



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

CHED MEMORANDUM ORDER (CMO)

No. 34

Series of 2008

SUBJECT : POLICIES AND STANDARDS FOR THE DEGREE OF
BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING
PROGRAM

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. 246-2008 of the Commission en banc dated May 19, 2008 and for the purpose of rationalizing the electrical engineering education in the country, the following policies and standards are hereby adopted and promulgated by the Commission.

ARTICLE I - INTRODUCTION

Section 1. Rationale

The field of **Electrical Engineering** deals with the generation, transmission, distribution and utilization of electricity. It also deals with the design, operation and protection, maintenance and economics of electrical systems with emphasis on ethical values to harness economically and safely the materials, and forces of nature for the benefit of society and the environment.

Laboratory experience is emphasized in the Bachelor of Science in Electrical Engineering (BSEE) curriculum to provide familiarity with electrical, electronic and computing equipment and with experimental techniques. Modern laboratories are available for electrical circuits, electronics, machines, power systems, computers and the like, thereby, giving the students necessary knowledge and skills in applying these tools for the advancement of mankind.

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 Electrical Engineering. The revision of the PS for the BSEE program emerged as a result of consolidated effort of the academe, industry and other concerned agencies.

ARTICLE II - AUTHORITY TO OPERATE

- Section 2.** The BSEE program shall be operated only by 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 herein shall be called BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING (BSEE).

Section 4. Program Description

4.1 Objectives

- a. Provide the students with an education in the fundamentals of electrical engineering that will allow them to be immediately competitive in industry or in graduate work while providing the best opportunity for achieving full potential.
- b. Develop a sense of professional responsibility and social awareness.
- c. Provide practical applications and hands-on work as evidenced by laboratory, design, project study, computer exercises and practicum courses. These would help the student to work well whether independently or as part of a group.

4.2 Program Outcomes

A graduate of the Bachelor of Science in Electrical Engineering (BSEE) program must attain:

- a. Ability to apply knowledge of mathematics, physical, life and information sciences; and engineering sciences appropriate to the field of practice.
- 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 identified constraints.
- d. Ability to work effectively in multi-disciplinary and multi-cultural teams.
- e. Ability to recognize, formulate, and solve engineering problems.
- f. Recognition of professional, social, and ethical responsibility.

- g. Ability to effectively communicate orally and in writing using the English language.
- h. Understanding of the effects of engineering solutions in a comprehensive context.
- i. Ability to engage in life-long learning and an understanding of the need to keep current of the developments in the specific field of practice.
- j. Knowledge of contemporary issues
- k. Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

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

- Power Engineer- *Power System Operation, Power System Protection, Power System Economics, Power Plant*
- Design Engineer -*Advance Power System, Advance Electrical Designer, Machine Automation and Process Control Designer*
- Illumination Engineer
- Entrepreneur
- Sales Engineer
- Distribution Engineer
- Engineering Educators and Researcher
- Instrumentation and Control Engineer
- Safety Engineer
- Maintenance Engineer
- Construction and Project Engineer
- Software Developer
- Electrical Design Inspector

Section 5. Allied Programs

The BSEE allied programs are Bachelor of Science in Electronics Engineering, Bachelor of Science in Mechanical Engineering, Bachelor of Science in Computer Engineering and Bachelor of Science in Computer Science.

ARTICLE IV- COMPETENCY STANDARDS

Section 6. This section defines the entry-level competency standards, knowledge, skills, attitudes and values applicable to the BS Electrical Engineering graduate, which are contained in **ANNEX 1** of this Memorandum.

ARTICLE V - CURRICULUM

Section 7. Curriculum Description

The BSEE 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, science and engineering fundamentals with emphasis on the development of analytical and creative abilities. It also contains language courses, social sciences and humanities. This is to ensure that the electrical engineering graduate is articulate and is able to understand the nature of his/her special role in society and the impact of his/her work on the progress of civilization.

The curriculum is designed to guarantee a certain breadth of knowledge of the Electrical Engineering disciplines through a set of core courses. It ensures depth and focus in certain disciplines through areas of specialization. It provides a recommended track of electives that HEIs may adopt or develop. The curriculum develops the basic engineering tools necessary to solve problems in the field of Electrical Engineering. This enables the graduate to achieve success in a wide range of career.

Institutional electives are prescribed in order to give a certain degree of specialization so that institutions of learning will develop strengths in areas where they already have a certain degree of expertise.

Emphasis is given to the basic concepts. Previously identified courses are strengthened to take into account new developments. New courses and/or topics are introduced so that the student's knowledge of the fundamentals may be enhanced. This is to allow the student to achieve a degree of knowledge compatible with international standards.

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

Classification/ Field / Course	Minimum No. of Hours/Week		Minimum Credit Units
	Lecture	Laboratory	
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 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 Aided Drafting	0	3	1
Computer Fundamentals and Programming	0	6	2
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			
Advanced Engineering Mathematics for EE	3	0	3
Numerical Methods with <i>Computer Application</i>	2	3	3
Basic Thermodynamics	3	0	3
Fundamentals of Material Science and Engineering	3	0	3
Electronic Circuits and Devices	2	3	3

Classification/ Field / Course	Minimum No. of Hours/Week		Minimum Credit Units
	Lecture	Laboratory	
Electronic Circuits Analysis and Design	2	3	3
Industrial Electronics	3	3	4
Electromagnetics	3	0	3
Mechanics of Fluid	2	0	2
Principles of Communications	3	3	4
Logic Circuits and Switching Theory	3	3	4
Microprocessor System	2	3	3
Control Systems Analysis	3	0	3
Information Technology	2	3	3
Sub - Total	36	24	44
E. Professional Courses			
1. Core Courses			
EE Laws, Contracts, and Ethics	2	0	2
Electrical Circuits 1	3	3	4
Electrical Circuits 2	3	3	4
Electrical Circuits 3	2	3	3
DC Machinery	2	3	3
AC Machinery	3	3	4
AC Apparatus and Devices	2	3	3
Research Methods for EE	1	0	1
Electrical Transmission and Distribution System	3	3	4
Illumination Engineering Design	2	3	3
Electrical System Design	2	3	3
Electrical Equipment: Operation and Maintenance	3	0	3
Electrical Engineering Safety	1	0	1
Power System Analysis and Design	3	3	4
Power Plant Engineering	2	3	3

Classification/ Field / Course	Minimum No. of Hours/Week		Minimum Credit Units
	Lecture	Laboratory	
Research Project	0	3	1
On-the Job Training	0	0	3
Instrumentation and Control	2	3	3
Seminars and Field Trips	1	0	1
Sub-total	37	37	53
2. Technical Electives			
EE Elective 1 (Track)	3	0	3
EE Elective 2 (Track)	3	0	3
EE Elective 3 (Track)	3	0	3
EE Elective 4 (Track)	3	0	3
Sub-total	12	0	12
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
English 1	3	0	3
English 2	3	0	3
English 3 (Technical Communications)	3	0	3
Pilipino 1	3	0	3
Pilipino 2	3	0	3
Sub-total	15	0	15

Classification/ Field / Course	Minimum No. of Hours/Week		Minimum Credit Units
	Lecture	Laboratory	
D. Mandated Course			
Rizal's Life, Works and Writings	3	0	3
Sub-total	3	0	3
E. Physical Education			
P.E. 1			2
P.E. 2			2
P.E. 3			2
P.E. 4			2
Sub-total			8
F. National Service Training Program			
NSTP 1			3
NSTP 2			3
Sub-total			6
GRAND TOTAL	176	84	221

***Suggested Track Elective Courses**

1. **Power System Operation**
 - 1.1 Power System Planning
 - 1.2 Power System Operation and Control
 - 1.3 Power System Dynamics and Stability
 - 1.4 Power System Market Operation
2. **Power System Protection**
 - 2.1 Protection of Alternators, Transformers, Bus-bars and Lines
 - 2.2 Protective Relaying
 - 2.3 Surge Protection in Power System
 - 2.4 High Voltage Insulation Engineering
3. **Power System Economics**
 - 3.1 Power System Planning
 - 3.2 Power System Reliability
 - 3.3 Economic Operation of Power System
 - 3.4 Power Quality & Demand Side Management (DSM)
4. **Advance Power System Design**
 - 4.1 Distribution Design
 - 4.2 Transmission Design
 - 4.3 CAD in Power System Analysis & Design
 - 4.4 Systems Protection Design
5. **Advance Electrical Design**
 - 5.1 Advance Illumination Design

- 5.2 High Rise Building Design
- 5.3 Sub-station Design
- 5.4 High-Voltage DC Cable Design or Underground Cable Design
- 6. Entrepreneurship**
 - 6.1 Project Management
 - 6.2 Project Testing Design & Documentation
 - 6.3 Total Quality Management
 - 6.4 Sales and Marketing Management
- 7. Machine Automation and Process Control**
 - 7.1 Pneumatics & Process Control
 - 7.2 Electropneumatics
 - 7.3 Programmable Logic Controllers in Manufacturing & Power System
 - 7.4 Human Machine Interface
- 8. Renewable Energy Resources Design**
 - 8.1 Nuclear Energy
 - 8.2 Solar Energy
 - 8.3 Wave Energy
 - 8.4 Wind Energy
 - 8.5 Biomass Energy

**Note: The school may adopt and develop course specification for each course.*

SUMMARY OF THE BSEE CURRICULUM

Classification/ Field	Total no. of Hours		Total No. of Units
	Lecture	Laboratory	
I. Technical Courses			
A. Mathematics	26	0	26
B. Natural Sciences	9	9	12
C. Basic Engineering Sciences	17	12	21
D. Allied Courses	36	24	44
E. Professional Courses	37	39	53
F. Electives	12	0	12
TOTAL (TECHNICAL)	137	84	168
II. Non-Technical Courses			
A. Social Sciences	12	0	12
B. Humanities	9	0	9
C. Language	15	0	15
D. Mandated Course	3	0	3

Classification/ Field	Total no. of Hours		Total No. of Units
	Lecture	Laboratory	
Physical Education			8
NSTP			6
TOTAL (NON-TECHNICAL)			53
GRAND TOTAL	176	84	221

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

The relationships of the identified courses in section 8 to the identified program outcomes in section 4-4.2 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 are complied with.

FIRST YEAR

First Year -First Semester

Subjects	No. of Hours		Total units	Pre-Requisite
	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
Pilipino 1	3	0	3	none
English 1	3	0	3	none
Social Science 1	3	0	3	none
PE 1	2	0	2	
SUB-TOTAL	20	6	22	

First Year -Second Semester

Subjects	No. of Hours		Total Units	Pre-Requisite
	Lec	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
Pilipino 2	3	0	3	
English 2	3	0	3	
Social Science 2	3	0	3	
Humanities 1	3	0	3	
PE 2	2	0	2	
SUB-TOTAL	20	0	20	

SECOND YEAR

Second Year - First Semester

Subjects	No. of Hours		Total Units	Prerequisite
	Lec	Lab		
Differential Calculus	4	0	4	Analytic Geometry, Solid Mensuration, Advanced Algebra
Physics 1	3	3	4	College Algebra, Plane and Spherical Trigonometry
English 3 Technical Communication	3	0	3	
Social Science 3	3	0	3	
Humanities 2	3	0	3	
Rizal Life, Works and Writing	3	0	3	
PE 3	2	0	2	
NSTP 1	3	0	3	
SUB-TOTAL	24	3	25	

Second Year -Second Semester

Subjects	No. of Hours		Total Units	Prerequisite
	Lec	Lab		
Integral Calculus	4	0	4	Differential Calculus
Physics 2	3	3	4	Physics 1
Humanities 3	3	0	3	
Social Science 4	3	0	3	
Probability & Statistics	3	0	3	College Algebra
PE 4	2	0	2	
NSTP 2	3	0	3	
Computer Fundamentals & Programming	0	6	2	Second Year Standing
SUB-TOTAL	21	9	24	

THIRD YEAR

Third Year -First Semester

Subjects	No. of Hours		Total Units	Pre-Requirement
	Lec	Lab		
Computer Aided - Drafting	0	3	1	Third Year Standing
Differential Equation	3	0	3	Integral Calculus
Fundamentals of Materials Science and Engineering	3	0	3	General Chemistry, Physics 2
Statics of Rigid Bodies	3	0	3	Physics 1, Integral Calculus
Electromagnetics	3	0	3	Physics 2, Integral calculus
Electrical Circuits I	3	3	4	Physics 2, Integral Calculus
Electronic Circuits and Devices	2	3	3	Physics 2, Integral Calculus
Engineering Economy	3	0	3	Third Year Standing
SUB-TOTAL	20	9	23	

Third Year -Second Semester

Subjects	No. of Hours		Total Units	Pre-Requisite
	Lec	Lab		
Advanced Engineering Mathematics for EE	3	0	3	Differential Equation
Dynamics of Rigid Bodies	2	0	2	Statics of Rigid Bodies
Environmental Engineering	2	0	2	General Chemistry
Mechanics of Deformable Bodies	3	0	3	Statics of Rigid Bodies
Electronic Circuits Analysis and Design	2	3	3	Electronic Circuits and Devices
Basic Thermodynamics	3	0	3	Integral Calculus, Physics 2
Electrical Circuits 2	3	3	4	Electrical Circuits 1
Safety Management	1	0	1	Third Year Standing
SUB-TOTAL	19	6	21	

FOURTH YEAR

Fourth Year -First Semester

Subjects	Minimum Hours			Pre-Requisite
	Lec	Lab	Units	
Logic Circuit and Switching Theory	3	3	4	Electronic Circuits Analysis and Design
DC Machinery	2	3	3	Electrical Circuits 2
Principles of Communication	3	3	4	Electronic Circuits Analysis and Design, Advanced Eng'g Math for EE
Control System Analysis	3	0	3	Advanced Eng'g Math for EE
Electrical Circuits 3	2	3	3	Electrical Circuits 2
Mechanics of Fluid	2	0	2	Mechanics of Deformable Bodies
Numerical Methods with Computer Application	2	3	3	Advanced Eng'g Math for EE
SUB-TOTAL	17	15	22	

Fourth Year -Second Semester

Subjects	No. of Hours		Units	Pre-Requisite
	Lec	Lab		
Microprocessor System	2	3	3	Logic Circuit and Switching Theory
AC Machinery	3	3	4	DC Machinery, Electrical Circuits 3
Industrial Electronics	3	3	4	Electronic Circuits Analysis and Design
Professional Elective 1	3	0	3	Fourth year standing
EE Laws, Contract and Ethics	2	0	2	Fourth year standing
AC Apparatus and Devices	2	3	3	co- requisite-AC machinery
Research Methods for EE	1	0	1	Fourth year standing
SUB-TOTAL	16	12	20	

SUMMER				
OJT			3	

FIFTH YEAR

Fifth Year -First Semester

Subjects	No. of Hours		Total Units	Pre-Requisite
	Lec	Lab		
Instrumentation and Control	2	3	3	Industrial Electronics
Electrical Transmission & Distribution system	3	3	4	AC Machinery, Electrical Circuits 3
Information Technology	2	3	3	Principle of Communication
Professional Elective 2	3	0	3	
Illumination Engineering Design	2	3	3	Co-requisite-Electrical System Design
Electrical System Design	2	3	3	AC Apparatus and Devices
Research Project	0	3	1	Research Methods for EE
SUB-TOTAL	14	18	20	

Fifth Year - Second Semester

Subjects	No. of Hours		Total Units	Pre-Requisite
	Lec	Lab		
Electrical Equipment Operation & Maintenance	3	0	3	AC Apparatus and Devices
Power Plant Engineering	2	3	3	Co-requisite-Power System Analysis & Design
Seminars and Field Trips	1	0	1	Fifth year standing
Professional Elective 3	3	0	3	
Professional Elective 4	3	0	3	
EE Safety	1	0	1	Safety Management
Power System Analysis & Design	3	3	4	Electrical System Design
Engineering Management	3	0	3	Third Year Standing
SUB-TOTAL	18	9	21	
GRAND TOTAL	176	84	221	

Section 11. Thesis/Research/project requirement

11.1 The Thesis /research/project requirement shall focus on any of the following areas:

- 11.1.1 Alternative Energy Resources
- 11.1.2 Innovative Electrical Equipment Design
- 11.1.3 Development of software for Power System Analysis and Design
- 11.1.4 Development of software for Electrical Circuit Analysis
- 11.1.5 Development of software for Illumination Engineering Design
- 11.1.6 Design of means of transportation using electricity
- 11.1.6 Development of low-cost sustainable ecomaterials for electrical installations
- 11.1.7 Other projects related to the practice of the Electrical Engineering profession

Section 12. On-the-job-training / practicum requirement

12.1 On –the-job-training (OJT) with a minimum of 240 hours is required. At the discretion of the HEIs, OJT may be substituted with student projects that will enhance, modernize, and elevate the level of effectiveness and relevance of electrical engineering education.

ARTICLE VI - COURSE SPECIFICATION

- Section 13.** The course specifications for the BS Electrical 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 14.** The following general requirements for the BS Electrical 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 15.** HEIs that have been granted permit or recognition for Bachelor of Science in Electrical Engineering degree program are hereby given a non-extendable period of four (4) years from the effectivity thereof, within which to fully comply. 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 Electrical Engineering programs 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 16.** 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 "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 17.** Any provision of this Order, which may thereafter be held invalid, shall not effect the remaining provisions.
- Section 18.** 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 XI - EFFECTIVITY CLAUSE

- Section 19.** This CMO shall take effect starting 1st semester of SY 2008-2009, after publication in an official gazette or in newspaper of general circulation.
- Section 20.** An educational institution applying to offer the new BSEE program shall likewise comply with all the provisions of this CMO. Permit to operate shall be issued on HEIs upon compliance with this CMO and CMO No. 25, s. 2005.

Pasig City, Philippines July 15, 2008

For the Commission:


ROMULO L. NERI
Chairman