

#### **4.1 Nature of the Program**

**Ceramic Engineering** is the engineering discipline that studies the structure, properties, processing and applications of traditional and advanced inorganic and non-metallic materials that are processed at an elevated temperature into useful products. A professional ceramic engineer will assume leading roles in the technological and socio-economic development of both local and foreign industry in the field of ceramic materials, particularly in the areas of research, development, manufacturing, maintenance, and operation.

#### **4.2 Program Outcomes**

The Bachelor of Science in Ceramic Engineering (BS CerE) program must produce graduates possessing the following:

- a. An ability to apply knowledge of mathematics, physical sciences, and engineering sciences to the practice of ceramic engineering.
- b. An ability to design and conduct experiments to test hypotheses and verify assumptions, as well as to organize, analyze and interpret data, draw valid conclusions, and develop mathematical models for 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 ceramic engineering problems.
- f. An understanding of the effects and impact of the ceramic engineering profession on the environment and the society, as well as the social and ethical responsibilities of the profession.
- g. A specialized knowledge in at least one focus area of ceramic 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 current of the development in a specific field of specialization.
- j. An ability to use the appropriate techniques, skills and tools necessary for the practice of ceramic engineering.
- k. A knowledge of contemporary issues.

#### **4.3 Specific Professions/ Careers/ Occupations or trades that the graduates may go into**

- 4.3.1 Education
- 4.3.2 Management
- 4.3.3 Entrepreneurship
- 4.3.4 Production Management/Engineering
- 4.3.5 Quality Assurance Engineering
- 4.3.6 Materials Engineering specializing in Ceramic Materials
- 4.3.7 Research and Development
- 4.3.8 Sales
- 4.3.9 Design Engineering
- 4.3.10 Consultancy

#### **Section 5. Allied Programs**

The BSCerE allied programs are Materials Engineering/Materials Science and Engineering, Chemical Engineering and Metallurgical Engineering

### **ARTICLE IV – COMPETENCY STANDARDS**

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

## ARTICLE V – CURRICULUM

### Section 7. Curriculum Description

- 7.1 The BS Ceramics Engineering program has a total of **194 credit units**. The program is comprised of the general education, basic engineering courses, professional courses, and allied courses.
- 7.2 The general education courses are in accordance with CHED Memorandum Order No. 59, s. 1996 “The New General Education Curriculum (GEC)”
- 7.3 The technical courses include Mathematics with a total of **26 units**, Physical Sciences with a total of 12 units, and the Basic Engineering Sciences with a total of **21 units**.
- 7.4 There are 23 professional courses with a total of **52 credit units** and an additional minimum of 240 hours of summer ceramic on-the-job training.
- 7.5 There are 10 allied courses with a total of **30 units**.
- 7.6 Monitoring of the OJT in conformity with course objective will be the responsibility of the department.

### Section 8. Curriculum Outline

Classification/ Field / Course	Minimum No. of Hours		Total No. of Units
	Lecture	Laboratory	
<b>I. TECHNICAL COURSES</b>			
<b>A. Mathematics</b>			
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
<b>Sub-Total</b>	<b>26</b>	<b>0</b>	<b>26</b>

Classification/ Field / Course	Minimum No. of Hours		Total No. of Units
	Lecture	Laboratory	
<b>B. Natural/Physical Sciences</b>			
General Chemistry 1	3	3	4
Physics 1	3	3	4
Physics 2	3	3	4
<b>Sub-Total:</b>	<b>9</b>	<b>9</b>	<b>12</b>
<b>C. Basic Engineering Sciences</b>			
Computer Fundamentals and Programming	0	6	2
Engineering Drawing	0	3	1
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
<b>Sub-Total:</b>	<b>17</b>	<b>12</b>	<b>21</b>
<b>D. Allied Courses</b>			
General Chemistry 2 (for Ceramic Engineering)	3	0	3
Analytical Chemistry	3	3	4
Principles of Geology	3	0	3
Elements of Mineralogy	2	3	3
Fundamentals of Materials Science and Engineering	3	0	3
Kinetics of Materials	3	0	3
Thermodynamics of Materials	2*/3**	3/0	3
Phase Equilibrium in Ceramic Systems	2	0	2

Classification/ Field / Course	Minimum No. of Hours		Total No. of Units
	Lecture	Laboratory	
Mechanics of Fluids	3	0	3
Basic Electrical Engineering	3	0	3
<b>Sub-Total:</b>	<b>27/28</b>	<b>9/6</b>	<b>30</b>
<b>E. Professional Courses</b>			
Advanced Engineering Mathematics for Ceramic Engineering	3	0	3
Ceramic Plant Design	1	3	2
Ceramic Forming Technology	1	3	2
Ceramic Testing	1	3	2
Ceramic Crystal Chemistry	3	0	3
Fuels and Combustion	2	3	3
Whitewares	2/3	3/0	3
Structural Clay Products	2*/3**	3/0	3
Properties of Ceramic Products	2	0	2
Cement Manufacturing Technology	2	0	2
Refractories	2	0	2
Quality Assurance	1	0	1
Advanced Ceramics I	2	0	2
Advanced Ceramics II	2	0	2
Ceramic Plant Visits	0	3	1
Ceramic Raw Materials and Processes	2	3	3
Research and Development in Ceramic Engineering	2*/3**	3/0	3
Glass Technology	2	0	2
Glazes and Enamels	2	3	3
Undergraduate Thesis	0	6	2
Thermal Processes and Pyrometry	2	3	3

Classification/ Field / Course	Minimum No. of Hours		Total No. of Units
	Lecture	Laboratory	
Seminar	1	0	1
Special Topics	2	0	2
Ceramic On-the-Job Training	240 hours		
<b>Sub-Total:</b>	<b>35/42</b>	<b>39/30</b>	<b>52</b>
<b>II NON-TECHNICAL COURSES</b>			
<b>A. Social Sciences</b>			
Social Science 1	3	0	3
Social Science 2	3	0	3
Social Science 3	3	0	3
Social Science 4	3	0	3
<b>Sub-Total:</b>	<b>12</b>	<b>0</b>	<b>12</b>
<b>B. Humanities</b>			
Humanities 1	3	0	3
Humanities 2	3	0	3
Humanities 3	3	0	3
<b>Sub-Total:</b>	<b>9</b>	<b>0</b>	<b>9</b>
<b>C. Languages</b>			
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
<b>Sub-Total:</b>	<b>15</b>	<b>0</b>	<b>15</b>
<b>D. Mandated Course</b>			

Classification/ Field / Course	Minimum No. of Hours		Total No. of Units
	Lecture	Laboratory	
Life and Works of Rizal	3	0	3
<b>Sub-Total:</b>	<b>3</b>	<b>0</b>	<b>3</b>
<b>E. Physical Education</b>			
P.E. 1			2
P.E. 2			2
P.E. 3			2
P.E. 4			2
<b>Sub-Total:</b>			<b>8</b>
<b>F. National Service Training Program</b>			
NSTP 1			3
NSTP 2			3
<b>Sub-Total:</b>			<b>6</b>
<b>GRAND TOTAL</b>			<b>194</b>

**Note:**

- \* If course has laboratory component the minimum number of lecture hours is 2 per week.
- \*\* If course has no laboratory component the minimum number of lecture hours is 3 per week.



<b>SUMMARY</b>			
Classification/ Field	Total No. of Hours		Total No. of Units
	Lecture	Laboratory	
<b>I. TECHNICAL COURSES</b>			
A. Mathematics	26	0	26
B. Natural Sciences	9	9	12
C. Basic Engineering Sciences	17	12	21
D. Allied Courses	27/28	9/6	30
E. Professional Course	35/42	39/30	52
<b>Sub- Total</b>	<b>114/122</b>	<b>72/60</b>	<b>141</b>
<b>II. NON- TECHNICAL</b>			
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
<b>Sub-Total</b>	<b>39</b>	<b>0</b>	<b>39</b>
Physical Education			8
NSTP			6
<b>Grand Total</b>			<b>194</b>

**Section 9. Relationship of the Courses to the Program Outcomes**

The relationship 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-requisite are complied with.

**FIRST YEAR**

**1<sup>st</sup> Year – First Semester**

Subjects	No. of Hours		Units	Pre-requisites
	Lec.	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
English 1	3	0	3	None
Pilipino 1	3	0	3	None
PE 1			2	None
NSTP 1			3	None
<b>TOTAL</b>	<b>15</b>	<b>6</b>	<b>22</b>	

**1<sup>st</sup> Year – Second Semester**

Subjects	No. of Hours		Units	Pre-requisites
	Lec.	Lab		
Analytic Geometry	2	0	2	College Algebra, Plane and Spherical Trigonometry
Solid Mensuration	2	0	2	College Algebra, Plane and Spherical Trigonometry
Advanced Algebra	2	0	2	College Algebra
General Chemistry 2 (for Ceramic Engineering)	3	0	3	Gen. Chemistry 1
English 2	3	0	3	English 1
Pilipino 2	3	0	3	Pilipino 1
Physics 1	3	3	4	College Algebra, Plane and Spherical Trigonometry
PE 2			2	PE 1
NSTP 2			3	NSTP 1
<b>TOTAL</b>	<b>18</b>	<b>3</b>	<b>24</b>	

## SECOND YEAR

### 2<sup>nd</sup> Year – First Semester

Subjects	No. of Hours		Units	Pre-requisites
	Lec.	Lab		
Differential Calculus	4	0	4	Advanced Algebra, Analytic Geometry, Solid Mensuration
Physics 2	3	3	4	Physics 1
English 3 (Technical Communication)	3	0	3	English 2
Humanities 1	3	0	3	None
Social Science 1	3	0	3	None
Computer Fundamentals and Programming	0	6	2	2 <sup>nd</sup> Year Standing
PE 3			2	PE 2
<b>TOTAL</b>	<b>16</b>	<b>9</b>	<b>21</b>	

### 2<sup>nd</sup> Year – Second Semester

Subjects	No. of Hours		Units	Pre-requisites
	Lec.	Lab		
Integral Calculus	4	0	4	Differential Calculus
Probability & Statistics	3	0	3	College Algebra
Social Science 2	3	0	3	Social Science 1
Rizal	3	0	3	None
Analytical Chemistry	3	3	4	General Chemistry 2
PE 4			2	PE 3
<b>TOTAL</b>	<b>16</b>	<b>3</b>	<b>19</b>	

### THIRD YEAR

#### 3<sup>rd</sup> Year – First Semester

Subjects	No. of Hours		Units	Pre-requisites
	Lec.	Lab		
Differential Equations	3	0	3	Integral Calculus
Statics of Rigid Bodies	3	0	3	Physics 1, Integral Calculus
Principles of Geology	3	0	3	General Chemistry
Fundamentals of Materials Science and Engineering	3	0	3	Physics 2, Integral Calculus
Thermodynamics of Materials	2/3	3/0	3	General Chemistry 2, Integral Calculus
Computer-Aided Drafting	0	3	1	3 <sup>rd</sup> Year Standing
Ceramic Raw Materials and Processes	2	3	3	Analytical Chemistry
<b>TOTAL</b>	<b>16/17</b>	<b>9/0</b>	<b>19</b>	

#### 3<sup>rd</sup> Year – Second Semester

Subjects	No. of Hours		Units	Pre-requisites
	Lec.	Lab		
Ceramic Crystal Chemistry	3	0	3	Fundamentals of Materials Science and Engineering
Kinetics of Materials	3	0	3	Thermodynamics of Materials
Phase Equilibrium in Ceramic Systems	2	0	2	Thermodynamics of Materials
Ceramic Testing	1	3	2	Fundamental of Material Science and Engineering
Elements of Mineralogy	2	3	3	Principles of Geology
Dynamics of Rigid Bodies	2	0	2	Statics of Rigid Bodies
Social Science 4	3	0	3	Social Science 3
<b>TOTAL</b>	<b>16</b>	<b>6</b>	<b>18</b>	

## FOURTH YEAR

### 4<sup>th</sup> Year – First Semester

Subjects	No. of Hours		Units	Pre-requisites
	Lec.	Lab		
Ceramic Forming Technology	1	3	2	Ceramic Raw Materials and Processes, Ceramic Testing
Basic Electrical Engineering	3	0	3	None
Mechanics of Fluids	3	0	3	Dynamics of Rigid Bodies
Research and Development in Ceramic Engineering	2/3	3/0	3	Ceramic Raw Materials and Processes, Probability and Statistics, Ceramics Testing
Fuels and Combustion	2	3	3	Analytical Chemistry
Mechanics of Deformable Bodies	3	0	3	Statics of Rigid Bodies
<b>TOTAL</b>	<b>14/15</b>	<b>9/6</b>	<b>17</b>	

### 4<sup>th</sup> Year – Second Semester

Subjects	No. of Hours		Units	Pre-requisites
	Lec.	Lab		
Whitewares	2/3	3/0	3	Phase Equilibrium in the Ceramic System, Ceramic Raw Materials and Processes, Ceramic Raw Materials and Processes Laboratory, Properties of Ceramics Products
Properties of Ceramic Products	2	0	2	Fundamentals of Materials Science and Engineering, Ceramic Crystal Chemistry
Glazes and Enamels	2	3	3	Ceramic Raw Materials & Processes, Phase Equilibrium in Ceramic Systems

Thermal Processes and Pyrometry	2	3	3	Kinetics of Materials, Fuels & Combustion
Environmental Engineering	2	0	2	General Chemistry
Safety Management	1	0	1	3 <sup>rd</sup> year standing
Engineering Economy	3	0	3	3 <sup>rd</sup> Year Standing
Advanced Engineering Mathematics	3	0	3	Differential Equation
<b>TOTAL</b>	<b>17/18</b>	<b>9/0</b>	<b>20</b>	

**Summer**  
**Ceramic On-the-Job Training (min. 240 hrs)**

**FIFTH YEAR**

**5<sup>th</sup> Year – First Semester**

Subjects	No. of Hours		Units	Pre-requisites
	Lec.	Lab		
Ceramic Part Design	1	3	2	Regular 5 <sup>th</sup> year standing, Engineering Economy
Refractories	2	0	2	Phase Equilibrium in Ceramics Systems, Ceramic Raw Materials and Processes, Properties of Ceramic Products
Advanced Ceramics I	2	0	2	4 <sup>th</sup> year standing
Glass Technology	2	0	2	Ceramic Raw Materials and Processes, Properties of Ceramic Products
Ceramic Manufacturing Technology	2	0	2	Ceramic Raw Materials and Processes, Phase Equilibrium in Ceramic Systems
Undergraduate Thesis	0	6	2	5 <sup>th</sup> year standing
Engineering Management	3	0	3	3 <sup>rd</sup> year standing
Special Topics	2	0	2	Consent of Instructor
<b>TOTAL</b>	<b>14</b>	<b>9</b>	<b>17</b>	

**5<sup>th</sup> Year – Second Semester**

Subjects	No. of Hours		Units	Pre-requisites
	Lec.	Lab		
Structural Clay Products	2/3	3/0	3	Phase Equilibrium in Ceramic System, Ceramic Raw Materials and Processes, Ceramic Raw Materials and Processes Laboratory, Properties of Ceramic Products
Quality Assurance	1	0	1	Probability and Statistics
Advanced Ceramics II	2	0	2	Advanced Ceramics I
Ceramic Plant Visits	0	3	1	Senior Standing
Seminar	1	0	1	5th year standing
Humanities 2	3	0	3	None
Humanities 3	3	0	3	None
Social Sciences 4	3	0	3	Social Science 3
<b>TOTAL</b>	<b>15/16</b>	<b>6/0</b>	<b>17</b>	

**SUGGESTED SPECIAL TOPICS**

Subjects	No. of Hours		Units	Pre-requisites
	Lec.	Lab		
Materials Selection	2	0	2	Consent of Instructor
Instrumentation	2	0	2	Consent of Instructor
X-ray Diffraction	2	0	2	Consent of Instructor
Advanced Microscopy Techniques	2	0	2	Consent of Instructor
Materials in Microelectronic Packaging	2	0	2	Consent of Instructor
Failure Analysis and Reliability	2	0	2	Consent of Instructor
Degradation of Materials	2	0	2	Consent of Instructor
Surface Technology	2	0	2	Consent of Instructor
Surface Science	2	0	2	Consent of Instructor
Entrepreneurship	2	0	2	Consent of Instructor
Marketing Strategies	2	0	2	Consent of Instructor
Technology Innovation	2	0	2	Consent of Instructor
Ceramic Art Design	2	0	2	Consent of Instructor

## **Section 11. Thesis/Research/Project Requirement**

11.1 The thesis topics can be of the following:

- 11.1.1 Application of the different fields of specialization in Ceramic Engineering
- 11.1.2 Industry-based projects related to ceramic engineering fields
- 11.1.3 Socio-economic projects related to ceramic engineering

## **Section 12. On-the-Job-Training/Practicum Requirement**

- 12.1 To expose the student to the actual operations relevant to ceramics engineering plant or facility
- 12.2 Two hundred forty (240) hours of actual practice
- 12.3 On –the- Job Training in a Ceramic Plant or any facility involved in processes which include but is not limited to the:
  - 12.3.1 preparation, separation, concentration of industrial minerals & other ceramic raw materials.
  - 12.3.2 Processing of ceramic raw materials into finished products

## **ARTICLE VI – COURSE SPECIFICATION**

**Section 13.** The course specifications for the BS Ceramic Engineering program are contained in **Annex III** of this Memorandum. **ANNEX IV** shall contain the summary of the Laboratory requirements.

- 1. Course Name
- 2. Course Description
- 3. Number of units for lecture and laboratory
- 4. Number of contact hours per week
- 5. Prerequisite
- 6. Course Objectives
- 7. Course Outlines
- 8. Equipment
- 9. References



## **ARTICLE VII - GENERAL REQUIREMENTS**

**Section 14.** The general requirements for the BS Ceramic Engineering program are contained in “**CMO 25, s. 2005 – revised PSG for Engineering Education.**”, a separate Memorandum issued by the Commission.

The following are hereby required to comply with the policies in the following areas:

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

## **ARTICLE VIII - TRANSITORY PROVISION**

**Section 15.** HEIs that have been granted permit or recognition for Bachelors of Science in Ceramic Engineering degree program are required to fully comply with all the requirements in this CMO, within a non-extendable period of three (3) years after the date of its effectivity. State Universities and Colleges (SUCs) and Local Colleges and Universities (LCUs) shall also comply with the requirements herein set forth.

Student currently enrolled in the Bachelor of Science in Ceramic 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 – REPEALING CLAUSE**

**Section 16.** All issuances including but not limited to CMO No. 49, s. 1997 and CMO No. 34, s. 2001 and/or any part thereof inconsistent herewith are deemed repealed or modified accordingly.

## **ARTICLE X - EFFECTIVITY CLAUSE**

**Section 17.** This CMO shall take effect starting 1<sup>st</sup> semester of SY 2008-2009, after publication in an official gazette or in a newspaper of general circulation.

**Section 18.** An educational institution applying to offer new BSCerE program shall likewise comply with all the provisions of this CMO. (see Article II – Authority to operate of this Memorandum)

Pasig City, Philippines \_\_\_\_\_

For the Commission:

**CARLITO S. PUNO, DPA**  
Chairman