

Updates from the CHED: The New BS Math and BS Applied Math Programs¹

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Abstract

The existing Policies, Standards, and Guidelines (PSG) for the BS Mathematics and BS Applied Mathematics programs (CMO No. 19, s. 2007) are being updated in view of the 2013 promulgation of the K to 12 basic education program (RA 10533) and approval of the new CHED General Education Curriculum (CMO No. 20, s. 2013). The proposed new curricula for the two undergraduate programs, prepared by the CHED Technical Committee for Mathematics in consultation with various stakeholders, will be presented for comments and discussion.

I. Introduction

Baccalaureate programs in the country are undergoing revisions due to the addition of two years to basic education as promulgated by R.A. 10533 s. 2013 and the issuance of CMO 19 s. 2013 that prescribes a new CHED General Education program. The CHED Technical Committee for Mathematics has drafted a revised Policies, Standards, and Guidelines (PSG) for the Bachelor of Science in Mathematics and Bachelor of Science in Applied Mathematics programs. The proposed new PSG is intended to replace the existing document that was issued through CMO No. 19, s. 2007. The general features of the draft PSG are reported in this paper. Other activities and initiatives of the CHED are also presented.

II. The Technical Panel for Science and Math and Technical Committee for Math

The Commission on Higher Education of the Philippines, abbreviated as CHED, is attached to the Office of the President for administrative purposes. It covers both public and private higher education institutions as well as degree-granting programs in all post-secondary educational institutions in the country.

The creation of CHED was part of a broad agenda for reforms in the country's education system, outlined by the Congressional Commission on Education (EDCOM) in 1992. Part of the reforms is the trifocalization of the education sector. The three governing bodies in the education sector are the Commission on Higher Education (CHED) for tertiary and graduate education, the Department of Education (DepEd)

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for basic education, and the Technical Education and Skills Development Authority (TESDA) for technical-vocational and middle level education.

The Commission constitutes technical panels for different disciplines and program areas. These technical panels assist the Commission in setting standards and in program and institution monitoring and evaluation. The technical panels shall be composed of senior specialists or academicians to be appointed by the Commission.

Eight disciplines are represented in the Technical Panel for Science and Mathematics (TPSM), namely: Biology and Molecular Biology, Chemistry, Environmental Science, Geology, Marine Science, Mathematics, Physics, and Statistics. The current TPSM Chair is Fr. Bienvenido Nebres, S.J. The Co-chair is Dr. Ester Albano-Garcia. The TPSM provides technical expertise to CHED in:

- Conceptualizing and developing policies, standards and guidelines (PSG), rules and regulations, and plans concerning operation of higher education programs;
- Evaluating compliance of HEIs to minimum standards for purposes of issuance of permit and recognition, provision of incentives, and imposition of sanctions such as program termination and closure;
- Formulating guidelines and criteria for COE/CODs;
- Developing assessment instruments for monitoring and evaluating tasks; and
- Other assigned tasks.

A Technical Committee assists the TPSM in undertaking its tasks and activities. Dr. Jose Maria P. Balmaceda (UPD) chairs the the Technical Committee for Mathematics (TC-Math). The members are Dr. Ferdinand P. Jamil (MSU-IIT), Dr. Reginaldo M. Marcelo (ADMU), Dr. Leonor A. Ruivivar (DLSU), and Dr. Jumela F. Sarmiento (ADMU). The TC-MATH Chair sits as member of the TPSM.

III. Current Education Reform in the Philippines

In the recent years, several major reform programs have been initiated at both the basic and tertiary level. The most significant is the addition of two years to basic education, through Republic Act 10533, enacted in 2013. The new Grades 11 and 12, comprising senior high school, will be implemented starting AY 2016-2017 for all students.

In view of this addition of two years to high school, CHED has also issued CMO 20, s. 2013: The New General Education Curriculum. This is a new set of required and elective inter-disciplinary courses with a liberal education perspective. Unlike courses specific to a field or degree program that focus on specialized knowledge or technical skills, GE courses aim at the holistic development of students through the development not only of intellectual competencies but also personal and civic

competencies. Previous GE courses that were remedial in nature are now expected to be covered in high school.

Another critical initiative at the tertiary level is CHED's advocacy for a paradigm shift to a learner-centered and outcomes-based framework for tertiary education, issued as CMO 46 s. 2012: Outcomes- and Typology-based Quality Assurance. As a consequence of this paradigm shift, the proposed new PSG will contain several features reflecting the outcomes-based approach. Among these are the following:

- Minimum standards are expressed as a minimum set of desired program outcomes.
- Program outcomes and performance indicators shall be specified.
- A mapping of courses (curriculum map) to outcomes shall be included
- For each course, an outcomes-based syllabus will be prepared.

Importantly, HEIs shall be given space to innovate their curricula in line with their assessment of how best to achieve the learning outcomes in their particular contexts and missions.

On the part of the Technical Committee, the revisions to the PSG have been undertaken in two stages. For the first stage, CMO No. 20 s. 2007 was transformation to an OBE-aligned syllabus, without revision of courses (program of study). This task was completed in 2014. The transformed PSG was presented last November 2014 to heads of Math Depts in regional public meetings held in Manila and Davao.

Stage 2 of the revision will include the particular changes to the curricula or program of study. These changes will address the effects of the K-12 reform and the approval of the new CHED GE Program. A draft of the revised PSG is now being presented to various stakeholders. A public hearing presenting the proposed PSG will be officially conducted before December 2015. Final approval by the Commission en banc is expected by the first quarter of 2016.

IV. The Proposed Curricula for the BS Math and BS Mathematics Programs

The existing "Programs, Standards, Guidelines" or PSG for the BS Math and BS Applied Math programs were issued in 2007 (CMO No. 19). The existing document needs to be revised to incorporate the changes due to K-12 and the new CHED GE curriculum and to reflect an OBE-philosophy. The revised PSG will be implemented in AY 2018-2019; however, CHED intends to approve the new document this 2015 or in early 2016 to give the HEIs time to prepare. The proposed new PSG is presented in this section.

To understand the changes proposed by the Technical Committee, let us compare the new General Education program (to be implemented in AY 2018-2019) with the current program, given in Tables 1 and 2.

FIELD OF STUDY	SPECIFIC COURSES	UNITS	TOTAL
Language and Humanities	English Filipino Humanities subjects (Art, Literature, Communication, etc)	6 6 9	21
Math, IT and Natural Sciences	Math (Precalculus) Natural Science courses Elective (IT, STS, etc)	6 6 3	15
Social Sciences	Subjects such as Political Science, Psychology, Sociology, History, etc.	12	12
Mandated	Life and Works of Rizal	3	3
TOTAL		51	51

Table 1. The Current CHED General Education Program

	SPECIFIC COURSES*	UNITS
Required GE Core Courses	<ol style="list-style-type: none"> 1. Understanding the Self 2. Readings in Philippine History 3. Contemporary World 4. Mathematics in the Modern World 5. Purposive Communication 6. Art Appreciation 7. Science, Technology and Society 8. Ethics 	24
Electives	<ul style="list-style-type: none"> • Three (3) additional GE elective courses [inter-disciplinary, integrative courses] covering at least 2 domains 	9
Mandated Course	<ul style="list-style-type: none"> • Life and Works of Rizal 	3
TOTAL		36

Table 2. The New CHED General Education Program

The graduates of the new BS Math and BS Applied Math programs

- shall be equipped with enhanced mathematical and critical thinking skills;
- are expected to have developed deeper appreciation and understanding of the importance of mathematics in history and the modern world;
- are able to do research or perform jobs that require analytical thinking and quantitative skills.

The curricula provide students with substantial exposure to the breadth and depth of mathematics, from classical to contemporary, and from theoretical to applied. The program of study covers foundational courses in core areas of math/applied math as well as advanced courses that will help prepare graduates to pursue higher studies or work in a variety of fields

EXISTING BS MATH/APPLIED		PROPOSED BS MATH/APPLIED	
COMPONENTS	UNITS	COMPONENTS	UNITS
General Education	51	General Education Program	36
Core Math	46*	Core Math	51
		Non-Math Foundational Courses	10
Electives		Electives	
1. Math/Applied Math	(15)18	1. Math/Applied Math	
2. Free	6	2. Cognates/Qualified Electives	
		3. Free	
Thesis/ Special Problem	(3)	Thesis/ Special Prob	3
TOTAL	121	TOTAL	121

Table 3. Comparison of the current and proposed BS Math and BS Applied Math programs (*Precalculus is included under the GE Component in the current curricula.)

COMPONENTS	CURRENT	PROPOSED	RATIONALE
General Education	51	36	New CHED GE program
Core Math	46	51	Two courses added; 12u for calculus (4-4-4)
Non-Math Foundation	-	10	These are required discipline-specific courses
Electives			*6 u of electives may be taken from qualified electives or cognate courses instead of math/app
1. Math/App Math	(15)18	9	
2. Cognates	-	6	
Qualified Elect*			
3. Free	6	6	
Thesis/ Special Problem	(3)	3	Thesis or special problem is now required
TOTAL	121	121	

Table 4. Components of the Proposed BS Math and BS Applied Math Programs

Further details of the curricular changes are given below.

- There will be two additional required 3-unit core courses for BS Math, namely, Topology and a choice of either Numerical Analysis or Mathematical Modeling.
- There will be two additional required 3-unit core courses for BS Applied Math, namely, Fundamental Concepts of Mathematics, and Mathematical Modeling.
- The Calculus series is being revised from 13 units (5-5-3 units) to 12 units (4-4-4 units) as some topics may be covered faster due to the inclusion of a Basic Calculus (80 hrs) course in Grade 11.
- The Statistics course will be replaced by a “higher” course, i.e., Statistical Theory, because the senior high school curriculum will now include a Statistics and Probability course in Grade 11/12 covering the following topics: random variables and probability distribution, normal distribution, sampling and sampling distributions, estimation of parameters, tests of hypothesis, and correlation and regression analysis.³
- In the current curriculum, either 15 or 18 units of math electives were included (18 units if program has no thesis or special problem). In the proposed new curriculum, a thesis or special problem course will be required (3 u). Thus, in the new curriculum, there will be 15 units of electives. Six (6) units of free electives are retained.
- The 15 units of electives are further broken down into two categories: nine (9) math or applied math electives, and six (6) units of cognates or qualified electives (the six units may also be taken from math or applied math electives). Qualified electives or cognates are any academic courses offered in allied or relevant fields chosen by a student and approved by the program adviser. Together with the math/applied math electives, these courses serve to incorporate a research focus or specialization to the student’s program.
- A new program component, Non-Math Foundational Courses, consisting of a minimum of ten (10) units is being proposed in the new curriculum. These non-math courses (such as Physics, Chemistry or certain skills courses, e.g. communication) may have been previously included by HEIs in the GE component. But as courses in the new GE are integrative with an interdisciplinary perspective, disciplinary courses will have to be placed in a different category. Thus, non-math courses specific to a discipline and relevant to the BS Math/Applied Math programs shall now be listed under this new component, given as follows:

	REQUIRED NON-MATH FOUNDATIONAL COURSES	
1	General Physics I (Mechanics) with laboratory	4

³ <http://www.deped.gov.ph/k-12/curriculum-guides>

2	Biology / Gen Chemistry I / Gen Physics II (with or without lab)	3
3	To be determined by HEI*/department	3
	TOTAL	10

Table 5. Non-Math Foundational Courses

BS MATHEMATICS	BS APPLIED MATHEMATICS
Calculus I, II, III (12u)	Calculus I, II, III (12u)
Fundamental Concepts of Math	Fundamental Concepts of Math
Fundamentals of Computing I	Fundamentals of Computing I
Differential Equations 1	Differential Equations I
Linear Algebra	Linear Algebra
Advanced Calculus I	Advanced Calculus I
Probability	Probability
Statistical Theory	Statistical Theory
Numerical Analysis/ Mathematical Modeling	Numerical Analysis
Topology	Mathematical Modeling
Modern Geometry	Discrete Mathematics
Abstract Algebra I	Operations Research
Advanced Course in Algebra or Analysis	Theory of Interest
Complex Analysis	Fundamentals of Computing II

Table 6. List of Required Math/Applied Math Courses in the new Curricula

IV. Other Activities of the Technical Committee for Mathematics

Centers of Excellence (COEs) are higher education institutions (HEIs) both public and private which have demonstrated the highest degree or level of standards along the areas of instruction, research and extension of their particular fields or courses. Centers of Development (COD) on the other hand, are educational disciplines which

have been considered to significantly improve over the course of the previous year. These provide institutional leadership in all aspects of development in specific areas of discipline in the various regions by providing networking arrangements to help ensure the accelerated development of Higher Educational Institutions in their respective service areas.

CHED recently issued a call for renewals or new applications for Center of Excellence (COE) and Center of Development (COD) designation. CMO 12 s. of 2015 prescribes the minimum standards for the selection of COEs and CODs for Science and Mathematics. Notably, the new standards now require that COEs in Mathematics must have an active Ph.D. Mathematics program and CODs in Mathematics must have an active MS Mathematics or MS Applied Mathematics Program. The evaluation criteria for Mathematics COEs and CODs is given in Table 6.

ELEMENTS		100%	INDICATORS
1. Instructional Quality		45%	
• Faculty	40%		Quality of faculty, facilities, and teaching programs; responsiveness of curriculum; efficiency in administration; enrolment and graduation data
• Physical Plant	20%		
• Students	15%		
• Programs	10%		
• Curriculum	10%		
• Administration	5%		
2. Research and Publication		30%	
• Publications/other activities	60%		Productivity of faculty; quality of research infrastructure
• Personnel	25%		
• Research Facilities	15%		
3. Extension and Linkages		20%	
4. Institutional Qualifications		5%	

Table 6. Selection Criteria for Math Center of Excellence (COE) and Center of Development (COD)

Another important development is a recently concluded agreement between CHED TPSM and DepEd, for the preparation of Teaching-Learning Guides/ Modules

for the senior high school math and physics courses. The writers will be supplied by the TPSM. For mathematics, writing teams for the following senior high school courses and coordinators have been constituted: (i) General Mathematics; (ii) Precalculus; (iii) Basic Calculus; and (iv) Probability and Statistics.

End

References

1. <http://www.ched.gov.ph>: Commission on Higher Education
2. <http://www.deped.gov.ph/k-12/curriculum-guides>
3. Republic Act 10533 s. 2013: The Enhanced Basic Education Act
4. CMO No. 19, s. 2013: The New CHED General Education Program
5. CMO No. 46, s. 2013: A Typology- and Outcomes-based Approach in Quality Assurance
6. CMO No. 12, s. 2015: Standards for Selection of COE and COD in Science and Mathematics