DepED
DEPARTMENT OF EDUCATION

Philippine National
Research Center for Teacher Quality

Prototype Syllabi for Pre-service Teacher Education
Compendium Series

COMPENDIUM 6:

Bachelor of Secondary Education

Mathematics Specialization Courses

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List of Acronyms

BTI	beginning teacher indicator
CLO	Course learning outcome
CMO	CHED Memorandum Order
COD	Center of Development
COE	Center of Excellence
ILO	Intended learning outcome
IM	Instructional material
OBE	Outcome-based Education
OECD	Organisation for Economic Co-operation and Development
PPST	Philippine Professional Standards for Teachers
PSG	Policies, Standards and Guidelines
PST	pre-service teacher
TEI	teacher education institution
TLA	teaching and learning activity
TOS	table of specifications

PROJECT BACKGROUND

Rationale

This compendium is one of ten in the series of **Prototype Syllabi on Priority Programs in Pre-service Teacher Education** developed through the Philippine National Research Center for Teacher Quality (RCTQ), with the Teacher Education Council (TEC) as lead, in partnership with select Centers of Excellence and Centers of Development in Teacher Education. The Development of PPST-based Prototype Syllabi on Priority Programs in Pre-Service Teacher Education Project aims to further align current teacher education curricula with the Philippine Professional Standards for Teachers (PPST) to ensure that the future educators are geared towards educating students for a long term and sustainable nation building.

The PPST-based prototype syllabi aim to provide a benchmark that TEIs can adopt or adapt to enhance their curricula. This promotes shared understanding and expectations of quality pre-service training throughout the country.

"Teacher qualifications, teacher's knowledge and skills, make more difference for student learning than any other single factor."
(Darling-Hammond, 2011)

The Philippine Professional Standards for Teachers (PPST)

The National Adoption and Implementation of the Philippine Professional Standards for Teachers (PPST) (DepEd Order No. 42, S. 2017) sets clear expectations of teachers along well-defined career stages. In adopting it, DepEd integrates PPST in all its professional development programs, learning and delivery systems, and HR systems. The DepEd adoption and integration of the PPST necessitate that Teacher Education Institutions (TEIs) align their curricula with what the department needs. The new CHED-issued PSGs on teacher education (2017) are based on PPST to ensure that every graduate of pre-service teacher education programs can cope with the demands of DepEd. The development of prototype syllabi supports new pre-service teacher education curriculum based on CHED requirements and DepEd needs.

Linking Theory to Practice

The developed prototype syllabi do not only respond to the curricular requirements of the PPST and CHED's PSGs. A key feature of the syllabi is the inclusion of activities that give opportunities for pre-service teachers to put their learnings into practice. This supports international studies on linking theory to practice. According to Darling-Hammond (George Lucas Educational Foundation, 2001):

> *"It's hard to learn theoretical ideas in isolation, try to remember them for two years until you get to student teaching, and then all of sudden be put in a situation where you're supposed to implement something you've never seen in practice. That doesn't work. That's the old model of teacher education."*

The prototype syllabi were anchored on the core principles of the **Pre-service Teachers' Practice-based Training (PSTePT) framework**, developed by RCTQ, with TEC as lead, and select COEs and CODs in teacher education. In this framework, practice-based teacher education training is described as experiential, developmental, formative, integrative and system-based. It is an attempt to integrate practicum into the course work of pre-service teachers starting from their professional education courses, by recommending the inclusion of experiential activities in the field like observations, interviews, and other opportunities to demonstrate their understanding of theories to actual practice.

Partnerships Towards Quality Pre-service Teacher Education

RCTQ and TEC partnered with select teacher education institutions on the development of 10 compendiums of prototype syllabi. Two to three TEIs collaboratively worked on one compendium/priority program. Three to four writers per institution were sent to attend a series of writeshops, reviews and validation to finalize the outputs.

Partner institutions in the development of the PPST-based Prototype Syllabi

CORDILLERA ADMINISTRATIVE REGION

Benguet State University
Values Education

University of the Cordilleras
Social Studies

Saint Louis University
Values Education

REGION I

Pangasinan State University
Social Studies

REGION II

Saint Mary's University
Science

REGION III

Angeles University Foundation
Physical Education

REGION V

Ateneo De Naga University
Elementary Education

Bicol University
Elementary Education

***Priority Program in which the institution served as lead writer**

REGION VIII

Leyte Normal University

Filipino

Southern Leyte State University

Filipino

REGION VII

University of San Jose-Recoletos

English

Cebu Normal University

English

REGION IX

Ateneo De Zamboanga University

Mathematics

Western Mindanao State University

Professional Education

REGION X

Bukidnon State University

Professional Education

Xavier University

Mathematics

NATIONAL CAPITAL REGION

Centro Escolar University

Early Childhood Education

De La Salle University - Manila

Science

Philippine Normal University

Professional Education
Physical Education

University of Asia and the Pacific

Early Childhood Education

PPST-BASED PROTOTYPE SYLLABI PRIORITY PROGRAMS

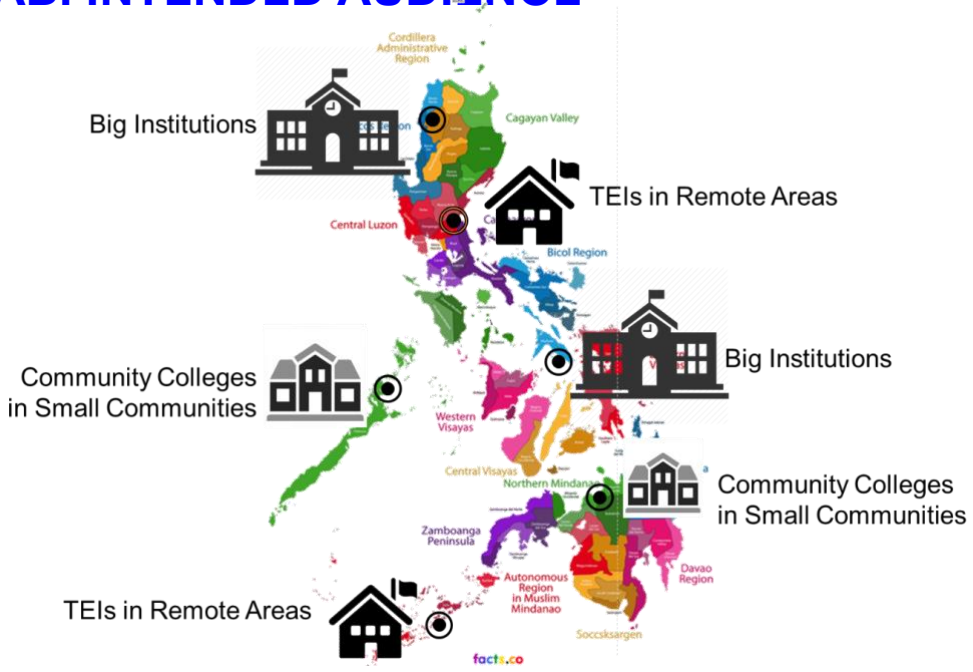
The priority programs were selected based on various consultations. The prototype syllabi are on the following programs:

- Early Childhood Education
- Elementary Education
- English
- Filipino
- Mathematics
- Physical Education
- Science
- Social Studies
- Values Education

PPST-BASED PROTOTYPE SYLLABI INTENDED AUDIENCE

The developed prototype syllabi are intended to assist all TEIs in the country. Specifically, they were developed to assist community colleges, colleges in remote areas, and other teacher education institutions to have further guidance in enhancing their teacher education curriculum.

Through established partnerships with COEs and CODs in teacher education across the country and the guidance of the Teacher Education Council, the continuity of the usability and impact of the the PPST-based prototype syllabi is ensured.



THE PROTOTYPE SYLLABI DEVELOPMENT PROCESS

The development followed three key phases:

Planning

Activities
- Develop the key features of the prototype syllabi
- Benchmark the syllabi template
- Select partner institutions and syllabi writers
- Map the pre-service teacher education curriculum to the K to 12 curriculum

Upskilling the Writers

Activities
- Review of the Beginning Teacher Indicators of PPST
- Review the Curriculum Quality Audit (CQA) Process for curriculum enhancement
- Writeshops
- Review and validation of interim outputs (though the TWG, the writing group and other specialists)

Review and Validation of Outputs

Activities
- Review of interim outputs during the 2018 Teacher Education Council Convention
- Review of alignment to the PPST through CQA process
- Review and validation with various stakeholders
  - December 6, 2018 - Review of interim outputs during the Teacher Education Council Convention with representatives from COEs and CODs
  - December-February 2018 – Review of the Technical Working group
  - January-February 2019 – Reviews from Partner Institutions
  - January 30-February 1 – Review from Non-Partner Institutions
  - February 13-16, 2019 – Curriculum Quality Audit review

GUIDE TO THE PROTOTYPE SYLLABI COMPENDIUM

This compendium is one of 10 in the PPST-based Prototype Syllabi in Pre-service Teacher Education Compendium Series:

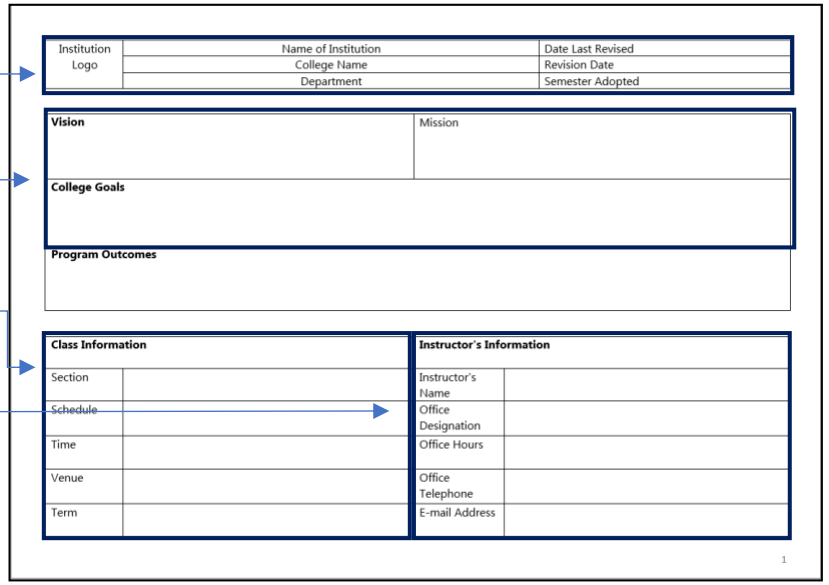
Compendium 1: Professional Education Courses
Compendium 2: Early Childhood Education Specialization Courses
Compendium 3: Elementary Education Specialization Courses
Compendium 4: English Specialization Courses
Compendium 5: Filipino Specialization Courses
Compendium 6: Mathematics Specialization Courses
Compendium 7: Physical Education Specialization Courses
Compendium 8: Science Specialization Courses
Compendium 9: Social Studies Specialization Courses
Compendium 10: Values Education Specialization Courses

Each compendium contains prototype syllabi that Teacher Education Institutions (TEIs) could either adapt or adopt. Parts of the prototype syllabi template were benchmarked from local and international sources and were agreed upon by the Technical Working Group and partner institutions.

GUIDE TO READING AND UNDERSTANDING THE PPST-BASED PROTOTYPE SYLLABI

Each prototype syllabi contains the common parts like:

- Institutional Logo and other information
- Vision, Mission and College Goals
- Class Information/Schedule
- Instructor's Information
- Course Information



Institution Logo	Name of Institution	Date Last Revised
	College Name	Revision Date
	Department	Semester Adopted

Vision	Mission
College Goals	
Program Outcomes	

Class Information		Instructor's Information	
Section		Instructor's Name	
Schedule		Office Designation	
Time		Office Hours	
Venue		Office Telephone	
Term		E-mail Address	

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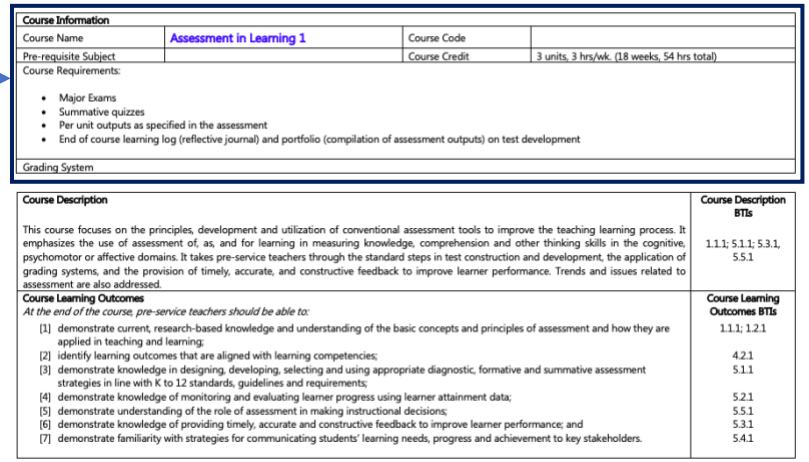


Course Information			
Course Name	Assessment in Learning 1	Course Code	
Pre-requisite Subject		Course Credit	3 units, 3 hrs/wk. (18 weeks, 54 hrs total)

Course Requirements:

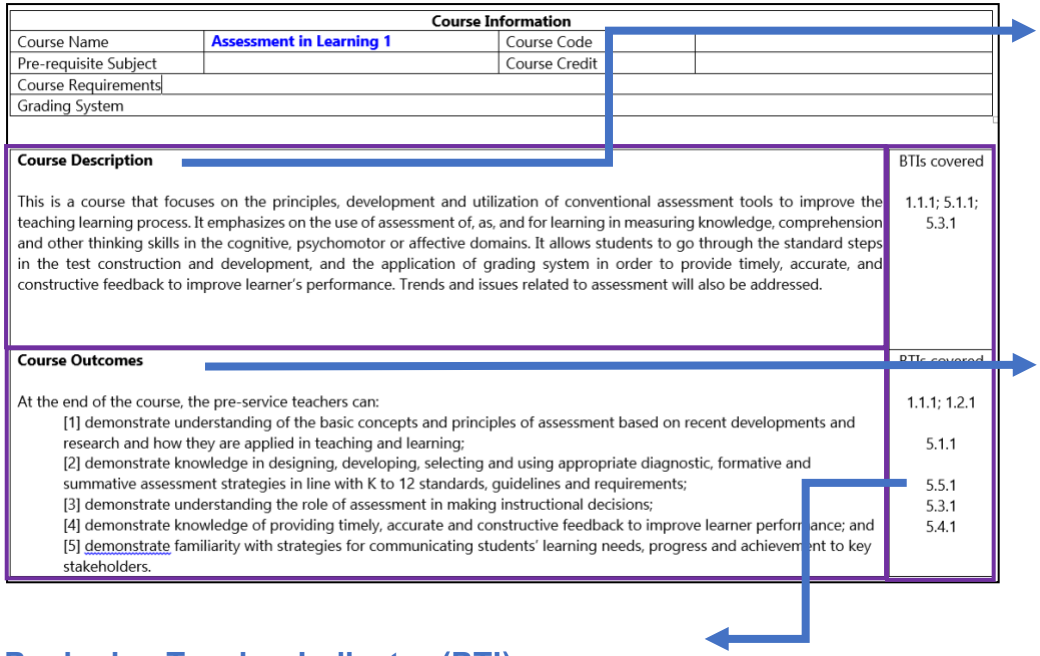
- Major Exams
- Summative quizzes
- Per unit outputs as specified in the assessment
- End of course learning log (reflective journal) and portfolio (compilation of assessment outputs) on test development

Grading System

Course Description	Course Description BTIs
This course focuses on the principles, development and utilization of conventional assessment tools to improve the teaching learning process. It emphasizes the use of assessment of, as, and for learning in measuring knowledge, comprehension and other thinking skills in the cognitive, psychomotor or affective domains. It takes pre-service teachers through the standard steps in test construction and development, the application of grading systems, and the provision of timely, accurate, and constructive feedback to improve learner performance. Trends and issues related to assessment are also addressed.	1.1.1; 5.1.1; 5.3.1, 5.5.1
Course Learning Outcomes *At the end of the course, pre-service teachers should be able to:*	**Course Learning Outcomes BTIs**
[1] demonstrate current, research-based knowledge and understanding of the basic concepts and principles of assessment and how they are applied in teaching and learning;	1.1.1; 1.2.1
[2] identify learning outcomes that are aligned with learning competencies;	4.2.1
[3] demonstrate knowledge in designing, developing, selecting and using appropriate diagnostic, formative and summative assessment strategies in line with K to 12 standards, guidelines and requirements;	5.1.1
[4] demonstrate knowledge of monitoring and evaluating learner progress using learner attainment data;	5.2.1
[5] demonstrate understanding of the role of assessment in making instructional decisions;	5.5.1
[6] demonstrate knowledge of providing timely, accurate and constructive feedback to improve learner performance; and	5.3.1
[7] demonstrate familiarity with strategies for communicating students' learning needs, progress and achievement to key stakeholders.	5.4.1

These parts were intentionally left blank and will be up to the teacher education institution, college of education and/or the faculty handling the course to fill in.

The remaining parts have been filled in by the technical working group, research team and writers. They are designed to be adopted or to serve as a benchmark and model that may be adapted by teacher education institutions, colleges of education and/or the faculty handling the course.



Course Information			
Course Name	Assessment in Learning 1	Course Code	
Pre-requisite Subject		Course Credit	
Course Requirements			
Grading System			

Course Description	BTIs covered
This is a course that focuses on the principles, development and utilization of conventional assessment tools to improve the teaching learning process. It emphasizes on the use of assessment of, as, and for learning in measuring knowledge, comprehension and other thinking skills in the cognitive, psychomotor or affective domains. It allows students to go through the standard steps in the test construction and development, and the application of grading system in order to provide timely, accurate, and constructive feedback to improve learner's performance. Trends and issues related to assessment will also be addressed.	1.1.1; 5.1.1; 5.3.1

Course Outcomes	BTIs covered
At the end of the course, the pre-service teachers can:	1.1.1; 1.2.1
[1] demonstrate understanding of the basic concepts and principles of assessment based on recent developments and research and how they are applied in teaching and learning;	5.1.1
[2] demonstrate knowledge in designing, developing, selecting and using appropriate diagnostic, formative and summative assessment strategies in line with K to 12 standards, guidelines and requirements;	5.5.1
[3] demonstrate understanding the role of assessment in making instructional decisions;	5.3.1
[4] demonstrate knowledge of providing timely, accurate and constructive feedback to improve learner performance; and	5.4.1
[5] demonstrate familiarity with strategies for communicating students' learning needs, progress and achievement to key stakeholders.	

Course Description

The course descriptions are enhanced versions of the course descriptions in the Policies, Standards and Guidelines (PSGs). Enhancements include additional inputs and/or elaboration using the language of the PPST to clarify the intent of the course and make the alignment to the PPST more explicit.

Course Learning Outcomes

The course outcomes use the language of the standards to make alignment to the standards more explicit. The course outcomes are constructively aligned with the course description, content and assessment.

Beginning Teacher Indicator (BTI) coverage

The column for Beginning Teacher Indicators (BTIs) is a new feature in pre-service teacher education syllabi. It shows which BTIs are addressed/covered by a course. It also shows where BTIs are covered, specifically in the description, course learning outcomes, content and assessment. Mapping course components to BTIs promotes constructive alignment, that is the intentional alignment of course content, assessment and feedback to achieve course learning outcomes (Biggs, 2003; Biggs & Tang, 2011). Examining **alignment** of **outcomes**, **content** and **assessment** supports constructive alignment in outcomes-based pre-service teacher education.

Time Allotment

The Time Allotment column indicates the recommended duration to cover the content.

Intended Learning Outcomes (ILOs)

The ILOs column presents outcomes which are specific to the content covered. It presents what pre-service teachers should be able to know or do after covering the topics.

The ILOs are learner-centered rather than content-centered. They provide guidance on the focus and intent of the content to be covered.

Content

The Content column outlines topics to be covered.

Mapping to the CLOs

Aside from the BTI coverage, the prototype syllabi also map ILOs and the Suggested Assessment to the corresponsing CLO/s, to ensure constructive alignment.
Example:1.1.1 [2]

Time Allotment	Intended Learning Outcomes (ILOs)	BTIs/ CLOs	Content	Suggested Teaching Learning Activities	Suggested Assessment	BTIs/ CLOs
Week 1-2	At the end of the unit, the pre-service teacher (PST) can: a. explain the basic concepts related to child and adolescent development; and b. explain how current research and theories on child and adolescent development contribute to teaching and learning within and across different areas.	1.1.1 [1] 1.2.1 [2]	**Unit 1 – Basic Concepts** **A. Definitions of Child and Adolescent Learners** 1. Definitions from UNESCO, UNICEF and WHO **B. Growth and Development: Nature or Nurture?** **C. Periods of Development** **D. Developmental Tasks and Education (Havighurst)** **E. Domains of Development** 1. Biological 2. Cognitive 3. Socio-emotional **F. Context and Development** **G. Development and Pedagogy: Theory and Research** 1. Theories and hypotheses 2. Methodology 3. Integrating theory and practice	**Facilitated discussion using comparative study.** A comparative discussion of the definition and characteristics of child and adolescent learners coming from various sources or authorities. **Advanced reading/research.** Topics on growth and development may be given in advance to PSTs in small groups to prepare them for debate and further discussions. **Explicit Instruction.** This shall involve modelling, guided learner practice and independent learner practice. Current research shall be used to highlight key concepts, with emphasis on the integration of theory into practice. Online journal search strategies will also be introduced to promote PSTs' academic literacy.	***Summative quizzes*** ***Unit learning log or reflective journal.*** **Infographic.** The PST, individually or in small groups, will *explain* the basic concepts related to child and adolescent learners' development and growth using text and graphic presentation or infographic. The output will be presented in class or exhibited in a gallery. **Debate.** Debate may also be used to assess PSTs' understanding of the "nature or nurture" issue based on their research. Groupings will be pre-determined to guide PSTs in their research. Premium will be given on the justifications and clarity of points. **Library/Online research.** This involves the systematic gathering of information in order to write a paper, create a presentation, or complete a project. As used in this context, pre-service teachers shall gather research information on identified topics from journals. The preservice teachers shall focus on	1.1.1 [1] 1.2.1 [2] 1.1.1 [1] 1.2.1 [2] 1.1.1 [1] 1.1.1 [1] 1.2.1 [2]

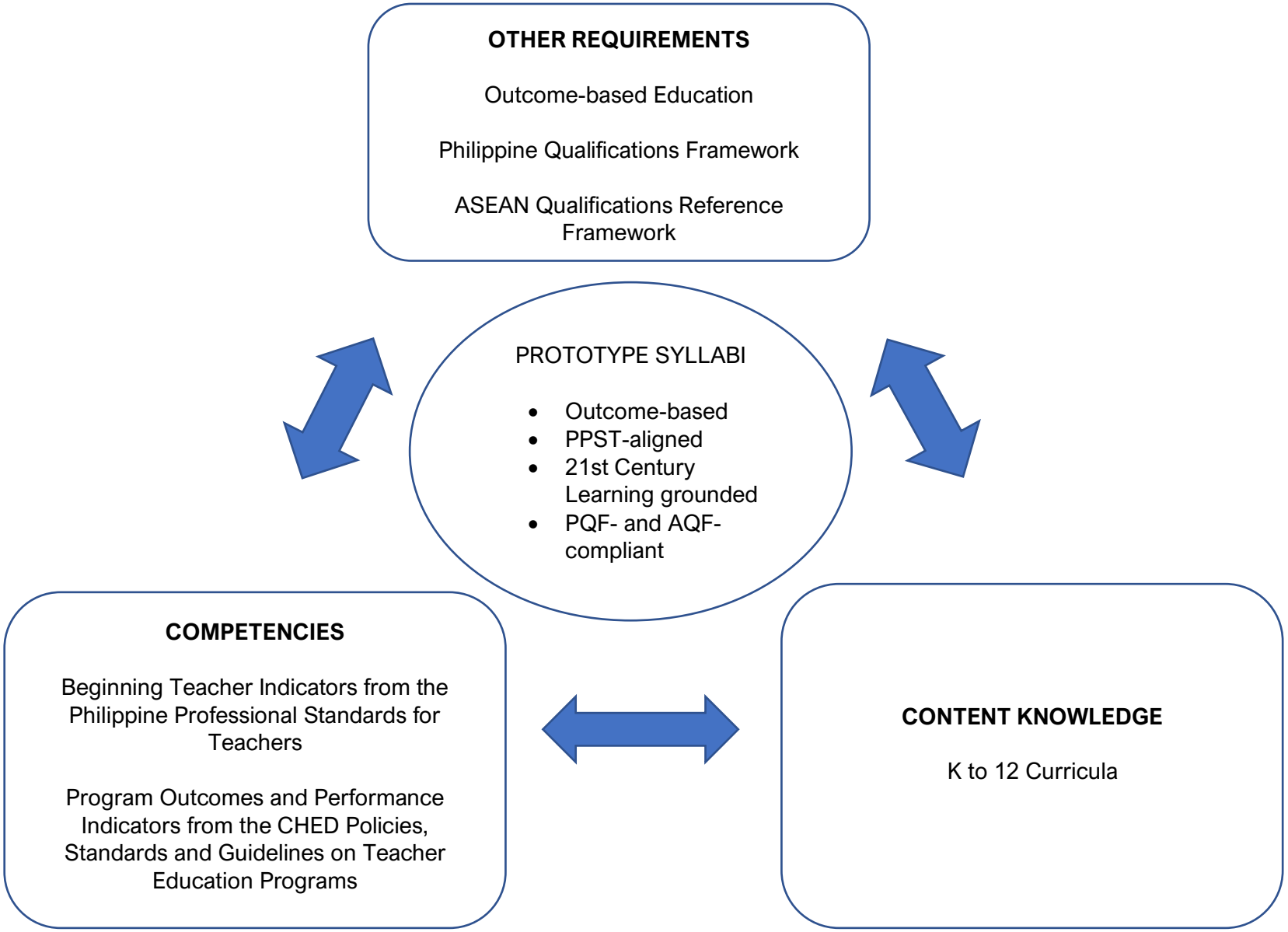
Suggested Teaching Learning Activities (TLAs)

The Suggested TLAs column indicates recommended activities to deliver the content and help facilitate the pre-service teachers' achievement of the ILOs.

Suggested Assessment

The Suggested Assessment column indicates recommended formative or summative activities to measure the achievement of the ILOs and/or mastery of the content covered.

FEATURES OF THE PROTOTYPE SYLLABI



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Readings on constructive alignment:

Biggs, J. (2003). *Aligning Teaching and Assessment to Curriculum Objectives*. Imaginative Curriculum Project, LTSN Generic Centre. https://scholar.google.com/scholar?q=%22Aligning%20Teaching%20and%20Assessment%20to%20Curriculum%20Objectives%22

Biggs, J. and Tang, C. (2011). *Teaching for quality learning at university*. Maidenhead: McGraw-Hill and Open University Press.

THE BEGINNING TEACHER INDICATORS

Domain 1: Content Knowledge and Pedagogy	Domain 2: Learning Environment	Domain 3: Diversity of Learners
1.1.1 Demonstrate content knowledge and its application within and/or across curriculum teaching areas.	2.1.1 Demonstrate knowledge of policies, guidelines and procedures that provide safe and secure learning environments.	3.1.1 Demonstrate knowledge and understanding of differentiated teaching to suit the learners' gender, needs, strengths, interests and experiences.
1.2.1 Demonstrate an understanding of research-based knowledge and principles of teaching and learning.	2.2.1 Demonstrate understanding of learning environments that promote fairness, respect and care to encourage learning.	3.2.1 Implement teaching strategies that are responsive to the learners' linguistic, cultural, socio-economic and religious backgrounds.
1.3.1 Show skills in the positive use of ICT to facilitate the teaching and learning process.	2.3.1 Demonstrate knowledge of managing classroom structure that engages learners, individually or in groups, in meaningful exploration, discovery and hands-on activities within the available physical learning environments	3.3.1 Use strategies responsive to learners with disabilities, giftedness and talents.
1.4.1 Demonstrate knowledge of teaching strategies that promote literacy and numeracy skills.	2.4.1 Demonstrate understanding of supportive learning environments that nurture and inspire learner participation.	3.4.1 Demonstrate understanding of the special educational needs of learners in difficult circumstances, including: geographic isolation; chronic illness; displacement due to armed conflict, urban resettlement or disasters; child abuse and child labor practices.
1.5.1 Apply teaching strategies that develop critical and creative thinking, and/or other higher-order thinking skills.	2.5.1 Demonstrate knowledge of learning environments that motivate learners to work productively by assuming responsibility for their own learning.	3.5.1 Demonstrate knowledge of teaching strategies that are inclusive of learners from indigenous groups.
1.6.1 Use Mother Tongue, Filipino and English to facilitate teaching and learning.	2.6.1 Demonstrate knowledge of positive and non-violent discipline in the management of learner behavior.	
1.7.1 Demonstrate an understanding of the range of verbal and non-verbal classroom communication strategies that support learner understanding, participation, engagement and achievement.		

Domain 4: Curriculum and Planning	Domain 5: Assessment and Reporting	Domain 6: Community Linkages and Professional Engagement	Domain 7: Personal Growth and Professional Development
4.1.1 Prepare developmentally sequenced teaching and learning processes to meet curriculum requirements.	5.1.1 Demonstrate knowledge of the design, selection, organization and use of diagnostic, formative and summative assessment strategies consistent with curriculum requirements.	6.1.1 Demonstrate an understanding of knowledge of learning environments that are responsive to community contexts.	7.1.1 Articulate a personal philosophy of teaching that is learner-centered.
4.2.1 Identify learning outcomes that are aligned with learning competencies.	5.2.1 Demonstrate knowledge of monitoring and evaluation of learner progress and achievement using learner attainment data.	6.2.1 Seek advice concerning strategies that build relationships with parents/guardians and the wider community.	7.2.1 Demonstrate behaviors that uphold the dignity of teaching as a profession by exhibiting qualities such as caring attitude, respect and integrity.
4.3.1 Demonstrate knowledge in the implementation of relevant and responsive learning programs.	5.3.1 Demonstrate knowledge of providing timely, accurate and constructive feedback to improve learner performance.	6.3.1 Demonstrate awareness of existing laws and regulations that apply to the teaching profession, and become familiar with the responsibilities specified in the Code of Ethics for Professional Teachers.	7.3.1 Seek opportunities to establish professional links with colleagues.
4.4.1 Seek advice concerning strategies that can enrich teaching practice.	5.4.1 Demonstrate familiarity with a range of strategies for communicating learner needs, progress and achievement.	6.4.1 Demonstrate knowledge and understanding of school policies and procedures to foster harmonious relationships with the wider school community.	7.4.1 Demonstrate an understanding of how professional reflection and learning can be used to improve practice.
4.5.1 Show skills in the selection, development and use of a variety of teaching and learning resources, including ICT, to address learning goals.	5.5.1 Demonstrate an understanding of the role of assessment data as feedback in teaching and learning practices and programs.		7.5.1 Demonstrate motivation to realize professional development goals based on the Philippine Professional Standards for Teachers.

THE PPST-BASED MATHEMATICS SPECIALIZATION COURSES PROTOTYPE SYLLABI

Document Bases:

CMO No. 75, s. 2017: Policies, Standards, and Guidelines for Bachelor of Secondary Education (BSEd)
K to 12 Curriculum Guide Mathematics (Grade 1 to Grade 10) [May 2016]
Philippine Professional Standards for Teachers (DO 42, s 2017)

Total Number of Specialization Courses	Available Specialization Course Outputs	Total Number of Elective Courses	Available Elective Course Outputs
20	20	0	0

Lead Writers:

Xavier University
ATENEO DE CAGAYAN

Secondary Writers/ Reviewers:

Institution Logo	Name of Institution	Date Last Revised
	College Name	Revision Date
	Department	Semester Adopted

Vision	**Mission**
College Goals	
Program Outcomes (from CMO No. 75, s. 2017, p. 3 and 5)**:** 6.2.b. Demonstrate mastery of subject matter/discipline 6.3.3.a. Exhibit competence in mathematical concepts and procedures 6.3.3.b. Exhibit proficiency in relating mathematics to other curricular areas	

Class Information		**Instructor's Information**	
Section		Instructor's Name	
Schedule		Office Designation	
Time		Office Hours	
Venue		Office Telephone	
Term		E-mail Address	

Course Information			
Course Name	**History of Mathematics**	Course Code	
Pre-requisite Subject		Course Credit	3 units, 3 hrs./wk. (18 weeks, 54 hrs. total)
Course Requirements			
Grading System			

Course Description	BTIs covered
The course presents the humanistic aspects of mathematics which provides the historical context and timeline that led to the present understanding and applications of the different branches of mathematics Topics included in this course are not very technical and rigid aspects of mathematics; rather they are early, interesting, and light developments of the field. They are intended to enrich the background of the students in the hope that the students find value and inspiration in the historical approach to the mathematical concepts.	1.1.1
Course Learning Outcomes	BTIs covered
At the end of the course, the pre-service teachers should be able to:	
A. Demonstrate knowledge and understanding of the historical facts and landmarks that led to the development of the different branches and schools of thought in mathematics;	1.1.1
B. Show critical and creative thinking in analyzing popular problems involving foundational concepts in mathematics; and	1.1.1
C. Manifest appreciation for mathematics as a dynamic field through sharing of personal experiences of enlightenment relative to the evolution of the different branches of mathematics.	1.1.1

Time Allotment	Intended Learning Outcomes (ILOs)	BTIs	Content	Suggested Teaching Learning Activities	Suggested Assessment	BTIs
Week 1-3	At the end of the week, the pre-service teacher (PST) should be able to: • Discuss the development of mathematics in the ancient period • Show the evolution of numeration systems in ancient times • Recognize the symbols and notations used • Perform the mathematical operations used in this period.	1.1.1 [A]	**Unit 1. The Development of mathematics: ancient period** a. Origins of Mathematics: Egypt and Babylonia b. Mathematics of Ancient Greece c. Islamic, Hindu and Chinese Mathematics	1. Content Focus / Discussion 2. Library work 3. Book reports	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation	1.1.1
Week 4-6	At the end of the week, the pre-service teacher (PST) should be able to: • Discuss the development of mathematics in the medieval and renaissance period • Discuss the birth of the calculus: Newton and Leibniz • Identify the giants of mathematics in this period and discuss their contributions.	1.1.1 [A]	**Unit 2. The Development of mathematics: a historical overview: Medieval Period** a. Medieval period and the Renaissance b. Birth of the Calculus c. Euler, Fermat and Descartes	1. Content Focus / Discussion 2. Library work 3. Book reports	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation	1.1.1

Week 7-10	At the end of the week, the pre-service teacher (PST) should be able to: • Discuss the origin of non-Euclidean geometries • Identify the personalities associated with non-Euclidean geometries • Present a timeline of these geometries from the time of their conception • Examine the origins of modern algebra and number theory and set theory • Identify the personalities associated with these branches of mathematics • Discuss the problems in the foundations of mathematics	1.1.1 [A,B]	**Unit 3. The Development of mathematics: a historical overview: Modern Period** a. Non-Euclidean Geometries b. Modern algebra and number theory c. Birth of set theory and problems in the foundations of mathematics	1. Content Focus / Discussion 2. Individual / Group Drill and Practice 3. Library work 4. Book reports	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation	1.1.1
Week 11-13	At the end of the week, the pre-service teacher (PST) should be able to: • Discuss what is mathematics from a variety of points of view • Discuss and describe what mathematicians do. • Discuss and debate the origin of mathematics	1.1.1 [B,C]	**Unit 4. The Nature of Mathematics** a. What is mathematics? b. What do mathematicians do c. Is mathematics invented or created?	1. Content Focus / Discussion 2. Individual / Group Drill and Practice 3. Problem Solving	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation	1.1.1

Week 14-18	At the end of the week, the pre-service teacher (PST) should be able to: • Discuss the foundations and formalism of mathematics • Discuss the relationship between mathematics and emergence of technology	1.1.1 [A,C]	**UNIT 5. Issues and Aspects** a. The concepts and role of the proof b. Infallibility and certainty in mathematics **c.** Mathematics and technology: the role of computers	1. Content Focus / Discussion 2. Individual / Group Drill and Practice 3. Individual/Group demonstrations	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation	1.1.1

Suggested References

Burton, D. M. (2010). *The history of mathematics: An introduction (7th ed).* McGraw-Hill Education

Davis, P., Hersh, R., & Marchisotto, E. A. (2011). *The mathematical experience*. Springer Science & Business Media.

Dunham, W. (1991). *Journey through genius: The great theorems of mathematics*. Wiley.

Hodgkin, L. (2005). *A history of mathematics: from Mesopotamia to modernity*. Oxford University Press on Demand.

Katz, V. J. (2009). *The History of Mathematics: An (3rd ed).* Pearson Addison-Wesley.

Institution Logo	Name of Institution	Date Last Revised
	College Name	Revision Date
	Department	Semester Adopted

Vision	**Mission**
College Goals	

Program Outcomes (from CMO No. 75, s. 2017, p. 3 and 5:

6.2.b. Demonstrate mastery of subject matter/discipline

6.3.3.a. Exhibit competence in mathematical concepts and procedures
6.3.3.b. Exhibit proficiency in relating mathematics to other curricular areas
6.3.3.f. Use effectively appropriate approaches, methods, and techniques in teaching mathematics including technological tools
6.3.3.g. Appreciate mathematics as an opportunity for creative work, moments of enlightenment, discovery and gaining insights of the world

Class Information		**Instructor's Information**	
Section		Instructor's Name	
Schedule		Office Designation	
Time		Office Hours	
Venue		Office Telephone	

Term		E-mail Address	
Course Information			
Course Name	**College and Advanced Algebra**	Course Code	
Pre-requisite Subject		Course Credit	3 units, 3 hrs./wk. (18 weeks, 54 hrs. total)
Course Requirements:			
Grading System			

Course Description	BTIs covered
The course builds upon the students' knowledge on properties of the real number system, operations on different types of algebraic expressions, and the solution of various types of equations and inequalities. The course also covers the prerequisites to trigonometry and calculus, specifically transcendental and non-transcendental functions, including the characteristics of their graphs and applications. It serves as a foundation for future study in various fields in mathematics. Students of this course will use hands-on materials, calculators and computer applications/ software when needed in solving problems where the algebra concepts are applied.	1.1.1 1.3.1
Course Learning Outcomes	BTIs covered
At the end of the course, the pre-service teachers should be able to:	
A. Show mastery in college and advanced algebra through identifying patterns, finding solutions to mathematical equations, interpreting and discussing results and applying mathematical concepts to real life problems; and	1.1.1
B. Demonstrate skills in factoring and simplifying rational expressions, solving equations, formulating and graphing functions and using appropriate computer applications/ software and calculators in solving and graphing.	1.1.1

Time Allotment	Intended Learning Outcomes (ILOs)	BTIs	Content	Suggested Teaching Learning Activities	Suggested Assessment	BTIs
Week 1-2	At the end of the week, the pre-service teacher (PST) should be able to: • define the following: constants, variables, expressions, terms, monomial, multinomial (binomial, trinomial…), polynomials, coefficients, factors, degree of a term/ polynomial, • perform the fundamental operations on polynomials • identify and to factor polynomials with common factors with special products (difference of two squares, perfect square trinomial, sum and difference of two cubes)of the general quadratic trinomial form, by a*c*ding and subtracting the same expression • perform the fundamental operations on algebraic fractions; • perform the fundamental operations on algebraic fractions; • simplify a complex fraction.	1.1.1 [A,B]	**Unit I – Algebraic Expressions** 1. Constants, variables, terms, monomial, multinomial (binomial, trinomial…), polynomials, coefficients, factors, degree of a term 2. The fundamental operations of algebraic expressions; 3. Factoring and Algebraic Fractions	1. Content Focus / Discussion 2. Individual / Group Drill and Practice 3. Problem Solving	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation	1.1.1

Week 3-5	At the end of the week, the pre-service teacher (PST) should be able to: • evaluate and simplify an expression with integral exponents; • evaluate and simplify expressions with rational exponents • perform the four fundamental operations on exponential expressions • define the principal n_{th} root of a real number • identify the index and radicand of a radical expression; • transform an expression with a fractional exponent to radical form and vice versa; • evaluate and simplify radical expressions • do the four fundamental operations on radicals (including rationalization).	1.1.1 [A,B]	**Unit II- Exponents and Radicals** 1. Laws of Exponents (integral and rational exponents) 2. Simplifying exponential expressions; 3. Fundamental operations on exponential expressions 4. Transforming exponential expressions to radicals and vice versa 5. Simplifying radical expressions 6. Fundamental operations on radicals expressions	1. Content Focus / Discussion 2. Individual / Group Drill and Practice 3. Problem Solving	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation	1.1.1
Week 6-7	At the end of the week, the pre-service teacher (PST) should be able to: • define relation and function and their graph; • differentiate relations from functions	1.1.1 [A,B]	**Unit V- Relations and Functions and Their Graphs** 1. Definition of a Relation 2. Definition of a Function 3. Domain & Range of a Function 4. Algebra of Functions 5. Inverse of a Function	1. Content Focus / Discussion 2. Individual / Group Drill and Practice 3. Problem Solving	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation	1.1.1

	• determine the domain and range of a function • perform algebra of functions; • define the inverse of a function; • determine the inverse of a function • graph functions and their inverses		6. The Rectangular Coordinate System 7. Graph of Linear Functions and Quadratic Functions			
Week 8-10	At the end of the week, the pre-service teacher (PST) should be able to: • define equality/equation • enumerate the properties of equality • classify equations in one variable according to their types; • find the solution set of the linear and quadratic equations in one variable • reduce other forms of equations into linear or quadratic and find the solution set • define inequality • find solution set of linear inequalities in one variable • solve quadratic, fractional and radical inequalities in one variable • solve linear inequalities involving absolute value	1.1.1 [A,B]	**Unit III- EQUATIONS and INEQUALITIES** 1. Properties of Equality 2. Basic concepts of equations 3. Solution set of linear, quadratic equations in one variable; other forms of equations leading to either linear or quadratic (radical, rational and exponential) 4. Introduction of inequalities; ordering of numbers; basic properties of inequalities 5. Solution of Linear inequalities (with solutions expressed in interval notation, set notation and graphical);	1. Content Focus / Discussion 2. Individual / Group Drill and Practice 3. Problem Solving	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation	1.1.1

			6. Solution of quadratic, fractional and radical inequalities 7. Linear inequalities involving absolute value			
Week 11-13	At the end of the week, the pre-service teacher (PST) should be able to: • define system of equations in two unknowns • find the solution set of a system of linear equations in two unknowns. • define inequlity in two unknowns • find solution set of linear inequalities in one unknown • solve system of linear inequalities in two unknowns • solve verbal problems involving one, two and three unknowns	1.1.1 [A,B]	**Unit IV System of Linear Equations and Inequalities** 1. Solution of system of linear equations in two variables (using graphical, substitution and elimination methods and other methods) 2. System of linear equations in three unknowns; 3. Verbal problems involving one, two, or three unknowns 4. Solution linear inequalities in two variables 5. Solution of system of inequalities in two variables	1. Content Focus / Discussion 2. Individual / Group Drill and Practice 3. Problem Solving	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation	1.1.1
Week 14-16	At the end of the week, the pre-service teacher (PST) should be able to: • define an exponential function and natural exponential function	1.1.1 [A,B]	**Unit VI - Exponential and Logarithmic Function** 1. Exponents and the Number *e* 2. Exponential Function 3. Logarithmic Function 4. Natural Logarithmic Function	1. Content Focus / Discussion 2. Individual / Group Drill and Practice 3. Problem Solving 4. Reflection Writing	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation	1.1.1

	• graph of an exponential function • evaluate exponential functions • define logarithmic function • graph logarithmic function • enumerate the properties of logarithmic functions • convert exponential expressions into logarithmic expressions and vice versa • compute the common and natural logarithm of a number apply the properties of logarithm • compute the common anti log of a given number • solve exponential and logarithmic equations		5. Properties of Logarithmic Functions 6. Exponential and Logarithmic Equations			
Week 17-18	At the end of the week, the pre-service teacher (PST) should be able to: • define a polynomial function • find the remainder of polynomial function when divided by a linear function of the form x – r; • find all possible roots of polynomial functions	1.1.1 [A,B]	**Unit VII - Polynomial Functions and Polynomial Equations** 1. The Remainder Theorem, The Factor Theorem, and Synthetic Division 2. Rational Zeros of Polynomial Functions 3. Real Roots of Polynomial Functions 4. Complex Zeros of Polynomial Functions	1. Content Focus / Discussion 2. Individual / Group Drill and Practice 3. Problem Solving 4. Reflection Writing	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation	1.1.1

Suggested References
Leithold, L. (1992). *College algebra and trigonometry*. Addison-Wesley. Stewart, J., Redlin, L., & Watson, S. (2015). *Algebra and trigonometry*. Cengage Learning. Vance, E. P. (1962). *Modern algebra and trigonometry*. Addison-Wesley.

Institution Logo	Name of Institution	Date Last Revised
	College Name	Revision Date
	Department	Semester Adopted

Vision	**Mission**
College Goals	
Program Outcomes (from CMO No. 75, s. 2017, p. 3 and 5)**:** 6.2.b. Demonstrate mastery of subject matter/discipline 6.3.3.a. Exhibit competence in mathematical concepts and procedures 6.3.3.b. Exhibit proficiency in relating mathematics to other curricular areas 6.3.3.f. Use effectively appropriate approaches, methods, and techniques in teaching mathematics including technological tools 6.3.3.g. Appreciate mathematics as an opportunity for creative work, moments of enlightenment, discovery and gaining insights of the world	

Class Information		**Instructor's Information**	
Section		Instructor's Name	
Schedule		Office Designation	
Time		Office Hours	
Venue		Office Telephone	

Term		E-mail Address	

Course Information			
Course Name	**Trigonometry**	Course Code	
Pre-requisite Subject		Course Credit	3 units, 3 hrs./wk. (18 weeks, 54 hrs. total)
Course Requirements:			
Grading System			

Course Description	BTIs covered
The course aims to enable students to achieve thorough grasp of circular and trigonometric functions, solutions to triangles, trigonometric identities and the polar coordinate system that will translate into proficient application of these concepts in problem solving and readiness for higher mathematics. Students of this course will engage in inquiry learning and problem-solving using computer applications/software and other technological devices.	1.1.1
Course Learning Outcomes	BTIs covered
At the end of the course, the pre-service teachers should be able to:	
A. Demonstrate critical thinking through finding solutions to application and/or real life problems that require trigonometric concepts and computations;	1.1.1
B. Show skills in using appropriate computer application/software and graphing calculators to carry out computations and explorations of trigonometric problems;	1.1.1
C. Exhibit competence in proving trigonometric identities	1.1.1

Time Allotment	Intended Learning Outcomes (ILOs)	BTIs	Content	Suggested Teaching Learning Activities	Suggested Assessment	BTIs
Week 1-3	At the end of the week, the pre-service teacher (PST) should be able to: • Use correct mathematical notation and terminology. • Perfectly define and draw a unit circle and identify the coordinates of trigonometric points of special angles. • Correctly identify the 6 trigonometric/circular functions and their value limits based on this unit circle. • Properly/correctly convert degree measure to radian measure and vice versa and use the radian measure appropriately when solving problems • Accurately solve problems involving arc length and area of circular sector.	1.1.1 [A]	**Chapter 1:** 1. Trigonometric points 2. Trigonometric functions 3. Points outside the unit circle 4. Arc length 5. Area of a circular sector	1. Interactive Discussion 2. Individual and Group Activity a. The students are asked to make a Concept Map. b. The students are asked to answer some drills individually or by pair. 3. Online drill and practice The students are asked to go to the websites below and choose problem/s to solve: http://www.onlinemathlearning.com/trigonometry-games.html http://www.purposegames.com/game/unit-circle-test-quiz 4. Reflection Activity: The students are asked to write down 3 things they learned about trigonometry (after the discussion of each main subtopic: unit circle, finding coordinates of special trigonometric points, trigonometric functions, arc length and area of circular sector), what they find difficult in the topics presented, and questions that they can generate from the discussion.	Formative Assessment: 4. Pen and Paper quiz 5. Seatwork 6. Class participation Performance Assessment: Reflection Paper	1.1.1
Week 4-5	At the end of the week, the pre-service teacher (PST) should be able to: • Properly sketch the graph of trigonometric functions based on its periodicity and amplitude with (or without)	1.1.1 [A,B]	**Chapter 2:** **Graph of Trigonometric Functions** 1. Sine Function 2. Cosine Function 3. Tangent Function 4. Cotangent Function	1. Interactive Discussion 2. Drill and Practice (Group and Individual) 3. Online drill and practice a. The students are asked to go to the website	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation Performance Assessment: Reflection Paper	1.1.1

	the use online trigonometry games /graphing calculator/ computer graphing applications and pen and paper activity. • Analyze the general behavior of the trigonometric function graphs. • State the appropriate domain, range, amplitude and period for each graph of Sine, Cosine, Tangent, Cosecant, Secant and Cotangent functions. • Point out and properly explain the effect of a change in period and amplitude.		5. Cosecant Function 6. Secant Function	below and choose problem/s to solve: http://www.onlinemathlearning.com/trigonometry-games.html b. The students are asked to graph the different trigonometric functions using geogebra or any computer graphing applications. 4. Reflection Activity The students are asked to write down 3 things they learned about the lesson on trigonometric functions, anything the students find difficult, and questions that they have for this topic.		
Week 6-9	At the end of the week, the pre-service teacher (PST) should be able to: • Properly apply basic trigonometric identities and algebraic properties to express one trigonometric function in terms of the other trigonometric functions. • Write a proof which verifies the validity of a stated identity. • Solve the values of trigonometric functions using identities.	1.1.1 [A]	**Chapter 3: Trigonometric identities** 1. Fundamental Identities 2. Sum and Difference of Two Angles Identities 3. Double Angle Identities 4. Half Angle Identities	1. Interactive Discussion 2. Drill and Practice (Group and Individual) 3. Online drill and practice The students are asked to go to the website below and choose problem/s to solve: http://www.onlinemathlearning.com/trigonometry-games.html 4. Reflection Activity The students are asked to write down 3 things they learned about the lesson on trigonometric identities, anything the students find difficult, and questions that they have for this topic.	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation Performance Assessment: Reflection Paper	1.1.1

Week 10-11	At the end of the week, the pre-service teacher (PST) should be able to: • Properly sketch the graph for each basic inverse trigonometric function and state the correct domain and range. • Explain well how inverse trigonometric functions facilitate the solving of trigonometric functions. • Apply inverse trigonometric and algebraic solving techniques on trigonometric functions to correctly solve a. numerical problems on inverse trigonometric functions. b. problems involving inverse trigonometric equations.	1.1.1 [A]	**Chapter 4:** Inverse of the Trigonometric Functions 1. Inverse trigonometric functions 2. Solving trigonometric equations	1. Interactive Discussion 2. Drill and Practice (Group and Individual) 3. Online drill and practice The students are asked to go to the website below and choose problem/s to solve: http://www.onlinemathlearning.com/trigonometry-games.html 4. Reflection Activity The students are asked to write down 3 things they learned about the lesson inverse of trigonometric functions, anything the students find difficult, and questions that they have for this topic.	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation Performance Assessment: Reflection Paper	1.1.1
Week 12-14	At the end of the week, the pre-service teacher (PST) should be able to: • Accurately distinguish the difference between right triangle and oblique triangle. • Use the trigonometric functions to solve problems involving right triangles. • Correctly specify the conditions when to use the law of sines and law of cosines. • Solve oblique triangle problems using the law of sines and the law of cosines. • Use the ambiguous case of the law of sines to solve	1.1.1 [A]	**Chapter 5:** **Solutions of Triangles** 1. Solving Right Triangles 2. Solving Oblique Triangles - Law of Sines - Law of Cosines	1. Interactive Discussion 2. Drill and Practice (Group and Individual) 3. Online drill and practice The students are asked to go to the website below and choose problem/s to solve: http://www.onlinemathlearning.com/trigonometry-games.html 4. Reflection Activity The students are asked to write down 3 things they learned about the lesson on solutions of triangles, anything the students find difficult, and questions that they have for this topic.	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation Performance Assessment: Reflection Paper	1.1.1

	oblique triangles where more than one solution exists. • Apply the laws of Sines and Cosines to find missing angles and sides for any given triangle. • Solve story problems involving triangles.					
Week 15-18	At the end of the week, the pre-service teacher (PST) should be able to: • Distinguish the difference between a Cartesian Coordinate and Polar Coordinate. • Convert Cartesian Coordinates to Polar Coordinates. • Convert Polar Coordinates to Cartesian Coordinates. • Plot points in a Polar coordinate system. • Properly graph polar functions.	1.1.1 [A]	**Chapter 6:** **Polar Coordinate system** 1. Converting from Cartesian Coordinates to Polar Coordinates 2. Converting from Polar Coordinates to Cartesian Coordinates 3. Plotting a Point in Polar Coordinate System 4. Distance between to Polar Points **5.** Graphing Polar functions	1. Interactive Discussion 2. Drill and Practice (Group and Individual) 3. Online drill and practice The students are asked to graph the different polar functions using geogebra or any computer graphing applications 4. Reflection Activity The students are asked to write down 3 things they learned about the lesson on polar coordinate system, anything the students find difficult, and questions that they have for this topic.	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation Performance Assessment: Reflection Paper	1.1.1

Suggested References

Larson, R. (2012). *Trigonometry*. Philippines: Cengage Learning.

Lial, M, Hornsby, J., Schneider, D., Daniels, C. (2014). *Trigonometry*. Philippines: Cengage Learning.

McKeague, C., & Turner, M. (2014). *Trigonometry*. Cengage Learning.

Stewart, J., Redin, L., & Watson, S. (2012). *Stewart's algebra and trigonometry*. Hiyas Press, Inc

Institution Logo	Name of Institution	Date Last Revised
	College Name	Revision Date
	Department	Semester Adopted

Vision	**Mission**
College Goals	

Program Outcomes (from CMO No. 75, s. 2017, p. 3 and 5)**:**

6.2.b. Demonstrate mastery of subject matter/discipline

6.3.3.a. Exhibit competence in mathematical concepts and procedures
6.3.3.b. Exhibit proficiency in relating mathematics to other curricular areas
6.3.3.e. Demonstrate proficiency in problem-solving by solving and creating routine and non-routine problems with different levels of complexity
6.3.3.g. Appreciate mathematics as an opportunity for creative work, moments of enlightenment, discovery and gaining insights of the world

Class Information		**Instructor's Information**	
Section		Instructor's Name	
Schedule		Office Designation	
Time		Office Hours	
Venue		Office Telephone	
Term		E-mail Address	

Course Information			
Course Name	**Plane and Solid Geometry**	Course Code	
Pre-requisite Subject		Course Credit	3 units, 3 hrs./wk. (18 weeks, 54 hrs. total)
Course Requirements:			
Grading System			

Course Description	BTIs covered
The course seeks to deepen BSED Math students' understanding of Euclidean geometry and to sharpen reasoning skills in preparation for mathematics teaching and readiness for higher mathematics. Learning of concepts, postulates, and theorems will be through inductive and deductive methods of reasoning with emphases on mathematical investigation, use of ICT and research-based knowledge on learning and teaching. Topics will cover the following: triangle congruence and similarity, circles, polygons, prisms, cylinders, pyramids, and cones.	1.1.1 1.2.1 1.3.1 1.5.1
Course Learning Outcomes	BTIs covered
At the end of the course, the pre-service teachers should be able to:	
A. Use critical thinking in proving geometric propositions, solving routine and non-routine problems in geometry;	1.1.1
B. Formulate conjectures through individual/group explorations and investigations using digital technology applying concepts and skills in geometry and other related disciplines;	1.1.1, 1.2.1
C. Design and implement appropriate learning episodes and assessment methods incorporating the use of digital technology and research-based teaching and learning practices; and	1.2.1, 1.3.1
D. Express curiosity, enjoyment, and perseverance when engaging in learning and teaching tasks.	7.5.1

Time Allotment	Intended Learning Outcomes (ILOs)	BTIs	Content	Suggested Teaching Learning Activities	Suggested Assessment	BTIs
Week 1	At the end of the week, the pre-service teacher (PST) should be able to: • discuss the three undefined terms and underlying postulates and theorems	1.1.1 [A]	**The Modern Axiomatic System** • Undefined Terms • Initial Postulates • Initial Postulates and Theorems	Interactive Discussion Group Activity -the students are asked to discuss among themselves the real life cases exhibiting characteristics of the three undefined terms in Geometry	Quiz Assignment Seatwork Boardwork	1.1.1
Week 2	At the end of the week, the pre-service teacher (PST) should be able to: • compare and contrast the properties of equality and inequality • apply the properties and axioms of real number numbers, equality and inequality in solving problems related to it • explain the steps of formal proof • do geometric interpretation of the absolute value	1.1.1 1.2.1 [A]	**Introduction to Proving** • Review of Algebra Concepts • Properties of Equality • Properties if Inequality • Absolute Value	Interactive Discussion Group Activity -the students are asked to solve exercises involving the properties of equality and inequality	Quiz Assignment Seatwork Boardwork	1.1.1
Week 3	At the end of the week, the pre-service teacher (PST) should be able to: • make representations of lines, segments, and rays • explain the basic theorems by proving them • apply the concepts of union and intersections on lines, segments and rays • point out the importance of using digital technology in Geometry	1.1.1 [A]	**Segments and Rays** • Line Measurement • Line Segments • Rays **Digital Technology Integration**	Lecture and Group Activity -The students are asked to list down real life cases exhibiting characteristics of lines, segments, and rays Integration of Digital Technology	Quiz Assignment Boardwork	1.1.1

	• use geometric software (Geogebra) to draw lines and rays • use geometric software (Geogebra) to get line measurements					
Week 4	At the end of the week, the pre-service teacher (PST) should be able to: • make representations of angles • compare and contrast the different kinds of angles • state the basic theorems concerning angles and angle pairs • discuss perpendicularity for lines • do proofs on perpendiculars • solve angle measurements using geometric software	1.1.1 1.3.1 [A]	**Angles and Perpendicular Lines** • Angles • Angle Measurement • Angle Pairs • Perpendicular Lines **Digital Integration Technology**	Discussion Group Activity -The students are asked to solve exercises Integration of Digital Technology	Quiz Assignment Seatwork Product-based output in digital form: Students will submit output using geometric software	1.1.1 1.3.1
Week 5	At the end of the week, the pre-service teacher (PST) should be able to: • discuss the conditions which guarantees parallelism • enumerate ways of showing that lines are parallel • classify angles formed by parallel lines and transversal line • examine the relationship between parallel lines and transversal line	1.1.1 [A]	**Parallel Lines** • Parallel Lines • Properties of Parallel Lines • Proving involving Parallel Lines	Lecture Group Activity a. The students are asked to complete a proof involving parallel lines b. They are to solve for the measurements of angles using the postulates and theorems governing parallel lines and transversals	Quiz Seatwork Boardwork	1.1.1

Week 6	At the end of the week, the pre-service teacher (PST) should be able to: • define Polygon • classify the different kinds of Polygons • prove theorems involving polygons • state the postulates and theorems governing their interior angles and diagonals • construct polygons using geometric software	1.1.1 1.2.1 [A,B, D]	**Polygons** • Definition of Polygons • Angles of a Triangles • Angles of a Polygon • Proving involving Polygons **Integration of Digital Technology**	Lecture Group Activity - The students are to discuss possible real life situations where the concepts of polygons are exhibited Integration of Digital Technology	Product-based output in digital form: Students will submit output using geometric software	1.1.1 7.5.1
Week 7	At the end of the week, the pre-service teacher (PST) should be able to: • classify angles according to sides and angles • discuss congruence between two geometric figures • state the postulate and theorems on congruency of triangles • do formal proofs of congruency of triangles	1.1.1 [A,D]	**Triangles and Congruent Triangles** • Introduction to triangles and Triangle Congruence • Proving Congruent Triangles • Triangle Congruence Theorems • Proving theorems involving Triangles and congruent Triangles **Integration of Digital Technology**	Lecture Group Activity • The students are to discuss possible real life situation where the concepts of triangles are exhibited • The students are asked to solve for the measurements of angles involving triangles • The students are to solve exercises on proving using the triangle congruence postulates, and right triangle congruence theorems	Group Activity: - Students are to bring 2 sheets of paper (construction paper) and scissors and cut out two triangles. They are to compare the two triangles. - Geometry in the Real World: Students will be asked to compare the four triangular panes of the octagonal window, whether they are congruent triangles or not. - Activity integrating digital technology - Problem Sets	1.1.1 7.5.1
Week 8	At the end of the week, the pre-service teacher (PST) should be able to: • classify the different kinds of quadrilaterals • solve the area of the different types of polygonal regions • prove theorems involving quadrilaterals	1.1.1 [A]	**Quadrilaterals** • Properties of Quadrilaterals • Classifications of Quadrilaterals 1. Parallelograms 2. Trapezoids 3. Trapeziums 4. Kite	Lecture Group Activity - The students are to discuss possible real life situation where the concepts of quadrilaterals are exhibited - The students are to ask to solve for the measurements	- Geometry in the Real World: Students are asked to name things they see that resembles to a quadrilaterals or quadrilateral in shape - Exam and Problem Set Technology Exploration Example:	1.1.1

			• classification and properties of Parallelograms • classification and properties of Trapezoid • Proving theorems involving quadrilaterals **Integration of Digital Technology**	of angles involving quadrilaterals Example: Take two straws and cut each straw into two pieces so that the lengths of the pieces of one straw match those of the second. Now form a quadrilateral by placing the pieces end to end so that congruent sides lie in opposite positions. What type of quadrilateral is always formed***?*** ***A Parallelogram*** Take two straws and cut them into pieces so that the lengths match. Now form a quadrilateral by placing congruent pieces together. What type of quadrilateral is always formed? ***A Kite*** From a sheet of construction paper, cut out kite ABCD so that AB=AD and BC = DC. a. Fold kite ABCD along the diagonal segment AC. Are two congruent triangles formed? ***Yes*** b. Fold kite ABCD along diagonal segment BD. Are two congruent triangles formed? ***No***	- Construct triangle ABC where M is the midpoint of segment AB and N is the midpoint of segment AC, draw segment MN. - Measure angle AMN and angle B. - Show that measure angle AMN = measure angle B, which shows that segment MN // segment BC. - Measure segment MN and segment BC - Show that MN = ½ (BC)	
Week 9	**Summative Examination**					
Week 10	At the end of the week, the pre-service teacher (PST) should be able to: • differentiate a circle and a sphere and the lines having a relationship to a sphere or a circle • list down the theorems about circles and	1.1.1 [A]	**Circles** • Definition • Tangent Lines • Arcs of Circles • Inscribed and Intercepted Arcs • Congruent Arcs	Lecture Group Activity - The students are to construct circles and list down important concepts involving circles and arcs	Long Examination Problem Sets Output from the technology exploration	1.1.1

	• prove theorems concerning spheres and circles • solve areas of a circle and/or polygons having relations with a circle or a sphere • use geometric software in solving areas of a circle and/or polygons		• Inscribed and Circumscribed Polygon • Proving theorems involving circles and spehres **Integration of Digital Technology**	The students are to discover the value of pie using real life circular objects in different sizes by measuring the diameter and circumference of these objects.		
Week 11	At the end of the week, the pre-service teacher (PST) should be able to: • compare and contrast the different types of solids • solve problems involving areas and volumes of basic geometric polygons • do geometric construction with the use of 1. compass and any straight edge 2. digital technology	1.1.1 [A]	**Perimeter, Area, and Solids and Basic Geometric Constructions** • Perimeter • Area • Measurements and Conversions • Definition of Basic Solids • Volumes • Geometric Constructions **Integration of Digital Technology**	Lecture Group Activity - The student are to discuss possible real life situation where the concepts of Solids are exhibited - The students are given a task to bring any household objects that can represent different basic geometric solids - The students are to solve problems involving areas and volumes of basic geometric polygons and solids - The students are also asked to do geometric constructions with the use of the compass and any straight edges. - The students are asked to use digital technology when doing geometric constructions	Long Examination Output from technology exploration	1.1.1
Week 12	At the end of the week, the pre-service teacher (PST) should be able to: • classify 3-dimensional figures according to their properties • use nets and cross sections to analyze 3-dimensional figures	1.1.1 [A]	**Three Dimensional Figures and their Properties** • Prism • Cylinder • Pyramid • Cone **Integration of Digital Technology**	Interactive Lecture Visual Representations	Groupwork output and output from the technology explorations Long Examination	1.1.1

Week 13	At the end of the week, the pre-service teacher (PST) should be able to: • draw representations of 3-dimensional figures • point-out a 3-dimensional figure from a given representation • apply Euler's formula to find the vertices, edges, and faces of a polyhedron	1.1.1 [A]	**Representations of Three-dimensional Figures** • Orthographic Drawing • Isometric Drawing • Perspective Drawing **Formula in Three Dimensions** • Polyhedron • Euler's Formula **Integration of Digital Technology**	Socratic Discussion Interactive Lecture Visual Representation	Long Examination	1.1.1
Week 14	At the end of the week, the pre-service teacher (PST) should be able to: • apply the distance and midpoint formula to solve 3-dimensional figures	1.1.1 [A]	**Formula in Three Dimensions (cont.)** • Diagonal of a Right Rectangular Prism • Distance and Midpoint formula in Three Dimensions **Integration of Digital Technology**	Plenary Investigation Interactive Lecture Visual Representation	Long Examination Output using digital technology	1.1.1
Week 15	At the end of the week, the pre-service teacher (PST) should be able to: • Define the following: lateral face, lateral edge, right and oblique prisms, altitude, surface area, lateral and surface area of a right prism • Derive and apply the formula for the lateral and surface areas of prism and cylinder	1.1.1 [A]	**Surface Area of Prisms and Cylinders** • Prisms 1. Lateral Face and Lateral Edge 2. Right and Oblique Prisms 3. Altitude 4. Surface Area 5. Lateral and Surface Area of a Right Prism • Cylinder 1. Lateral Surface 2. Axis of Cylinder 3. Right and Oblique Cylinders	Interactive Lecture Creative Presentation	Long Examination Output using in digital technology	1.1.1

			4. Lateral and Surface Area of a Right Cylinder **Integration of Digital Technology**			
Week 16	At the end of the week, the pre-service teacher (PST) should be able to: • differentiate regular and and non-regular pyramids • derive and apply the formula for the lateral and surface areas of a pyramid in problem solving	1.1.1 [A]	**Surface Area of Pyramids and Cones** • Pyramid 1. Regular Pyramid 2. Non-Regular Pyramid 3. Lateral and Surface Area of a Regular Pyramid **Integration of Digital Technology**	Interactive Lecture Dyadic Seatwork	Group Problem and solution Presentation Output using digital technology	1.1.1
Week 17	At the end of the week, the pre-service teacher (PST) should be able to: • differentiate right and oblique cones • derive and apply the formula for the lateral and surface areas of a cone in problem solving	1.1.1 [A]	**Surface Area of Pyramids and Cones (cont.)** • Cone 1. Right and Oblique Cones 2. Lateral and Surface Area of a Right Cone 3. **Integration of Digital Technology**	Interactive Lecture Solve-Group-Share	Long Examination Output using digital technology	1.1.1
Week 18	**Final Summative Examination**					

Suggested References

Alexander and Koeberlein (2015). *Elementary Geometry for College Students, 6th Edition*.Cengage Learning.

Greig, Jo(2012). *Tutor In A Book's Geometry*. The Geometry Store.

Institution Logo	Name of Institution	Date Last Revised
	College Name	Revision Date
	Department	Semester Adopted

Vision	**Mission**
College Goals	
Program Outcomes (from CMO No. 75, s. 2017, p. 3 and 5)**:** 6.2.b. Demonstrate mastery of subject matter/discipline 6.3.3.a. Exhibit competence in mathematical concepts and procedures 6.3.3.b. Exhibit proficiency in relating mathematics to other curricular areas	

Class Information		**Instructor's Information**	
Section		Instructor's Name	
Schedule		Office Designation	
Time		Office Hours	
Venue		Office Telephone	
Term		E-mail Address	

Course Information			
Course Name	**Logic and Set Theory**	Course Code	
Pre-requisite Subject		Course Credit	3 units, 3 hrs/wk. (18 weeks, 54 hrs total)
Course Requirements:			
Grading System			

Course Description	BTIs covered
The course is a study of mathematical logic which covers topics such as propositions, logical operators, rules of replacement, rules of inference, algebra of logic and quantifiers, and methods of proof. It also includes a discussion of elementary theory of sets such as fundamental concepts of sets, set theorems, set operations, functions and relations. It prepares the students for higher/advanced mathematics (Number theory, Linear Algebra, Abstract Algebra)	1.1.1
Course Learning Outcomes At the end of the course, the pre-service teachers should be able to: A. Exhibit mastery in logic and set theory by constructing truth tables, formulating logical arguments, identifying valid mathematical arguments, interpreting set notation correctly and determining whether a given function is injective, surjective or bijective. B. Show proficiency in logic and set theory by constructing and understanding proofs of mathematical propositions which use some standard proof techniques.	BTIs covered 1.1.1 1.1.1

Time Allotment	Intended Learning Outcomes (ILOs)	BTIs	Content	Suggested Teaching Learning Activities	Suggested Assessment	BTIs
Week 1-3	At the end of the week, the pre-service teacher (PST) should be able to: • discuss and apply the sentencial connectives • use mathematical symbols and discern truth values of arguments • construct truth tables • work with existence, qualification and validation conditions • determine whether the given proposition is a tautology	1.1.1 [A]	**Logic** 1. Sentencial connectives 2. Truth values of arguments and truth table 3. Existence, qualification and validation conditions 4. Tautology	1. Interactive Discussion 2. Individual and Group Activity a. The students are asked to make a Concept Map. b. The students are asked to answer some drills individually or by pair. 3. Reflection Activity: The students are asked to write down 3 things they learned about logic (after the discussion of each main subtopic: sentencial connectives, truth values of arguments and truth table, existence, qualification and conditions, tautology), what they find difficult in the topics presented, and questions that they can generate from the discussion.	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation Performance Assessment: Problem Set	1.1.1
Week 4	At the end of the week, the pre-service teacher (PST) should be able to: • discuss the class construction axiom • discuss class operations • discuss and – Russel's Paradox	1.1.1 [A]	**Cantor's Algebra of Sets** 1. Class construction axiom 2. Class operations 3. Russel's Paradox	1. Interactive Discussion 2. Individual and Group Activity a. The students are asked to make a Concept Map. b. The students are asked to answer some drills individually or by pair. 3. Reflection Activity: The students are asked to write down 3 things they learned about Cantor's algebra of sets (after the discussion of each main subtopic: class construction axiom, class operations, Russel's Paradox), what they find difficult in the topics presented, and questions that	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation Performance Assessment: Problem Set	1.1.1

				they can generate from the discussion.		
Week 5	At the end of the week, the pre-service teacher (PST) should be able to: • explain the Zermelo-Fraenkel Axioms • identify sets which are empty • determine the power set of a set	1.1.1 [A]	**Zermelo-Fraenkel Axioms** 1. Zermelo-Fraenkel Axioms 2. Empty Sets 3. Power set of a set	1. Interactive Discussion 2. Individual and Group Activity a. The students are asked to make a Concept Map. b. The students are asked to answer some drills individually or by pair. 3. Reflection Activity: The students are asked to write down 3 things they learned about Zermelo-Fraenkel Axioms (after the discussion of each main subtopic: Zermelo-Fraenkel Axioms, empty sets, power set of a set), what they find difficult in the topics presented, and questions that they can generate from the discussion.	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation Performance Assessment: Problem Set	1.1.1
Week 6	At the end of the week, the pre-service teacher (PST) should be able to: • define and perform the operations on sets • discuss and prove the theorems on sets	1.1.1 [A,B]	**Algebra of Sets** 1. Operations on sets 2. The axiom of replacement	1. Interactive Discussion 2. Individual and Group Activity a. The students are asked to make a Concept Map. b. The students are asked to answer some drills individually or by pair. 3. Reflection Activity: The students are asked to write down 3 things they learned about algebra of sets (after the discussion of each main subtopic: operations on sets, the axiom of replacement), what they find difficult in the topics presented, and questions that they can generate from the discussion.	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation Performance Assessment: Problem Set	1.1.1

Week 7-9	At the end of the week, the pre-service teacher (PST) should be able to: • define and give examples of relations • define a function between sets and the image and inverse image of subsets of the domain and codomain, resp. • determine domain and range of a relation/function • define and give examples of equivalence relations and partitions • discuss the inclusion, restriction maps and characteristic functions • prove statements combining the concepts of the image and inverse image of subsets of the domain and codomain, and composition of, or injective, surjective, or bijective functions	1.1.1 [A,B]	**Relations and Functions** 1. Relations and functions between sets 2. Image and inverse image 3. Domain and range of a relation/function 4. Equivalence relations, order relations, strict order relations, and partitions 5. Inclusion, restriction maps and characteristic functions 6. Composition of functions 7. Injective, surjective, and bijective functions	1. Interactive Discussion 2. Individual and Group Activity a. The students are asked to make a Concept Map. b. The students are asked to answer some drills individually or by pair. 3. Reflection Activity: The students are asked to write down 3 things they learned about relations and functions (after the discussion of each main subtopic: relations and functions between sets, image and inverse image, domain and range of a relation/function, equivalence relations, order relations, strict order relations, and partitions, inclusion, restriction maps, characteristic functions, injective, surjective and bijective functions), what they find difficult in the topics presented, and questions that they can generate from the discussion.	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation Performance Assessment: Problem Set	1.1.1
Week 10-11	At the end of the week, the pre-service teacher (PST) should be able to: • define successor sets, inductive sets, induction principle • discuss the axiom of infinity and successor sets • discuss Peano's axiom and the recursion theorem • define and give examples of transitive sets	1.1.1 [A]	**Natural Numbers** 1. Successor sets, inductive sets, induction principle 2. Axiom of infinity and successor sets 3. Peano's axiom and recursion theorem 4. Transitive sets 5. Arithmetic and ordering of natural numbers	1. Interactive Discussion 2. Individual and Group Activity a. The students are asked to make a Concept Map. b. The students are asked to answer some drills individually or by pair. 3. Reflection Activity: The students are asked to write down 3 things they learned about natural numbers (after the discussion of each main subtopic: successor sets, inductive sets,	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation Performance Assessment: Problem Set	1.1.1

	• discuss the arithmetic and ordering of natural numbers			induction principle, Axiom of infinity and successor sets, Peano's axiom and recursion theorem, transitive sets, arithmetic and ordering of natural numbers), what they find difficult in the topics presented, and questions that they can generate from the discussion.		
Week 12-13	At the end of the week, the pre-service teacher (PST) should be able to: • define an equinumerosity • understand cardinality of sets, countability, infinite, finite, uncountable sets • discuss the arithmetic and ordering of cardinal numbers	1.1.1 [A]	**Cardinal Numbers** 1. Equinumerosity 2. Cardinality of sets, countability, infinite, finite, uncountable sets 3. Arithmetic and ordering of cardinal numbers	1. Interactive Discussion 2. Individual and Group Activity a. The students are asked to make a Concept Map. b. The students are asked to answer some drills individually or by pair. 3. Reflection Activity: The students are asked to write down 3 things they learned about cardinal numbers (after the discussion of each main subtopic: equinumerosity, cardinality of sets, countability, infinite, finite, and infinite sets, arithmetic and ordering of cardinal numbers), what they find difficult in the topics presented, and questions that they can generate from the discussion.	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation Performance Assessment: Problem Set	1.1.1
Week 14-15	At the end of the week, the pre-service teacher (PST) should be able to: • discuss the continuum hypothesis and Construction of the Real Numbers • construct the set of integers, the set of rational numbers, and the set of real numbers	1.1.1 [A]	**Axiom of Choice** 1. Continuum hypothesis 2. Construction of the Real Numbers, set of integers, se rational numbers	1. Interactive Discussion 2. Individual and Group Activity a. The students are asked to make a Concept Map. b. The students are asked to answer some drills individually or by pair. 3. Reflection Activity: The students are asked to write down 3 things they	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation Performance Assessment: Problem Set	1.1.1

				learned about axiom of choice (after the discussion of each main subtopic: continuum hypothesis, construction of the real numbers, set of integers, set of rational numbers), what they find difficult in the topics presented, and questions that they can generate from the discussion.		
Week 16-18	At the end of the week, the pre-service teacher (PST) should be able to: • define and ordinal number • discuss and apply transfinite induction	1.1.1 [A]	**Ordering and Ordinals** 1. Ordinal number 2. Transfinite induction	1. Interactive Discussion 2. Individual and Group Activity a. The students are asked to make a Concept Map. b. The students are asked to answer some drills individually or by pair. 3. Reflection Activity: The students are asked to write down 3 things they learned about ordering and ordinals (after the discussion of each main subtopic: ordinal number, transfinite induction), what they find difficult in the topics presented, and questions that they can generate from the discussion.	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation Performance Assessment: Problem Set	1.1.1

Suggested References

Rosen, K. (2019). *Discrete Mathematics and its application*. McGrawHill.
Stoll, R. (2017). *Logic and set theory*. McGrawHill.

Institution Logo	Name of Institution	Date Last Revised
	College Name	Revision Date
	Department	Semester Adopted

Vision	**Mission**
College Goals	

Program Outcomes (from CMO No. 75, s. 2017, p. 3 and 5)**:**

6.2.b. Demonstrate mastery of subject matter/discipline

6.3.3.a. Exhibit competence in mathematical concepts and procedures
6.3.3.b. Exhibit proficiency in relating mathematics to other curricular areas

Class Information		**Instructor's Information**	
Section		Instructor's Name	
Schedule		Office Designation	
Time		Office Hours	
Venue		Office Telephone	
Term		E-mail Address	

Course Information			
Course Name	**Elementary Statistics and Probability**	Course Code	
Pre-requisite Subject		Course Credit	3 units, 3 hrs/wk (18 weeks, 54 hrs total)
Course Requirements			
Grading System			

Course Description	BTIs covered
This course introduces statistical techniques that are essential to data analysis in educational researches. The main goal in this exploration is statistical literacy – the ability to understand and apply a variety of parametric statistical operations. Topics will cover descriptive statistics, probability, inferential statistics, regression and correlation. Students will be required to conduct a mini-research related to teaching and learning that will showcase the use of both descriptive and inferential statistics. Moreover, this course will enhance students' ability in using statistical software such as SPSS to automate data processing.	1.1.1
Course Learning Outcomes At the end of the course, the pre-service teachers should be able to:	BTIs covered
A. Demonstrate knowledge and skills in data gathering, processing, and communication;	1.1.1
B. Use appropriate statistical measures to describe and compare data sets; ;	1.1.1
C. Run appropriate inferential statistical tests to verify hypotheses and formulate data-driven conclusions and decisions;	1.1.1
D. Use appropriate statistical treatments to analyze a teacher-made summative test, profile students' performance, and generate recommendations for enhancement;	5.2.1 5.5.1
E. Exhibit competence in the use of statistical software in data processing as entailed by an actual mini-research relating to teaching and learning;	1.3.1
F. Manifest accuracy in data handling for evidence-based decisions.	1.1.1

Time Allotment	Intended Learning Outcomes (ILOs)	BTIs	Content	Suggested Teaching Learning Activities	Suggested Assessment	BTIs
Week 1	At the end of the week, the pre-service teacher (PST) should be able to: • discuss the contributions of the different statisticians/mathematicians in the continuous improvement of statistical knowledge and concepts • differentiate between a. Descriptive and Inferential Statistics b. Population and Sample • Identify the types of data and the level of measurement for each variable • describe the different data collection methods and sampling techniques • create a tree diagram illustrating data and their levels of measurement • Explain how Statistics can be used and misused • Point out the importance of using digital technology in Statistics	1.1.1 [A]	**The Nature of Statistics** • Description and history of statistical science • Descriptive and Inferential Statistics • Population and Sample • Variables and types of Data • Data Collection and Sampling Techniques • Uses and Misuses of Statistics • The use of computers and calculator	Round Table Discussion - Prior knowledge probing - Follow-up questioning Concept Mapping T-Chart or Venn Diagram Interactive Lecture -students are presented with names of variables and are asked to give the best answer Visualization Activity Interactive Lecture	Written Work: Concept Note from the Round Table Discussion Product-based: Completed T-Chart or Venn Diagram: Students are to compare and contrast the different terms like Descriptive and Inferential statistics and the like. Hands Signal (get responses from the class through "thumbs up/down" signal to determine students understanding of a concept or process. Product-based Illustration: Tree Diagram Oral Recitation	1.1.1
Week 2	At the end of the week, the pre-service teacher (PST) should be able to: • identify the type of data collection method to be used in different studies/researches • apply the appropriate sampling technique during data collection	1.1.1 [A]	**Collection and Sampling Techniques** • Data Collection ➢ Interview Method ➢ Questionnaire Method ➢ Observation Methods ➢ Test Methods	Multiple Visual Representation Cooperative Learning Structure: With another student or two from the class, the students are asked to interview thirty or more students at their college/school, get some	Written Works and digital technology application: Frequency Distribution Table Histograms Charts and other graphs	1.1.1

			➢ Registration Method ➢ Other methods • Sampling Techniques ➢ Sampling Error ➢ Random Sampling ➢ Systematics Random Sampling ➢ Stratified Random Sampling ➢ Cluster Sampling ➢ Purposive Sampling ➢ Quota Sampling ➢ Convenience Sampling ➢ Other sampling techniques	information from them like name, course and year, and determine the answers to the questions listed below. 1. What is your height? 2. What is your birth date? 3. How many semesters have you attended this college, including this semester? 4. How many units have you completed? 5. What is your Grade Point Average? 6. What is your gender? 7. What is the color of your hair? 8. What is the color of your eyes? 9. What is your blood type? 10. How many different cellphones have you/family owned, including your present one? 11. How much do you expect your annual income to be in your first job after you have completed your formal education? Note: These are sample questions only. The teacher can modify this to make it more relevant and timely. The students are to decide to what data collection method to use and what sampling technique to employ. After doing so, the students are to answer several questions like - Which are discrete/continuous Qualitative/quantitative, among others		

				The students are also asked to include in their output the reason/s of choosing the data collection method and the sampling method. Note: The teacher should also emphasize that the data gathered could also be used in their mini research as their terminal output. Integration of Digital Technology		
Week 3	At the end of the week, the pre-service teacher (PST) should be able to: • present data through texts, tables, and graphs • organize data sets using frequency distribution table • represent data in frequency distributions graphically using histograms, frequency polygons, and ogives • use appropriate digital technology in organizing data • represent data using graphs, Pareto charts, time series graphs, and pie graphs • draw a stem and leaf plot and scatter plot • interpret a stem and leaf plot and scatter plot • use appropriate digital technology in organizing data	1.1.1 [A,B]	**Presentation of Data** • Data Presentation ➢ Tabular Method ➢ Graphical Method ➢ Textual Method • Organizing Data ➢ Frequency Distribution Table • Histograms, Frequency Polygons, and Ogives • Other types of Graphs ➢ Pareto Charts ➢ Time Series Graphs ➢ Pie Charts ➢ Stem-Leaf Plot ➢ Box Plot • Paired Data and Scatter Plots	Multiple Visual Representation - using the information gathered from their activity on collection of data, the students are to present using the different forms of data presentation Integration of Digital Technology	Written Works: Charts and other graphs Product-based output in digital form: Students are given data set and would ask them to use the suitable graph for a given data set through the application of digital technology.	1.1.1

Week 4	At the end of the week, the pre-service teacher (PST) should be able to: • summarize data using measures of central tendency • decide the appropriate measure of central tendency to be used given a data set • interpret numerical output to describe the distribution of data set in terms of its variability	1.1.1 [A,B]	**Data Descriptions (Grouped and Ungrouped Data)** • Measures of Central Tendency • Measures of Variation	Socratic Method on Inferencing and Interpreting Cooperative Learning Structure: Think-Pair-Share- students thinking about a question, pairing off and discussing the question with a classmate, and then sharing their answers with the whole class Note: The teacher may also use the data collected by the students to do data descriptions and the succeeding lectures	Written Work: Long Quiz and One-sentence summary Performance Task: Problem Set	1.1.1
Week 5	At the end of the week, the pre-service teacher (PST) should be able to: • identify the position of a data value using various measures of positions such as percentiles, deciles, and quartiles, median, and Z-Scores • Interpret the values of quantiles • Use the techniques of exploratory analysis, like Boxplot and five-Number summaries to summarize data • Use digital technology to describe and compare data sets	1.1.1 [A,B]	**Data Descriptions (Grouped and Ungrouped Data)** • Measures of Position • Exploratory Data Analysis	Socratic Method on Inferencing and Interpreting Cooperative Learning Structure: Think-Pair-Share- students thinking about a question, pairing off and discussing the question with a classmate, and then sharing their answers with the whole class	Written Work: Long Quiz and One-sentence summary Performance Task: Problem Set	1.1.1
Week 6	At the end of the week, the pre-service teacher (PST) should be able to: • define Probability and Sample Space	1.1.1 [A,B]	**Probability and Counting Rules** • Sample Spaces and Probability • Union and Intersection of sets/events	Visual Representation Group Problem Solving: Students are paired with another student and will be given different tasks to work on. After some time,	4-Square Graphic Map Written Works: Problem-Solution	1.1.1

	• differentiate between union and intersection of events • find the probability of union and intersection of events sets • find the probability of an event using classical probability and empirical probability • find the probability of compound events using addition rules and multiplication rules		• The Addition Rules for Probability • The Multiplication Rules and Conditional Probability	they will be asked to exchange paper and answer the problem after which they are now asked to compare and explain their solutions and answer to the problems.		
Week 7	At the end of the week, the pre-service teacher (PST) should be able to: • find the total number of outcomes in a sequence of events using the fundamental counting rule • use permutation or combination in finding the number of ways an *r* objects can be selected from *n* objects with or without regard to order • define random variable • differentiate discrete random variable from continuous random variable • describe the distributions graphically	1.1.1 [A,B]	**Probability and Counting Rules/Probability Distributions** • Counting Rules • Probability and Counting Rules • Random Variables • Discrete and Continuous Variables • Probability Distribution	Group Problem Solving: Students are paired with another student and will be given different tasks to work on. After some time, they will be asked to exchange paper and answer the problem after which they are now asked to compare and explain their solutions and answer to the problems.	Written Work : Summative Test	1.1.1
Week 8	At the end of the week, the pre-service teacher (PST) should be able to: • discuss the properties of a Normal Distribution • identify distributions as symmetric or skewed	1.1.1 [A,B]	**The Normal Distribution** • Normal Distribution • Applications of the Normal Distribution • The Central Limit Theorem Sample Size Determination Confidence Interval	Socratic Method	Oral Discussion Learning Log	1.1.1

	• apply concepts and principles of normal distribution to real life problems • apply the Central Limit Theorem to solve problems involving sample means for large samples • compute for the sample size needed • construct and interpret 95% and 99% confidence intervals for means and proportions • use digital technology in finding the probability of an event and the number of ways an *r* objects can be selected from *n* objects with or without regard to order					
Week 9	**Summative Examination**					
Week 10	At the end of the week, the pre-service teacher (PST) should be able to: • differentiate between null and alternative hypotheses • formulate null and alternative hypotheses based on the given problem • make statistically-based decisions regarding populations through hypothesis testing procedure using the traditional method and/or p-value method	1.1.1 1.2.1 [A,B, C,F]	**Hypothesis Testing** • Steps in Hypothesis Testing • Hypothesis Testing using the traditional method and the p-value method • Z Test for the Mean • T Test for a Mean • Z Test for a Proportion	Problem Solving Activities Students are given different situations/problems and ask them to use the correct statistical test in hypothesis testing. Note: The students may retrieve their data and are asked to formulate null and alternative hypotheses. These may also be used in their mini-research presentation later on.	Written Works: Hypothesis Formulation and decision making	1.1.1
Week 11	At the end of the week, the pre-service teacher (PST) should be able to:		**Hypothesis Testing** • Z Test for the Mean • T Test for a Mean • Z Test for a Proportion	Hands-on Activities: Students is to use the correct test in hypothesis testing employing digital technology	Written Works: Hypothesis Formulation and decision making Outputs in digital form	1.1.1

	• utilize digital technology to automate data processing and interpretation	1.1.1 1.3.1 [A,E]	Introduction of Digital technology to process data			
Week 12	At the end of the week, the pre-service teacher (PST) should be able to: • use appropriate statistical test in testing the difference between means, proportions, and variances • interpret the result of the different statistical tests • utilize digital technology in data processing • produce the interpretation of results in digital outputs	1.1.1 1.3.1 [A,B,C,E,F]	**Testing the Difference Between Two Means, Two Proportions, and Two Variances** • Testing the Difference Between Two Means: Using the z Test • Testing the Difference Between Two Means of Independent Samples: Using the t Test • Testing the Difference Between Two Means: Dependent Samples • Testing the Difference Proportions • Testing the Difference Between Two variances	Hands-on Activity using digital technology	Product-based: • Test of difference One-sentence summary to interpret results using z-test, t-test	1.1.1
Week 13	At the end of the week, the pre-service teacher (PST) should be able to: • Identify the number of groups or classification to be tested • Use the ANOVA technique to determine if there is a significant difference among three or more means. • utilize digital technology in data processing • produce the interpretation of results in digital outputs	1.1.1 1.3.1 [A,B,C,E,F]	**Testing the differences among more than two means** • Analysis of Variance (ANOVA)	Hands-on Activity: Interpreting and Analyzing data	Product-based Assessment: Analysis of Variance of a group data Interpretation of digital results	1.1.1 1.3.1

Week 14	At the end of the week, the pre-service teacher (PST) should be able to: • draw and interpret scatter plot for a set of ordered pairs • compute the correlation coefficient • test the hypothesis $H_o: p=0$ • compute the equation of the regression line • compute the coefficient of determination and the standard error of estimate • create mathematical models showing the relationship between one or more independent variables. • utilize digital technology in data processing • produce the interpretation of results in digital outputs	1.1.1 1.3.1 [A,B C,E,F]	**Correlation and Regression** • Correlation • Regression • Coefficient of Determination and Standard Error of the Estimate	Visualization Activity Interpreting Graphs Problem Solving and Interpretation Activities	Product-based: • drawing of the scatter plot • Answers to problem sets • Mathematical Models	1.1.1
Week 15	At the end of the week, the pre-service teacher (PST) should be able to: • investigate several teacher-made tests, profile of students' performance and choose appropriate statistical treatments to analyze the data • generate recommendations for the enhancement of the teacher-made tests and profiling of students' performance	1.1.1 5.5.1 [A,B, C,D]	**Applying Statistical Procedures to Problems**	Hands-on Activity: Students are given sample teacher made tests and ask them to compute the different measures like mean, median, mode, and the like and ask them to interpret these values.	Written Work: • Interpretation of the teacher-made test • Profile of students' academic achievement One-sentence summary of recommendation	1.1.1 1.2.1
Week 16	At the end of the week, the pre-service teacher (PST) should be able to: • conduct a mini-research related to teaching and learning that showcases the	1.1.1 1.3.1	**Mini-Research Project**	Punctuated Lecture Inquiry Method	Product-based: Mini Research	1.1.1 5.2.1 5.5.1

	use of both descriptive and inferential statistics • manifest accuracy in data handling	5.2.1 5.5.1 [A,B, C,D,E ,F]				
Week 17	At the end of the week, the pre-service teacher (PST) should be able to: • present and discuss results of their research	1.1.1 5.2.1 5.5.1 [A,B, C,D]	**Presentation of Mini-Research Proposal**		Individual/Group Presentation : Learning Walk • Posting of Outputs • Presentation and demo • Modifying Works to integrate comments and suggestions • Finalizing Results • Scoring Rubric	1.1.1 1.2.1 5.2.1 5.5.1
Week 18	**Final Summative Examination**					

Suggested References

Bluman, A.G. (2013). *Elementary Statistics: A Step by Step Approach, 6th Edition*. McGraw Hill International.

Supe et. Al.,(2012).*Elementary Statistics*. Central Book Supply Inc.

Institution Logo	Name of Institution	Date Last Revised
	College Name	Revision Date
	Department	Semester Adopted

Vision	**Mission**

College Goals

Program Outcomes (from CMO No. 75, s. 2017, p. 3 and 5)**:**

6.2.b. Demonstrate mastery of subject matter/discipline

6.3.3.a. Exhibit competence in mathematical concepts and procedures
6.3.3.b. Exhibit proficiency in relating mathematics to other curricular areas

Class Information		**Instructor's Information**	
Section		Instructor's Name	
Schedule		Office Designation	
Time		Office Hours	
Venue		Office Telephone	
Term		E-mail Address	

Course Information			
Course Name	**Calculus I with Analytic Geometry**	Course Code	
Pre-requisite Subject		Course Credit	
Course Requirements			
Grading System			

Course Description	BTIs covered
The course equips the students with knowledge and skills about lines and conic sections, limits and continuity of functions, differentiating and integrating algebraic, exponential, logarithmic, and trigonometric functions in one variable needed in higher calculus. The course emphasizes the enhancement of critical thinking and problem-solving skills related to analytic geometry and calculus. Students of this course are expected to employ computer applications/software and other technological devices as tools in learning and problem solving.	1.1.1
Course Learning Outcomes At the end of the course, the pre-service teachers should be able to: A. Demonstrate understanding of core analytic geometry concepts by relating these to calculus concepts of limits, continuity, derivatives, and antiderivatives; B. Demonstrate higher order thinking by applying concepts and skills in carrying out computations and explorations of analytic geometry and calculus problems with or without the use of ICT tools;	BTIs covered 1.1.1 1.1.1

Time Allotment	Intended Learning Outcomes (ILOs)	BTIs	Content	Suggested Teaching Learning Activities	Suggested Assessment	BTIs
Week 1-3	At the end of the week, the pre-service teacher (PST) should be able to: • plot points on the Cartesian plane; • compute the distance between two points; • identify and compute the slope of a line; • determine the equation of a line given certain conditions; • identify whether two lines are parallel or perpendicular through their slopes; • determine the equation of conic sections satisfying given conditions; and • graph conic sections.	1.1.1 [A]	**Analytic Geometry** **a. Ordered pairs of real numbers;** **b. distance formula;** **c. Slopes; different forms of the equation of a line;** **d. parallel and perpendicular lines;** **e. conic sections (circle, parabola, ellipse, hyperbola)**	Punctuated lecture (a short lecture followed by an activity) Cooperative Learning Activity: Think-Aloud Pair Problem Solving or Pairs Check	Formative Assessment: 4. Pen and Paper quiz 5. Seatwork 6. Class participation	1.1.1
Week 4	At the end of the week, the pre-service teacher (PST) should be able to: • state the definition of a function; • determine the domain and range of a function; • perform the fundamental operations, including composition, of functions; • determine whether a function is odd or even; and • identify and graph absolute value functions; rational functions; algebraic functions; greatest integer functions with or without the use of technology.	1.1.1 [A]	**Functions** **a. Functions;** **b. domain and range;** **c. algebra of functions;** **d. composite functions;** **e. even and odd functions;** **f. absolute value functions;** **g. rational function;** **h. algebraic function;** **i. greatest integer function;** **j. graphs of function.**	Punctuated lecture (a short lecture followed by an activity) Cooperative Learning Activity: Think-Aloud Pair Problem Solving or Pairs Check	Formative Assessment: 4. Pen and Paper quiz 5. Seatwork 6. Class participation	1.1.1

Week 5-7	At the end of the week, the pre-service teacher (PST) should be able to: • state and illustrate the intuitive definition of a limit; • state the epsilon-delta definition of a limit • use the epsilon-delta definition of a limit in evaluating limits of functions; • Evaluate limits of functions using theorems on limits; and • Compute limits of indeterminate form using L'Hopital's Rule.	1.1.1 [A,B]	**Limits** **a. Limits (intuitive);** **b. definition of a limit;** **c. limit theorems;** **d. limit of a function;** **e. one-sided limits;** **f. Infinite limits;** **g. limits at infinity**	Punctuated lecture (a short lecture followed by an activity) Cooperative Learning Activity: Think-Aloud Pair Problem Solving or Pairs Check	Formative Assessment: 4. Pen and Paper quiz 5. Seatwork 6. Class participation	1.1.1
Week 8	At the end of the week, the pre-service teacher (PST) should be able to: • Determine whether a function is continuous or not; classify the type of discontinuity of functions	1.1.1 [A]	**Continuity** **a. Definition of continuity;** **b. types of discontinuity;** **c. theorems on discontinuity;** **d. continuity of a composite function and continuity on an interval;** **e. intermediate value theorem;** **f. continuity of trigonometric functions;** **g. squeeze theorem.**	Punctuated lecture (a short lecture followed by an activity) Cooperative Learning Activity: Think-Aloud Pair Problem Solving or Pairs Check	Formative Assessment: 4. Pen and Paper quiz 5. Seatwork 6. Class participation	1.1.1
Week 9-14	At the end of the week, the pre-service teacher (PST) should be able to: • state and use the definition of derivative to differentiate functions; • differentiate functions by using the rules for differentiation, i.e., the power, product, quotient and chain rules; • determine the higher derivatives of functions	1.1.1 [A]	**The Derivative** **a. Definition of Derivatives;** **b. Derivatives of Polynomials & Exponential Functions;** **c. Product and Quotient Rules;** **d. Derivatives of Trigonometric Functions;** **e. Chain Rule,** **f. Implicit Differentiation,** **g. Higher Derivatives;**	Punctuated lecture (a short lecture followed by an activity) Cooperative Learning Activity: Think-Aloud Pair Problem Solving or Pairs Check	Formative Assessment: 4. Pen and Paper quiz 5. Seatwork 6. Class participation	1.1.1

	• differentiate functions implicitly; and • solve derivative-related problems (rates of change and related rates).		**h. Derivatives of Logarithmic Functions;** **i. Rates of Change (Applications); Related Rates**			
Week 15-16	At the end of the week, the pre-service teacher (PST) should be able to: • Determine the intervals where the graph of the function is increasing or decreasing, concave upward or concave downward; • locate extreme values, points of inflections, and asymptotes of the graph of the function; and • sketch the graph of a function using the first derivative and second derivative tests • solve application problems on relative and absolute extreme.	1.1.1 [A]	**Graphing Functions, Extreme Function Values and Optimization** **a. Mean-Value Theorem;** **b. Relative extreme function values;** **c. Increasing and decreasing functions and the first derivative test;** **d. Concavity and Graphing functions analytically;** **e. Absolute extreme and optimization**	Punctuated lecture (a short lecture followed by an activity) Cooperative Learning Activity: Think-Aloud Pair Problem Solving or Pairs Check	Formative Assessment: 4. Pen and Paper quiz 5. Seatwork 6. Class participation	1.1.1
Week 17-18	At the end of the week, the pre-service teacher (PST) should be able to: • determine indefinite integrals of functions using theorems of integration; • find approximate area under the curve using Riemann sum; and • evaluate definite integrals using the Fundamental Theorem of Calculus; find area under the curve using definite integrals	1.1.1 [A,B]	**Introduction to antiderivative** **a. Antiderivatives;** **b. Fundamental Theorem of Calculus;** **c. Indefinite Integral;** **d. The Definite Integral;** **e. Areas and Distance**	Punctuated lecture (a short lecture followed by an activity) Cooperative Learning Activity: Think-Aloud Pair Problem Solving or Pairs Check	Formative Assessment: 4. Pen and Paper quiz 5. Seatwork 6. Class participation	1.1.1

Suggested References

Leithold, L. (1996). *The Calculus 7*. Harper Collins.

Stewart, J.(2016). *Calculus: Early Transcendentals (8th Ed.).*Cengage Learning

Institution Logo	Name of Institution	Date Last Revised
	College Name	Revision Date
	Department	Semester Adopted

Vision	**Mission**

College Goals

Program Outcomes (from CMO No. 75, s. 2017, p. 3 and 5)**:**

6.2.b. Demonstrate mastery of subject matter/discipline

6.3.3.a. Exhibit competence in mathematical concepts and procedures
6.3.3.g. Appreciate mathematics as an opportunity for creative work, moments of enlightenment, discovery and gaining insights of the world

Class Information		**Instructor's Information**	
Section		Instructor's Name	
Schedule		Office Designation	
Time		Office Hours	
Venue		Office Telephone	
Term		E-mail Address	

Course Information			
Course Name	**Calculus II**	Course Code	
Pre-requisite Subject		Course Credit	3 units, 3 hrs./wk. (18 weeks, 54 hrs. total)
Course Requirements			
Grading System			

Course Description	BTIs covered
Calculus II is the continuation of Calculus I with Analytic Geometry - the second of a series of three calculus courses. The course aims to further develop and strengthen the students' understanding of differential and integral calculus. Topics include the applications of definite integrals, techniques of integration, indeterminate forms, improper integrals of algebraic and transcendental functions.	1.1.1
Course Learning Outcomes At the end of the course, the pre-service teachers should be able to: A. Select and use appropriate models and techniques of integration for finding solutions to integral-related problems with and without the use of technology.	BTIs covered 1.1.1

Time Allotment	Intended Learning Outcomes (ILOs)	BTIs	Content	Suggested Teaching Learning Activities	Suggested Assessment	BTIs
Week 1 to Week 3	At the end of the session/s, the pre-service teachers should be able to: • Integrate using power formula • Integrate trigonometric functions, logarithmic, exponential, inverse trigonometric and hyperbolic functions	1.1.1 [A]	**Integration concepts and formulas** 1. Review on Anti-differentiation 2. Review on Indefinite integrals 3. Simple Power formula 4. Simple trigonometric functions 5. Logarithmic functions 6. Exponential functions 7. Inverse Trigonometric functions 8. Hyperbolic functions 9. General power formula	1. Content Focus / Discussion 2. Individual / Group Drill and Practice 3. Boardwork 4. Problem Solving	Formative Assessment: 1. Oral Recitation. 2. Pen and paper quiz 3. Seatwork 4. Class participation	1.1.1
Week 4-7	At the end of the session/s, the pre-service teachers should be able to: • perform integration by parts • perform integration of powers of trigonometric functions • perform integration by trigonometric substitution • integrate rational functions using partial fractions • perform integration using miscellaneous substitution	1.1.1 [A]	**Techniques of Integration** 1. Integration by Parts 2. Integration of Powers of Trigonometric Functions 3. Integration by Trigonometric Substitution 4. Integration of Rational Functions by Partial Fractions 5. Miscellaneous Substitution	1. Content Focus / Discussion 2. Individual / Group Drill and Practice 3. Boardwork 4. Problem Solving	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation	1.1.1
Week 8	At the end of the session/s, the pre-service teachers should be able to: • Write and compute long sums using sigma notation • Define and evaluate definite integrals; • Identify and apply the properties of definite integrals;	1.1.1 [A]	**Definite Integrals** 1. Summation Notation& Riemann Sum 2. Definition of Definite Integrals 3. Properties of Definite Integrals 4. The Mean Value Theorem for Integrals 5. The Fundamental Theorem of Calculus	1. Content Focus / Discussion 2. Individual / Group Drill and Practice 3. Boardwork 4. Problem Solving	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation	1.1.1

	• Discuss and verify/prove the Mean Value Theorem for Integrals; and • Discuss and verify/prove the Fundamental Theorem of Calculus.					
Week 9-13	At the end of the session/s, the pre-service teachers should be able to: • Find the area of the region bounded by curves using Riemann sum and definite integrals; • Find the volume of a solid of revolution using different methods; • Apply definite integrals in solving work problems and finding the length of arc of a plane curve.	1.1.1 [A]	**Applications of the Definite Integral** 1. Area of a Region in a Plane 2. Volume of a Solid of Revolution 3. Work 4. Length of Arc of a Plane Curve 5. Other miscellaneous application topic (free topic)	1. Content Focus / Discussion 2. Individual / Group Drill and Practice 3. Boardwork 4. Problem Solving	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation	1.1.1
Week 14	At the end of the session/s, the pre-service teachers should be able to: • enumerate the different indeterminate forms • evaluate limits of rational functions at a point where the limit is indeterminate	1.1.1 [A]	**Indeterminate Forms** 1. Definition 2. L' Hospital's Rule	1. Content Focus / Discussion 2. Individual / Group Drill and Practice 3. Boardwork 4. Problem Solving	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation	1.1.1
Week 15-16	At the end of the session/s, the pre-service teachers should be able to: • evaluate improper integrals with infinite upper limit • evaluate improper integrals with infinite lower limit	1.1.1 [A]	**Improper Integrals** 1. Definition of Improper Integrals 2. Improper Integrals: a. with Infinite Upper Limit b. with Infinite Lower Limit c. with Both Upper &	1. Content Focus / Discussion 2. Individual / Group Drill and Practice 3. Boardwork 4. Problem Solving	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation	1.1.1

	• evaluate improper integrals with infinite upper and lower limits • evaluate improper integrals with infinite discontinuities of the Integrand		Lower Limits Infinite 3. Improper Integrals with Infinite Discontinuities of the Integrand			
Week 17-18	At the end of the session/s, the pre-service teachers should be able to: • draw the graph of a polar function • find the area of the region bounded by the polar curve • find the area of the region bounded by 2 polar curves	1.1.1 [A]	**Polar Coordinate System** 1. Polar Functions 2. Polar Graphs Polar Curves 3. Area of Regions in Polar Coordinates	1. Content Focus / Discussion 2. Individual / Group Drill and Practice 3. Boardwork 4. Problem Solving 5.	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation	1.1.1

Suggested References

Leithold, L. (1996). *The Calculus 7*. Harper Collins.

Stewart, J.(2016). *Calculus: Early Transcendentals (8th Ed.).* Cengage Learning

Institution Logo	Name of Institution	Date Last Revised
	College Name	Revision Date
	Department	Semester Adopted

Vision	**Mission**

College Goals

Program Outcomes (from CMO No. 75, s. 2017, p. 3 and 5)**:**

6.1.a. Articulate and discuss the latest developments in the specific field of practice
6.2.b. Demonstrate mastery of subject matter discipline

6.3.3.a. Exhibit competence in mathematical concepts and procedures
6.3.3.g. Appreciate mathematics as an opportunity for creative work, moments of enlightenment, discover and gaining insights of the world

Class Information		**Instructor's Information**	
Section		Instructor's Name	
Schedule		Office Designation	
Time		Office Hours	
Venue		Office Telephone	
Term		E-mail Address	

Course Information			
Course Name	**Calculus III**	Course Code	
Pre-requisite Subject		Course Credit	3 units, 3 hrs./wk. (18 weeks, 54 hrs. total)
Course Requirements			
Grading System			

Course Description	BTIs covered
Calculus III is the continuation of Calculus II – the last of a series of three calculus courses. The course aims to provide students with a deeper understanding of differentiation and integration of sequences, infinite series, power series, as well as of multiple integration for multivariable functions.	1.1.1 1.2.1
Course Learning Outcomes At the end of the course, the pre-service teachers should be able to: A. Select and use appropriate models and techniques of differentiation and integration for finding solutions to series and integral-related problems with and without the use of technology.	BTIs covered 1.1.1

Time Allotment	Intended Learning Outcomes (ILOs)	BTIs	Content	Suggested Teaching Learning Activities	Suggested Assessment	BTIs
Week 1-5	At the end of the session/s, the pre-service teachers should be able to: • Define sequences and series • determine whether the sequence is increasing, decreasing or not monotonic • determine whether the series is bounded • determine whether the series is convergent or divergent	1.1.1 [A]	**I – Sequences and Infinite Series** 1. Sequences 2. Monotonic and bounded sequences 3. Series of constant terms and nth-term test for divergence 4. The integral, Comparison, and Limit Comparison Tests 5. The alternating series, ratio, and root test	1. Content Focus / Discussion 2. Individual / Group Drill and Practice 3. Problem Solving (may use graphing calculators or Graphing mobile application)	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation	1.1.1
Week 6-10	At the end of the session/s, the pre-service teachers should be able to: a. Determine the interval convergence of the power series b. Compute for the radius of convergence of the power series c. Identify the power series representation of the integral d. Use a power series to compute the indicated accuracy the value of given quantity	1.1.1 [A]	**II. Power series** 1. Power series and radius and interval of convergence of power series 2. Differentiation and integration of power series 3. Taylor, Maclaurin and binomial series 4. Approximation using Taylor polynomials	1. Content Focus / Discussion 2. Individual / Group Drill and Practice 3. Problem Solving (may use graphing calculators or Graphing mobile application)	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation	1.1.1

Week 11-18	At the end of the session/s, the pre-service teachers should be able to: • Find an approximate value of the double integrals • Evaluate the iterated integral (double and triple integral) • Compute for the mass and center of mass of the lamina • Compute for the surface area, mass and volume using double integral • Compute for the surface area, mass and volume using triple integral	1.1.1	**III. Multiple Integration** 1. double integrals 2. double integrals in polar coordinates 3. applications of double integrals (area, volume, mass, surface area) 4. triple Integrals 5. Triple Integrals in cylindrical and spherical coordinates 6. Applications of triple integrals (volume and mass)	1. Content Focus / Discussion 2. Individual / Group Drill and Practice 3. Problem Solving (may use graphing calculators or Graphing mobile application)	Formative Assessment: 1. Pen and Paper quiz 2. Seatwork 3. Class participation	1.1.1

Suggested References

Anton, H., Bivens, I.C. & Davis, S. (2011). *Calculus Early Transcendentals (10th Ed.).* Wiley.
Anton, H., Bivens, I.C. & Davis, S. (2012). *Calculus (10th Ed.).* Wiley.
Edwards, Jr., C.H. & Penney, E. (2007). *Calculus, Early Transcendentals (7th Ed.).* Prentice Hall.
Etgen, G., S. Salas & Hille, E. (2003). *Calculus : One and Several Variables (9th Ed.*) John Wiley and Sons.
Leithold, L. (1996). *The Calculus 7.* Harper Collins.
Stewart, J. (2017). *Calculus: Early Transcendentals (8th Ed.).* Brooks/Cole.
Thomas, G.B., Weir, M.D. & Hass, J.L. (2009). *Thomas' Calculus (12th Ed.).* Pearson.
Thomas, G.B., Weir, M.D. & Hass, J.L. (2009). *Thomas' Calculus Early Transcendentals (12th Ed.).* Pearson.
Varberg, D., Purcell, E.J., & Rigdon, S.E. (2006). *Calculus Early Transcendentals*. Pearson.
Varberg, D., Purcell, E.J., & Rigdon, S.E. (2006). *Calculus (9th Ed.).* Pearson.

Modern Geometry

Institution Logo	Name of Institution	Date Last Revised
	College Name	Revision Date
	Department	Semester Adopted

Vision	**Mission**
College Goals	
Program Outcomes (from CMO No. 75, s. 2017, p. 3 and 5)**:** 6.2.b. Demonstrate mastery of subject matter/discipline 6.3.3.a. Exhibit competence in mathematical concepts and procedures 6.3.3.b. Exhibit proficiency in relating mathematics to other curricular areas	

Class Information		**Instructor's Information**	
Section		Instructor's Name	
Schedule		Office Designation	
Time		Office Hours	
Venue		Office Telephone	
Term		E-mail Address	

Course Information			
Course Name	**Modern Geometry**	Course Code	
Pre-requisite Subject		Course Credit	3 Units
Course Requirements			
Grading System			

Course Description	BTIs covered
This course seeks to enrich students' knowledge of Euclidean Geometry. It discusses the properties and applications of other types of geometries such as hyperbolic and elliptical geometries, finite geometry, and projective geometry. Students will advance their skills in the use of the axiomatic method and in writing proofs which are both important in higher mathematics.	1.1.1
Course Learning Outcomes At the end of the course, the pre-service teachers should be able to: A. Demonstrate understanding of the 5th Postulate and how it led to the emergence of other types of geometry; B. Demonstrate knowledge of the similarities and differences among the different geometric types in terms of concepts, models, and properties with or without the use of ICT tools ; C. Show critical thinking and logical reasoning in using the axiomatic method when constructing proofs for non-Euclidean geometric propositions; D. Demonstrate understanding of mathematics as a dynamic field relative to the emergence of the different types of geometries.	BTIs covered 1.1.1 1.1.1 1.1.1 1.1.1

Time Allotment	Intended Learning Outcomes (ILOs)	BTIs	Content	Suggested Teaching Learning Activities	Suggested Assessment	BTIs
Week 1-3	At the end of the session/s, the pre-service teachers should be able to: • Discuss theorems familiar from high school geometry the traditional viewpoint • Discover any hidden assumptions that are made by Euclid in his axioms and proofs , or appeals to intuition instead of logic.	1.1.1 [A]	**Unit 1. CLASSICAL EUCLIDEAN GEOMETRY** 1. The origins of geometry 2. Undefined terms 3. Euclid's first four postulates 4. The parallel postulate 5. Attempts to prove the parallel postulate	1. Interactive Discussion 2. Problem-solving (Individual) A. Given some figures, students are asked to solve the problem using the postulates presented. B. The students are asked to prove some postulates discussed. 3. Boardwork A. Some students are asked to write the solutions of the problems on the board and then explain it.	Formative assessment: 1. Oral Recitation 2. Pen and paper quiz 3. Class participation 4. Seatwork	1.1.1
Week 4-7	At the end of the session/s, the pre-service teachers should be able to: • discuss the different methods of proving mathematical statements • develop the idea of non-traditional models and types of geometry	1.1.1 [A,B, D]	**Unit 2 MODERN APPROACH TO AXIOMATICS** 1. Informal logic 2. Theorems and proofs 3. RAA proofs 4. Negation 5. Quantifiers 6. Implication Law of excluded middle and proof by cases 7. Incidence geometry Models 8. Isomorphism of models	1. Interactive Discussion 2. Problem-solving (Individual) A. The students are asked to prove some problems related to the topics discussed. 3. Boardwork A. Some students are asked to write the solutions of the problems on the board and then explain it.	Formative assessment: 1. Oral Recitation 2. Pen and paper quiz 3. Class participation 4. Seatwork	1.1.1
Week 8-10	At the end of the session/s, the pre-service teachers should be able to: • Discuss a version of Hilbert's axioms of incidence and betweenness and prove many of the theorems that were taken for granted by Euclid in his Elements	1.1.1 [A,C, D]	**Unit 3 HILBERT'S AXIOMS** 1. Flaws in Euclid 2. Axioms of betweenness 3. Axioms of congruence 4. Axioms of continuity 5. Axiom of parallelism	1. Interactive Discussion 2. Problem-solving (Individual) A. The students are asked to prove some problems related to the topics discussed. 3. Boardwork A. Some students are asked to write the solutions of the problems on the board and then explain it.	Formative assessment: 1. Oral Recitation 2. Pen and paper quiz 3. Class participation 4. Seatwork	1.1.1

	• Show how the notions of incidence and betweeness can be developed without appealing to geometric intuitions.					
Week 11-13	At the end of the session/s, the pre-service teachers should be able to: • define neutral geometry • prove the rest of Hilbert's axioms, and develop (some of) Euclidean geometry from the modern point of view	1.1.1 [A,C, D]	**Unit 4 NEUTRAL GEOMETRY** 1. Geometry without the parallel axiom 2. Alternate interior angle theorem 3. Exterior angle theorem 4. Measure of angles and segments 5. Saccheri-Legendre theorem 6. Equivalence of parallel postulates 7. Angle sum of a triangle	1. Interactive Discussion 2. Problem-solving (Individual) A. The students are asked to prove some problems related to the topics discussed. 3. Boardwork A. Some students are asked to write the solutions of the problems on the board and then explain it.	Formative assessment: 1. Oral Recitation 2. Pen and paper quiz 3. Class participation 4. Seatwork	1.1.1
Week 14-15	At the end of the session/s, the pre-service teachers should be able to: • discuss the role of the parallel postulate in Euclidean geometry • investigate the question of whether or not the parallel postulate is necessary for geometry • discuss statements in geometry that are equivalent to the parallel postulate	1.1.1 [A,D]	**UNIT 5 HISTORY OF THE PARALLEL POSTULATE** 1. Proclus 2. Wallis 3. Saccheri 4. Clairaut 5. Legendre 6. Lambert and Taurinus 7. Farkas Bolyai	1. Interactive Discussion 2. Problem-solving (Individual) A. The students are asked to prove some problems related to the topics discussed. 3. Boardwork A. Some students are asked to write the solutions of the problems on the board and then explain it.	Formative assessment: 1. Oral Recitation 2. Pen and paper quiz 3. Class participation 4. Seatwork	1.1.1
Week 16-18	At the end of the session/s, the pre-service teachers should be able to: • differentiate hyperbolic and Euclidean geometry. • discuss some of the important theorems in hyperbolic geometry.	1.1.1 [A,B, C]	**UNIT 6 HYPERBOLIC AND NON-EUCLIDEAN GEOMETRY** 1. Janos Bolyai 2. Gauss 3. Lobachevsky 4. Subsequent developments 5. Hyperbolic geometry 6. Angle sums (again)	1. Interactive Discussion 2. Problem-solving (Individual) A. The students are asked to prove some problems related to the topics discussed. 3. Boardwork A. Some students are asked to write the solutions of	Formative assessment: 1. Oral Recitation 2. Pen and paper quiz 3. Class participation 4. Seatwork	1.1.1

	• discuss models of hyperbolic geometry • justify the (relative) consistency of hyperbolic geometry. • explain how non-Euclidean geometry led to revolutionary ideas such as Einstein's theory of relativity, or new fields such as differential geometry.		7. Similar triangles 8. Consistency of hyperbolic geometry 9. The Beltrami-Klein model 10. The Poincare models 11. Perpendicularity in the 12. Beltrami-Klein model	the problems on the board and then explain it.		

Suggested References

Batten, L. (1997). *Combinatorics of Finite Geometries*. Cambridge University Press.

Greenberg, M. (1974). *Euclidean and Non-Euclidean Geometries*: *Development and Histories*. W.H. Freeman.

Ryan, P. (1986). *Euclidean and Non-Euclidean Geometry.* Cambridge University Press.

Smart, J. (1998). *Modern Geometries*. Brooks/ Cole.

Institution Logo	Name of Institution	Date Last Revised
	College Name	Revision Date
	Department	Semester Adopted

Vision	**Mission**

College Goals

Program Outcomes (from CMO No. 75, s. 2017, p. 3 and 5)**:**

6.2.b. Demonstrate mastery of subject matter/discipline

6.3.3.a. Exhibit competence in mathematical concepts and procedures
6.3.3.b. Exhibit proficiency in relating mathematics to other curricular areas

Class Information		**Instructor's Information**	
Section		Instructor's Name	
Schedule		Office Designation	
Time		Office Hours	
Venue		Office Telephone	
Term		E-mail Address	

Course Information			
Course Name	**Mathematics of Investment**	Course Code	
Pre-requisite Subject		Course Credit	3 units, 3 hrs./wk. (18 weeks, 54 hrs. total)
Course Requirements			
Grading System			

Course Description	BTIs covered
This course offers the students a basic mathematical concepts and skills applicable to economics, business and accounting. It will enhance the student's mathematical understanding of investment. Topics covered in this course includes determining the time value of money using simple and compound interest and discounting, variation of annuities, amortization, stocks and bonds, and sinking fund. The students are to employ mathematics as the main tool in solving investment-related problems and in making good investment calculations and decisions.	1.1.1
Course Learning Outcomes At the end of the course, the pre-service teachers should be able to: A. Select and apply appropriate formulas, concepts and procedures in solving various problems related to investment and interpret investment numerical results.	BTIs covered 1.1.1

Time Allotment	Intended Learning Outcomes (ILOs)	BTIs	Content	Suggested Teaching Learning Activities	Suggested Assessment	BTIs
Week 1-3	At the end of the session/s, the pre-service teachers should be able to: • Analyze and distinguish between interest and discount formula: F = P (1+rt) and P = F (1-dt); • Distinguish between the use of interest rate and discount rate; • Compute for equivalent interest and discount rates.	1.1.1 [A]	**I. SIMPLE INTEREST AND DISCOUNT** 1. Simple Interest 2. Approximate & Actual Number of days 3. Ordinary & Exact Interest 4. Simple Discount 5. Equivalent rates 6. Discounting Promissory notes	4. Interactive Discussion 5. Individual and Group Activity c. The students are asked to make a Concept Map. d. The students are asked to answer some drills individually or by pair. 6. Reflection Activity: The students are asked to write down 3 things they learned about simple interest and discount (after the discussion of each main subtopic: Simple Interest, approximate & actual number of days, ordinary & exact interest, simple discount, equivalent rates, discounting promissory notes), what they find difficult in the topics presented, and questions that they can generate from the discussion..	Formative Assessment: 7. Pen and Paper quiz 8. Seatwork 9. Class participation Performance Assessment: Reflection Paper	1.1.1
Week 4-6	At the end of the session/s, the pre-service teachers should be able to: • Differentiate simple from compound interest; • Solve compound interest problems where either F, P, T or i is unknown; • Set-up and solve equations of value; • Discuss current bank practices and be able to solve problems on savings account deposit.	1.1.1 [A]	**II. COMPOUND INTEREST** 1. Compound Interest 2. Effective & Nominal rates 3. Equivalent rates 4. Equation of values	1. Interactive Discussion 2. Individual and Group Activity a. The students are asked to make a Concept Map. b. The students are asked to answer some drills individually or by pair. 3. Reflection Activity: The students are asked to write down 3 things they learned about compound interest (after the discussion of each main subtopic: compound interest, effective & nominal rates, equivalent rates and equation of values), what they find difficult in the topics	Formative Assessment: 10. Pen and Paper quiz 11. Seatwork 12. Class participation Performance Assessment: Reflection Paper	1.1.1

				presented, and questions that they can generate from the discussion..		
Week 7-8	At the end of the session/s, the pre-service teachers should be able to: • Define ordinary annuity, its present value and compound amount; • Derive formulas for the present value and compound amount of an ordinary annuity; • Solve annuity problems where either Present value, Amount/future value, term or interest is unknown.	1.1.1 [A]	**III. SIMPLE ANNUITIES** **Ordinary Annuities** 1. Finding the present value and amount at the end of the term 2. Finding the term of the ordinary annuity	1. Interactive Discussion 2. Individual and Group Activity a. The students are asked to make a Concept Map. b. The students are asked to answer some drills individually or by pair. 3. Reflection Activity: The students are asked to write down 3 things they learned about simple annuities (finding the present value and amount at the end of the term), what they find difficult in the topics presented, and questions that they can generate from the discussion..	Formative Assessment: 13. Pen and Paper quiz 14. Seatwork 15. Class participation Performance Assessment: Reflection Paper	1.1.1
Week 9-10	At the end of the session/s, the pre-service teachers should be able to: • Differentiate ordinary from special annuities; • Define the different special annuities • Derive the formula for each type of special annuity; • Compute special annuity problems.	1.1.1 [A]	**IV. SPECIAL ANNUITIES** 1. Annuity Due 2. Deferred Annuity	1. Interactive Discussion 2. Individual and Group Activity a. The students are asked to make a Concept Map. b. The students are asked to answer some drills individually or by pair. 3. Reflection Activity: The students are asked to write down 3 things they learned about special annuities (after the discussion of each main subtopic: annuity due, deferred annuity), what they find difficult in the topics presented, and questions that they can generate from the discussion..	Formative Assessment: 16. Pen and Paper quiz 17. Seatwork 18. Class participation Performance Assessment: Reflection Paper	1.1.1
Week 11-12	At the end of the session/s, the pre-service teachers should be able to: • Construct an amortization schedule;	1.1.1 [A]	**V. AMORTIZATION AND SINKING FUND** 1. Extinction of Debt 2. Computation of the outstanding balance 3. Amortization method	1. Interactive Discussion 2. Individual and Group Activity a. The students are asked to make a Concept Map.	Formative Assessment: 19. Pen and Paper quiz 20. Seatwork 21. Class participation	1.1.1

	• Solve the problems on amortization where Present Value, Amount/Future value, rate, terms, or time is unknown; • Compute the outstanding liability for any desired time • Determine the periodic expense and book value of a sinking fund.		4. Sinking fund method	b. The students are asked to answer some drills individually or by pair. 3. Reflection Activity: The students are asked to write down 3 things they learned about amortization and sinking fund (after the discussion of each main subtopic: extinction of debt, computation of the outstanding balance, amortization method, sinking fund method), what they find difficult in the topics presented, and questions that they can generate from the discussion..	Performance Assessment: Reflection Paper	
Week 13-14	At the end of the session/s, the pre-service teachers should be able to: • Define a general annuity and a perpetuity; • Relate a general annuity and ordinary annuity; • Derive the formulas for the present value and compound amount of a general annuity; • Compute for the present value and compound amount of a general annuity.	1.1.1 [A]	**VI. GENERAL ANNUITIES AND PERPETUITIES** **1.** General annuities **2.** Perpetuities	1. Interactive Discussion 2. Individual and Group Activity a. The students are asked to make a Concept Map. b. The students are asked to answer some drills individually or by pair. 3. Reflection Activity: The students are asked to write down 3 things they learned about general annuities (after the discussion of each main subtopic: general annuities, perpetuities), what they find difficult in the topics presented, and questions that they can generate from the discussion..	Formative Assessment: 22. Pen and Paper quiz 23. Seatwork 24. Class participation Performance Assessment: Reflection Paper	1.1.1
Week 15-18	At the end of the session/s, the pre-service teachers should be able to: • Define bonds and stocks • Compute the price of different types of bonds and stocks	1.1.1 [A]	**VII. Bond and securities** 1. Basic financial securities 2. Bonds and stocks 3. Price of a bond 4. Other formulas for the bond	1. Interactive Discussion 2. Individual and Group Activity a. The students are asked to make a Concept Map. b. The students are asked to answer some drills individually or by pair. 3. Reflection Activity:	Formative Assessment: 25. Pen and Paper quiz 26. Seatwork 27. Class participation Performance Assessment:	1.1.1

			5. Premium and discount 6. Valuation between coupon payment dates 7. Yield rates and the Bond Salesman's Formula 8. Callable bonds 9. Serial bonds and stocks	The students are asked to write down 3 things they learned about bond and securities (after the discussion of each main subtopic: basic financial securities, bonds and stocks, other formulas for the bond, premium and discount, valuation between coupon payment dates, yield rates and the Bond Salesman's formula, callable bonds and serial bonds and stocks), what they find difficult in the topics presented, and questions that they can generate from the discussion.	Reflection Paper	

Suggested References

Hart, W. (1924). *The Mathematics of Investment*. D.C. Heath & Co.

Kellison, S. (2008). *Theory of Interest*. McGraw-Hill.

Shao, P & Shao, S. (1997). *Mathematics of Management and Finance.* CENGAGE Learning.

Institution Logo	Name of Institution	Date Last Revised
	College Name	Revision Date
	Department	Semester Adopted

Vision	**Mission**
College Goals	

Program Outcomes (from CMO No. 75, s. 2017, p. 3 and 5)**:**

6.2.b. Demonstrate mastery of subject matter/discipline

6.3.3.a. Exhibit competence in mathematical concepts and procedures
6.3.3.b. Exhibit proficiency in relating mathematics to other curricular areas

Class Information		**Instructor's Information**	
Section		Instructor's Name	
Schedule		Office Designation	
Time		Office Hours	
Venue		Office Telephone	
Term		E-mail Address	

Course Information			
Course Name	**Number Theory**	Course Code	
Pre-requisite Subject		Course Credit	3 units, 3 hrs./wk. (18 weeks, 54 hrs. total)
Course Requirements			
Grading System			

Course Description	BTIs covered
This course intends to facilitate understanding of number theoretic concepts and properties as well as enhance skills in employing different proving techniques which are useful in most areas in mathematics. Generally, it entails exploration, seeking of patterns, generating and proving conjectures as students engage in mathematical investigations. Topics include divisibility, prime numbers, unique factorization, Diophantine equations, linear congruences, and multiplicative functions.	1.1.1
Course Learning Outcomes At the end of the course, the pre-service teachers should be able to: A. Prove and solve number theoretic propositions and problems by applying fundamental concepts and principles in number theory; B. Recognize and or generate number theory concepts and properties from inferring patterns embedded in problems and real-world phenomena; C. Generate and communicate results of a mathematical investigation on a number theoretic conjecture carried out using ICT and research; D. Design and use activity sheets for selected number theory topics in a teaching demonstration.	BTIs covered 1.1.1 1.1.1 1.1.1 1.1.1 4.5.1

Time Allotment	Intended Learning Outcomes (ILOs)	BTIs	Content	Suggested Teaching Learning Activities	Suggested Assessment	BTIs
Week 1	At the end of the week, the pre-service teacher (PST) should be able to: • explain the definitions and properties of basic concepts related to numbers and sequences by producing examples and non-examples; • use the Well-Ordering Property in proving propositions about the integers; • prove the properties on sums and products and other related propositions; • apply appropriate properties in solving problems involving sums and products. • delineate and solve problems involving arithmetic, geometric, and harmonic sequences and series.	1.1.1 [B] 1.1.1 [A] 1.1.1 [A] 1.1.1 [A] 1.1.1 [A]	**I. The Integers** a. Numbers and Sequences b. Sums and Products	Interactive Discussion with - Background Knowledge Probe where students answer a short diagnostic test - Guided Reciprocal Peer Questioning where students form and pose questions based on question-stems provided by the teacher - Think-Pair-Share problem solving and proving activities where students write initial solutions/proofs, then are paired off to consolidate solutions/proofs with a peer, and share consolidated work to the whole class - K-U-L Graphic Organizer where students describe what they know, unsure about, and learned from the discussion	Oral Presentation of Proofs and Problem Solutions K-U-L Graphic Organizer outlining what students know, unsure about, and learned Pen and Paper Tests that engage students in problem solving and proving mathematical propositions	1.1.1
Week 2-3	At the end of the week, the pre-service teacher (PST) should be able to: • prove the first and second principles of Mathematical Induction (PMI); • conjecture formulae based on tabulated data gathered from explorations; • apply the principles of mathematical induction in proving formulae and other claims related to the integers; • produce counterexamples to show falsity of statements;	1.1.1 [A] 1.1.1 [B] 1.1.1 [A] 1.1.1 [A]	c. Mathematical Induction d. Fibonacci Sequence	Interactive Discussion with - Follow-up questioning where the teacher uses Q & A as a strategy to engage students in critical thinking and deepen students conception - Think-Pair-Share problem solving and proving activities - Student Video where students prepare a video recording of their oral discussion of solutions/proofs - Team Project where students search for numeric patterns and sequences reflected in real-life and prepare a mini video lecture on the chosen sequence (e.g. the	(Videotaped) Oral Presentation of Proofs and Problem Solutions Student-generated Videos of numeric patterns and sequences in real life Pen and Paper Test that engage students in problem solving and proving mathematical propositions	1.1.1

	• generate actual sequences for given recursive functions; • prove claims on the Fibonacci sequence and other similar recursive functions	1.1.1 [A] 1.1.1 [A]		Fibonacci sequence reflected in real life)		
Week 4	At the end of the week, the pre-service teacher (PST) should be able to: • prove the properties of binomial coefficients; • apply the Binomial Theorem in writing the expansions of binomial powers; • use definitions and theorems in proving propositions on divisibility; • recognize and describe number patterns on the Pascal Triangle.	 1.1.1 [A] 1.1.1 [A] 1.1.1 [A] 1.1.1 [B]	d. Binomial Coefficients e. Divisibility	Interactive Discussion with - Study Session (Homework) where students are asked to view video-lectures on the binomial coefficients and divisibility. Students are asked to write one question on a note card intended to clarify a Muddiest Point. - Think-Pair-Share where the teacher distributes an activity sheet and students are asked to construct the Pascal Triangle, and then search for number patterns which they will share to a partner and then to the whole class - Group Problem Solving and Proving activity where students work collaboratively to solve problems and prove claims on the divisibility concept	Pattern Recognition Activity Sheet Oral Presentation of Group Output Pen and Paper Test that engage students in problem solving and proving mathematical propositions	1.1.1
Week 5-6	At the end of the week, the pre-service teacher (PST) should be able to: • express relatively large positive integers in canonical or prime-factored form. • use different methods in finding the greatest common divisor and least common multiple of given integers;	 1.1.1 [A] 1.1.1 [A]	**II. Primes and Greatest Common Divisors and Prime Factorization** a. Prime Numbers b. Greatest Common Divisor c. The Euclidean Algorithm d. The Fundamental Theorem of Arithmetic	Interactive Discussion and Punctuated Lectures with - Solve First - Before Discussion Activity where students are asked to answer a short diagnostic test on prime numbers and greatest common divisors. Questions and responses will be processed during discussion.	Oral Presentation of Proofs and Problem Solutions Student-Generated End of Class Summary 15-Minute Teaching Demonstration using student-designed activity sheets intended to foster meaningful	1.1.1

	• prove theorems concerning the prime numbers, greatest common divisor and least common multiple of integers; • design and use an activity sheet, and implement an activity-based learning episode for meaningful exploration and discovery.	1.1.1 [A,B] 1.1.1 4.5.1 [D]		- One-Discussion-Question per Student where students are required to write and pose one question to the whole class - Think-Pair-Share Problem Solving and Proving sessions - Student-Generated End of Class Summary where students write a summary of learning points on a note card to be shared to the whole class within a 2-minute time-frame - Performance Task where students are asked to choose a property, prepare an activity sheet, and do a 15-minute demo teaching covering the property	exploration and discovery (Performance Task with Rubrics) Pen and Paper Test that engage students in problem solving and proving mathematical propositions	
Week 7	At the end of the week, the pre-service teacher (PST) should be able to: • prove the Linear Diophantine Equation Theorem; • solve Linear Diophantine Equations; • solve word problems including non-routine problems involving Linear Diophantine Equations.	1.1.1 [A]	e. Linear Diophantine Equations	Interactive Discussion and Punctuated Lectures with - Guided Reciprocal Peer Questioning where students are asked to write questions to ask each other for the purpose of appraising understanding of the proof of the Linear Diophantine Equation Theorem - Think-Pair-Share Problem Solving session - Homework Problem Set where students are asked to submit a Double Entry Learning Log, that is, a solution script with explanation or reasons	Double Entry Learning Logs: Problem Solutions with explanations (including Non-routine Problems and Math Olympiad Problems) Oral Presentation of Problem Solutions Pen and Paper Test that engage students in problem solving	1.1.1
Week 8	At the end of the week, the pre-service teacher (PST) should be able to:		**III. Congruences** a. Introduction to Congruences	Interactive Discussion and Punctuated Lectures with - Four-Square Graphic Organizer where the students are to illustrate the definition and provide	Four-Square Graphic Organizer (definition, example, non-example, application in real life)	1.1.1

	• Illustrate the definition of congruence through examples and non-examples; • recognize the application of congruence in real world contexts; • construct proofs for the basic properties of congruence; • solve non-routine problems using properties of congruence.	1.1.1 [A]		examples, non-examples and application in real life. A video lecture (or advanced reading/study session) is given prior to class session (Flipped Learning) - Muddiest Point Discussion - Guided Reciprocal Peer Questioning to give the students the opportunity to explore and enhance their understanding of the concept of congruence - Think-Pair-Share Problem Solving and Proving activity	Oral Presentation of Proofs and Problem Solutions Pen and Paper Test that engage students in problem solving and proving mathematical propositions	
Week 9	**Summative Examination**					
Week 10-11	At the end of the week, the pre-service teacher (PST) should be able to: • apply appropriate properties in solving linear congruences; • use the Chinese Remainder Theorem to solve the ancient Chinese remainder problem and other similar problems; • solve systems of simultaneous linear congruences; • construct and solve linear congruence derived from word problems with real world contexts.	1.1.1 [A]	c. Linear Congruence d. The Chinese Remainder Theorem e. Systems of Linear Congruence	Interactive Discussion and Punctuated Lectures with - Study Session with Video Lectures made accessible to students in advance. Students are asked to submit a Double Entry Learning Log outlining annotated solutions to a problem set - Muddiest Point Discussion - Group Problem Solving session	Double Entry Learning Log that outlines annotated solutions to a problem set Oral Presentation of Problem Solutions Pen and Paper Test that engage students in problem solving	1.1.1
Week 12-13	At the end of the week, the pre-service teacher (PST) should be able to: • apply the concept of congruence in proving the different divisibility tests; • solve problems applying the perpetual calendar concept	1.1.1 [A]	**IV. Some Applications of Congruences** a. Divisibility Test b. Perpetual Calendar c. Round-Robin Tournaments	Interactive Lectures with - Videotaped Lectures (or advanced reading/study session) given to students prior to class session (Flipped Learning) - Gallery Walk (by team) with application problems posted on the stations. -	Oral Presentation of Problem Solutions from Gallery Walk (with Grading Rubric) Oral Presentation of Think-Pair-Share Output	1.1.1

	• construct a round-robin schedule for a given number of teams			- Think-Pair-Share Proving session on the divisibility tests	Pen and Paper Test that engage students in problem solving and proving	
Week 14-15	At the end of the week, the pre-service teacher (PST) should be able to: • prove Wilson's Theorem, Fermat's Little Theorem, and Euler's Theorem • apply the Wilson's Theorem and Fermat's Little Theorem in solving congruence application problems and other related problems; • use the Euler's Theorem in solving linear congruences; • use the Wilson's Theorem, Fermat's Little Theorem, and Euler's Theorem in establishing other related propositions.	1.1.1 [A]	**V. Some Special Congruences** a. Wilson's Theorem b. Euler's Theorem	Interactive Lectures with - Videotaped Lectures (or advanced reading/study session) given to students prior to class session (Flipped learning) - Muddiest Point Discussion - Think-Pair-Share Proving activity where each pair is to submit a Double Entry Learning Log outlining the proof of an assigned theorem - X Games where students solve extreme problems (Math Olympiad Problems) by groups in class	Double Entry Learning Log from Think-Pair-Share proving activity Oral Presentation of Proofs and Problem Solutions (with grading rubric) Pen and Paper Test that engage students in problem solving and proving mathematical propositions	1.1.1
Week 16-17	At the end of the week, the pre-service teacher (PST) should be able to: • prove theorems on multiplicative functions; • use appropriate theorems in determining the values of the Euler-Phi Function, Number of Divisors and Sum of Divisors functions; • conduct a mathematical investigation on selected arithmetic functions using ICT tools and research.	1.1.1 [A] 1.1.1 [A] 1.1.1 [A,B, C]	**VI. Multiplicative Functions** a. The Euler-Phi Function b. The Sum and Number of Divisors	Interactive Lectures with - Solve First-Before Discussion Activity - Directed Paraphrasing of Definitions and Properties - Collaborative Activity: Problem Sending and Problem Solving - Inquiry-based project (mathematical investigation) where students engage in mathematical exploration using ICT tools and research	Pen and Paper Tests that engage students in problem solving and proving mathematical propositions Oral Presentation of Problem Solutions Three-Minute Write-Up (Summary of Points) One-Problem Mathematical Investigation Project	1.1.1
Week 18	**Final Summative Examination**					

Suggested References
Burton, D.M. (2010). *Elementary number theory (7th Edition)*. New York, USA: McGraw-Hill Education. Rosen, K.H. (2011). *Elementary number theory and its applications (6th Edition)*. Boston, USA: Pearson. Tattersal, J.J. (1999). *Elementary number theory in nine chapters*. New York, USA: Cambridge University Press.

Institution Logo	Name of Institution	Date Last Revised
	College Name	Revision Date
	Department	Semester Adopted

Vision	**Mission**

College Goals

Program Outcomes (from CMO No. 75, s. 2017, p. 3 and 5)**:**

6.2.b. Demonstrate mastery of subject matter/discipline

6.3.3.a. Exhibit competence in mathematical concepts and procedures
6.3.3.b. Exhibit proficiency in relating mathematics to other curricular areas

Class Information		**Instructor's Information**	
Section		Instructor's Name	
Schedule		Office Designation	
Time		Office Hours	
Venue		Office Telephone	
Term		E-mail Address	

Course Information			
Course Name	**Linear Algebra**	Course Code	
Pre-requisite Subject		Course Credit	3 units, 3 hrs./wk. (18 weeks, 54 hrs. total)
Course Requirements			
Grading System			

Course Description	BTIs covered
This course provides a basic understanding of vector spaces and matrix algebra; with application to solutions of systems of linear equations and linear transformation. Students of this course are expected to employ computer applications/software and other technological devices as tools in learning and problem solving.	1.1.1
Course Learning Outcomes At the end of the course, the pre-service teachers should be able to: A. Determine and use appropriate techniques for solving systems of linear equation-related problems/models with and/or without the use of technology.	BTIs covered 1.1.1

Time Allotment	Intended Learning Outcomes (ILOs)	BTIs	Content	Suggested Teaching Learning Activities	Suggested Assessment	BTIs
Week 1-3	At the end of the session/s, the pre-service teachers should be able to: • solve different kinds of linear systems using elimination method • correctly identify different kinds of matrices • add and multiply matrices • prove the different properties of matrix addition and matrix multiplication • solve linear systems using Gauss-Jordan Reduction Method • find the inverse of the matrix using different methods	1.1.1 [A]	**I. LINEAR EQUATIONS AND MATRICES** 1.Linear Systems 2.Matrices 3.Matrix Addition and Matrix Multiplication 4.Transpose of a matrix 5.Solutions of Linear Systems of Equations (Gauss- Jordan Reduction Method) 6. The Inverse of a Matrix	1. Interactive Discussion 2. Problem-solving (Group Activity) A. The students are asked to solve different kinds of linear systems (no. of equations =, > or < no. of variables) using elimination method. B. The students are asked to give examples of the different kind of matrices. C. The students are asked to solve different linear systems using Gauss-Jordan Reduction Method. D. The students are asked to formulate real-life situation problems where they can apply linear systems. 3. Boardwork Some groups are asked to write on the board the solutions to the problems they have solved and let somebody from the group explain it.	Formative assessment: 1. Oral Recitation 2. Pen and paper quiz 3. Class participation 4. Seatwork	1.1.1
Week 4-5	At the end of the session/s, the pre-service teachers should be able to: • correctly determine the determinant of a matrix using different methods • show detailed proofs of properties of determinants	1.1.1 [A]	**II. DETERMINANTS** 1.Definition and Properties 2.Cofactor Expansion and Applications 3.Determinants from a Computational Point of View	1. Interactive Discussion 2. Problem-solving (Individual) C. Given some matrices, students are asked to compute the determinants of these matrices using the different methods.	Formative assessment: 1. Oral Recitation 2. Pen and paper quiz 3. Class participation 4. Seatwork	1.1.1

				D. The students are asked to prove some properties of determinants. 3. Boardwork Some students are asked to write the solutions of the problems on the board and then explain it.		
Week 6	At the end of the session/s, the pre-service teachers should be able to: • relate the connection between points in a plane and vectors in a plane • graph a 2-vector in the Cartesian plane • perform operations on vectors accurately and can properly represent sum and difference vectors graphically	1.1.1 [A]	**III. VECTORS AND VECTOR SPACES** 1.Definition of a Vector in a Plane 2.Graphical Representation of Vector in a Plane 3.Operations involving Vectors in a Plane	1. Interactive Discussion 2. Problem-solving (Individual) A. The students are asked to represent graphically 2-vectors in the Cartesian plane. B. The students are asked to perform operations on vectors. 3. Boardwork Some students are asked to write the solutions of the problems on the board and then explain it.	Formative assessment: 1. Oral Recitation 2. Pen and paper quiz 3. Class participation 4. Seatwork	1.1.1
Week 7-9	At the end of the session/s, the pre-service teachers should be able to: • Correctly identify sets which are real vector spaces and subsets which are subspaces • Prove properties of real vector spaces and subspaces • Determine bases of vector spaces and subspaces	1.1.1 [A]	**IV. REAL VECTOR SPACES AND SUBSPACES** 1. Definition of a Real Vector Space and Subspaces 2. Linear Independence 3. Basis and Dimension 4. Rank of a Matrix	1. Interactive Discussion 2. Problem-solving (Group) A. Given some sets, the students are asked to prove or verify that the given sets are real vector spaces or not. B. The students are asked to determine bases for some given vector spaces. 3. Boardwork Some students are asked to write the solutions of the problems on the board and then explain it.	Formative assessment: 1. Oral Recitation 2. Pen and paper quiz 3. Class participation 4. Seatwork	1.1.1

Week 10-12	At the end of the program, the graduates should be able to: • Determine whether two vector spaces are isomorphic • Determine whether a function from one vector space to another is a linear transformation • find the kernel and range, find t basis for the kernel and range, determine the nullity and rank • Determine whether a given linear transformation is one-to-one or onto • Find the standard matrix for a given linear transformation ar composition of linear transform • Determine whether a given linear transformation is invertible and find its inverse if exists • Know and use the properties of similar matrices	1.1.1 [A]	**V. LINEAR TRANSFORMATION** 1.Isomorphism of vector spaces 2.Linear transformation 3.Kernel of a linear transformation 4.Range, nullity and rank 5.Dimension theorem 6.Nonsingular Linear transformation 7.Matrix of a linear transformation 8.Similarity	1. Interactive Discussion 2. Problem-solving (Group) 3. Boardwork • Some students are asked to write the solutions of the problems on the board and then explain it.	Formative assessment: 1. Oral Recitation 2. Pen and paper quiz 3. Class participation 4. Seatwork	1.1.1
Week 13-14	At the end of the session/s, the pre-service teachers should be able to: • Verify an eigenvalue and an eigenvector of a given matrix • Explain the geometrical interpr of the eigenvalue and eigenvector of a given matrix. • Find the characteristic equation and the eigenvalues and corresponding eigenvectors of a given matrix. • Determine whether a given	1.1.1 [A]	**VII. EIGENVALUES AND EIGENVECTORS** 1.Eigenvectors and eigenvalues 2.Characteristic polynomial 3.Hamilton-cayley theorem 4.Diagonalization	1. Interactive Discussion 2. Problem-solving (Group) 3. Boardwork Some students are asked to write the solutions of the problems on the board and then explain it.	Formative assessment: 1. Oral Recitation 2. Pen and paper quiz 3. Class participation 4. Seatwork	1.1.1

	matrix is diagonalizable, symme orthogonal • Find a basis B (if possible) for the domain of a linear transformation L such that the matrix of L relative to B is diagonal. • Find the eigenvalues of a given symmetric matrix and det the dimension of the corresponding eigenspace. • Find an orthogonal matrix that diagonalizes a given matrix					
Week 15-16	At the end of the session/s, the pre-service teachers should be able to: • For a given vector v , find its length, a unit vector in the same or opposite direction, all vectors that are orthogonal to v , and the projection of v onto a given vector or vector space. • Find the distance, the dot product, the inner product, the cross product and the angle between any two given vectors in a Euclidian space. . • Verify and use the Cauchy-Schwarz Inequality, the Triangle Inequality and the Pythagorean Theorem for vectors. • Determine whether any two given vectors are orthogonal, parallel, or neither. • Determine whether a given set of vectors is orthogonal, orthonormal, or neither.	1.1.1 [A]	**VIII INNER PRODUCT SPACES** 1.Length and Dot Product in R^{n} 2.Inner Product Spaces 3.Orthonormal Bases: Gram-Schmidt Process 4.Mathematical Models and Least Squares Analysis	1. Interactive Discussion 2. Problem-solving (Group) 3. Boardwork Some students are asked to write the solutions of the problems on the board and then explain it.	Formative assessment: 1. Oral Recitation 2. Pen and paper quiz 3. Class participation 4. Seatwork	1.1.1

	• Determine whether given subspaces are orthogonal • Solve problems involving mathematical models and least squares analysis					

Suggested References

Finkbeiner, D. (1960). *Introduction to Matrices and Linear Transformation.* D.B. Taraporevala.

Herstein, H. (1964). *Topics in Algebra.* Wiley.

Kolman, B. (1970). *Elementary Linear Algebra*. Pearson.

Lang, S. (1971). *Linear Algebra.* Springer.

Institution Logo	Name of Institution	Date Last Revised
	College Name	Revision Date
	Department	Semester Adopted

Vision	**Mission**

College Goals

Program Outcomes (from CMO No. 75, s. 2017, p. 3 and 5)**:**

6.1.a. Articulate and discuss the latest developments in the specific field of practice
6.2.b. Demonstrate mastery of subject matter/discipline
6.2.e. Apply skills in the development and utilization of ICT to promote quality, relevant, and sustainable educational practices

6.3.3.a. Exhibit competence in mathematical concepts and procedures
6.3.3.b. Exhibit proficiency in relating mathematics to other curricular areas
6.3.3.e. Demonstrate proficiency in problem-solving by solving and creating routine and non-routine problems with different levels of complexity
6.3.3.f. Use effectively appropriate approaches, methods, and techniques in teaching mathematics including technological tools
6.3.3.g. Appreciate mathematics as an opportunity for creative work, moments of enlightenment, discovery and gaining insights of the world

Class Information		**Instructor's Information**	
Section		Instructor's Name	
Schedule		Office Designation	
Time		Office Hours	
Venue		Office Telephone	
Term		E-mail Address	

Course Information			
Course Name	**Advanced Statistics**	Course Code	
Pre-requisite Subject		Course Credit	3 units, 3 hrs./wk. (18 weeks, 54 hrs. total)
Course Requirements			
Grading System			

Course Description	BTIs covered
This course is designed to deepen students' concepts and techniques that are essential to data processing and analysis. Topics will cover non-parametric statistics such as *Rank Tests for one sample, two samples,* and *k samples, test for randomness, association tests, distribution tests,* and *tests for independence.* This course will enhance students' ability in using statistical software such as SPSS to automate data processing.	1.1.1
Course Learning Outcomes At the end of the course, the pre-service teachers should be able to:	BTIs covered
A. Exhibit mastery of basic concepts and procedures of non-parametric statistics by illustrating examples that apply statistical concepts;	1.1.1
B. Exhibit proficiency in analyzing data by using appropriate technology for informed decision-making;	1.3.1
C. Display competence in the correct usage of statistical tests by conducting investigations and researches to formulate data-driven conclusions and decisions;	1.2.1
D. Demonstrate competence in utilizing appropriate statistical tests to analyze teacher-made test results, students' performance, and provide feedback for improvement;	5.2.1, 5.3.1
E. Demonstrate proficiency in problem solving by giving appropriate examples that can be solved using non-parametric statistics;	1.1.1
F. Appreciate statistics by advocating the use of statistical data in making important decisions in everyday life.	1.1.1

Time Allotment	Intended Learning Outcomes (ILOs)	BTIs	Content	Suggested Teaching Learning Activities	Suggested Assessment	BTIs
Week 1	At the end of the week, the pre-service teacher (PST) should be able to: • discuss the basic principles of research and planning for research • explain the various types of research designs • explain the importance of using Nonparametric Statistics	1.1.1 [A]	**Introduction to Nonparametric Statistics** • Introduction to Research • Overview of Nonparametric Statistics • Importance of Nonparametric Statistics	Round Table Discussion - Prior knowledge probing - Follow-up questioning	Written Work: Concept Note from the Round Table Discussion Product-based: Completed T-Chart or Venn Diagram: Students are to compare and contrast Parametric Statistics and Nonparametric Statistic Hands Signal (get responses from the class through "thumbs up/down" signal to determine students' understanding of a concept or process. Oral Recitation	1.1.1
Week 2	At the end of the week, the pre-service teacher (PST) should be able to: • Enumerate the uses of Nonparametric tests • identify the types of data and the level of measurement for each variable	1.1.1 [A]	**Introduction to Nonparametric Statistics** • Uses of Nonparametric Statistics • Levels of Measurement and types of data used in Nonparametric tests	Round Table Discussion - Prior knowledge probing - Follow-up questioning Concept Mapping T-Chart or Venn Diagram Interactive Lecture	Written Work: Concept Note from the Round Table Discussion Hands Signal (get responses from the class through "thumbs up/down" signal to determine students' understanding of a concept or process.	1.1.1

	• create a tree diagram illustrating data and their levels of measurement			-students are presented with names of variables and are asked to give the best answer Visualization Activity Interactive Lecture Round Table Discussion - Prior knowledge probing - Follow-up questioning	Product-based Illustration: Tree Diagram Oral Recitation	
Week 3	At the end of the week, the pre-service teacher (PST) should be able to: • differentiate between Null and Alternative Hypotheses • state the Null and Alternative Hypotheses given a problem • list down the different Nonparametric statistical test for testing the Null hypothesis • Compare and contrast the different Nonparametric statistical test	1.1.1 [A]	**The Use of Statistical Tests in Research** • The Null and Alternative Hypothesis • The Choice of Statistical Nonparametric tests	Round Table Discussion - Prior knowledge probing - Follow-up questioning	Product-based: Completed T-Chart or Venn Diagram: Students are to compare and contrast the different Nonparametric tests	1.1.1
Week 4	At the end of the week, the pre-service teacher (PST) should be able to: • enumerate the different One-sample tests	1.1.1 1.3.1	**The One-Sample Test** • Binomial Test • x^2One-sample Test • Kolmogorov-Smirnov One-sample Test • One-sample Runs Test		Written Work: Long Quiz	1.1.1

	• decide what One-sample test to use given a data set and its hypotheses • examine the chance occurrences of outcomes on repeated trials for a binary variable • test whether a series of values is random in a population • examine the difference between an observed sample distribution and an assumed distribution in a population • Run the analysis using digital technology • interpret the result of the analysis	[A,B]	**Digital Technology Application**	Cooperative Learning Structure: Think-Pair-Share- students thinking about a specific problem, pairing off and discussing the kind of One-sample test to use with a classmate, and then sharing their answers to the whole class	and One-sentence summary Performance Task: Problem Set Students are given different situations that call the use of One-sample test and ask the students to run the analysis and use the correct One-sample test. Results and interpretation in digital output	
Week 5	At the end of the week, the pre-service teacher (PST) should be able to: • explain when a nonparametric test for two related samples be used • enumerate the assumptions for two related samples • test the null hypothesis that the distributions of the before and after responses are equally likely • test whether two related or dependent	1.1.1 [A]	**The Case of Two Related Samples** • McNemar Test for the Significance of Changes • Sign Test Wilcoxon Matched-pairs Signed-ranks Test	Socratic Method on Inferencing and Interpreting	Written Work: Long Quiz and One-sentence summary Performance Task: Problem Set	1.1.1

	observations for treatments are different or not • test whether the medians or means of related samples differ or not. • use digital technology to produce results • interpret the results of the analysis					
Week 6	At the end of the week, the pre-service teacher (PST) should be able to: • explain when a nonparametric test for two independent samples be used • test the assumptions for two independent samples • determine the degree or extent to which the unrelated groups differ on some variable • assess the differences between two discrete dichotomous variables • examine equality of two population medians • determine differences between frequencies of responses on discrete variables for two independent groups. • use digital technology to produce results	1.1.1 1.3.1 [A,B]	**The Case of Two Independent Samples** • Fisher Exact Probability Test • x^2 Test for Two Independent Samples • Median Test	Visual Representation Group Problem Solving: Students are paired with another student and will be given different tasks to work on. After some time, they will be asked to exchange paper and answer the problem after which they are now asked to compare and explain their solutions and answer to the problems. Socratic Method on Inferencing and Interpreting	Written Works: Problem-Solution Performance Task: Problem Set Students are given different situations that call the use of One-sample test and ask the students to run the analysis and use the correct One-sample test. Results and interpretation in digital output	1.1.1

	• interpret the results of the analysis					
Week 7	At the end of the week, the pre-service teacher (PST) should be able to: • determine whether the medians of one sample is larger (or smaller) than the median of the other sample • assess the difference in the median value of two independent samples • use digital technology to produce results • interpret the results of the analysis	1.1.1 1.3.1 [A,B]	**The Case of Two Independent Samples (cont.)** • Mann-Whitney U Test • Kolmogorov-Smirnov Two-samples Test • Wald-Wolfowitz Runs Test	Group Problem Solving: Students are paired with another student and will be given different tasks to work on. After some time, they will be asked to exchange paper and answer the problem after which they are now asked to compare and explain their solutions and answer to the problems. Socratic Method on Inferencing and Interpreting	Written Work : Summative Test Performance Task: Problem Set Students are given different situations that call the use of One-sample test and ask the students to run the analysis and use the correct One-sample test. Results and interpretation in digital output	1.1.1
Week 8	At the end of the week, the pre-service teacher (PST) should be able to: • evaluate differences among multiple distributions when the response variable is dichotomous or ranks • use digital technology to produce results • interpret the results of the analysis	1.1.1 1.3.1 [A,B]	**The Case of *k* Related Samples** • Cochran Q Test • Friedman Two-way analysis of Variance by Ranks	Socratic Method on Inferencing and interpreting	Oral Discussion Learning Log	1.1.1
Week 9	**Summative Examination**					

Week 10	At the end of the week, the pre-service teacher (PST) should be able to: • compare the medians of multiple independent samples • analyze differences among multiple samples • use digital technology to produce results • interpret the results of the analysis	1.1.1 1.3.1 [A,B]	**The Case of *k* Independent Samples** • x^2 Test for k Independent Samples • Extension of the Median Test	Problem Solving Activities Students are given different situations/problems and ask them to use the correct statistical test. Students will be asked to produced output with interpretation in digital form	Written Works: Hypothesis testing and decision making Outputs in digital form	1.1.1
Week 11	At the end of the week, the pre-service teacher (PST) should be able to: • Test differences in three or more independent groups • use digital technology to produce results • interpret the results of the analysis	1.1.1 1.3.1 [A,B]	**The Case of *k* Independent Samples (cont.)** • Kruskal-Wallis One-way Analysis of Variance by Ranks	Hands-on Activities: Students is to use the correct test in hypothesis testing employing digital technology	Written Works: Hypothesis Formulation and decision making Outputs in digital form	1.1.1
Week 12	At the end of the week, the pre-service teacher (PST) should be able to: • determine whether there is relationship between variables that are of rank order • design own research questions to test association or agreement	1.1.1 1.2.1 1.3.1 [A,B, C.E]	**Measures of Correlation and Their Tests of Significance** • Contingency Coefficient: *C* • Spearman Rank Correlation Coefficient: *rs*	Hands-on Activity: Interpreting and Analyzing data	Product-based Assessment: Analysis of data and result interpretation (digital results)	1.1.1

	• use digital technology to automate results • write a hypothetical results and concluding statement about a posted problem					
Week 13	At the end of the week, the pre-service teacher (PST) should be able to: • determine whether there is relationship between variables that are of rank order • design own research questions to test association or agreement • use digital technology to automate results • write hypothetical results and concluding statement about a posted problem	1.1.1 1.2.1 1.3.1 [A,B, C.E]	**Measures of Correlation and Their Tests of Significance (cont.)** • Kendall Rank Correlation Coefficient: r • Kendall Partial Rank Correlation Coefficent: $r_{xy.s}$	Visualization Activity Interpreting results Problem Solving and Interpretation Activities	Written Work : Summative Test Performance Task: Problem Set	1.1.1
Week 14	At the end of the week, the pre-service teacher (PST) should be able to: • determine whether there is relationship between variables that are of rank order • design own research questions to test association or agreement	1.1.1 1.2.1 1.3.1 [A,B, C.E]	**Measures of Correlation and Their Tests of Significance (cont.)** • Kendall Coefficent of Concordance: W	Visualization Activity Interpreting results Problem Solving and Interpretation Activities	Written Work : Summative Test Performance Task: Problem Set	1.1.1

	• use digital technology to automate results • write hypothetical results and concluding statement about a posted problem					
Week 15-16	At the end of the week, the pre-service teacher (PST) should be able to: • conduct a mini-research choosing one nonparametric test • manifest accuracy in data handling	1.1.1 1.2.1 1.3.1 5.2.1 5.3.1 [A,B, C.E]	**Mini-Research Project**	Collection and Analysis of data The students are given two (2) weeks to do data collection applying the use of nonparametric statistics. Students are expected to produce results with it interpretations.	Mini Research - the mini research would include research designs and procedures, research questions and hypotheses, digital output and interpretation. Sample data gotten by the students should also be submitted. Prior to the mini-research project, a short discussion on how to go about the mini-research should be given by the teacher.	1.1.1
Week 17	At the end of the week, the pre-service teacher (PST) should be able to: • present and discuss results of their research	1.1.1 1.2.1 1.3.1 5.2.1 5.3.1 [A,B, C.E]	**Presentation of Mini-Research**	Paper presentation	Individual/Group Presentation : Learning Walk • Posting of Outputs • Presentation and demo • Modifying Works to integrate comments and suggestions • Finalizing Results Scoring Rubric	1.1.1
Week 18	**Final Summative Examination**					
Suggested Reference						
Kraska-Miller M.(2014). *Nonparametric Statistics for Social and Behavioral Sciences*. Taylor & Francis Group, LLC.						

Institution Logo	Name of Institution	Date Last Revised
	College Name	Revision Date
	Department	Semester Adopted

Vision	**Mission**

College Goals

Program Outcomes (from CMO No. 75, s. 2017, p. 3 and 5)**:**

6.1.b. Effectively communicate in English and Filipino, both orally and in writing
6.1.c. Work effectively and collaboratively with a substantial degree of independence in multidisciplinary and multicultural teams
6.3.3.a. Exhibit competence in mathematical concepts and procedures
6.3.3.e. Demonstrate proficiency in problem solving by solving and creating routine and non-routine problems with different levels of complexity
6.3.3.g Appreciate mathematics as an opportunity for creative work, moments of enlightenment, discovery, and gaining insights of the world

Class Information		**Instructor's Information**	
Section		Instructor's Name	
Schedule		Office Designation	
Time		Office Hours	
Venue		Office Telephone	
Term		E-mail Address	

Course Information			
Course Name	**Problem Solving, Mathematical Investigation and Modeling**	Course Code	
Pre-requisite Subject		Course Credit	3 units, 3 hrs./wk. (18 weeks, 54 hrs. total)
Course Requirements			
Grading System			

Course Description	BTIs covered
This course intends to enhance the students' knowledge and skills in dealing with real-life and/or non-routine applications of mathematics. Students will have the opportunity to explore the use of problem solving strategies or heuristics as they engage in mathematical investigations, formulate and justify conjectures, make generalizations, and communicate mathematical ideas.	1.1.1

Course Learning Outcomes At the end of the course, the pre-service teachers should be able to:	BTIs covered
	1.1.1
A. Demonstrate understanding of the role of problem solving and mathematical investigation and modelling in mathematics education;	1.1.1
B. Demonstrate knowledge and skills in the use of problem solving heuristics when analyzing and solving real life and non-routine problems;	1.1.1
C. Demonstrate creative and critical thinking in exploring, inventing problem solving strategies, and posing new problems in collaboration with other students	1.1.1
D. Exhibit problem solving competence by engaging in mathematical investigations anchored on real-life and/or non-routine problems;	1.1.1
E. Reflect, reason, and argue critically when communicating results of mathematical investigations.	

Time Allotment	Intended Learning Outcomes (ILOs)	BTIs	Content	Suggested Teaching Learning Activities	Suggested Assessment	BTIs
Week 1	At the end of the week, the pre-service teacher (PST) should be able to: • articulate a definition of problem solving; • differentiate between routine and non-routine problems; • outline the steps in problem solving from personal practice vis a vis those outlined by Polya and others; • explain the significance of problem solving in mathematics education.	1.1.1 [A]	**I. Problem Solving and Mathematics Education** a. Problem Solving: Definition and Process b. Problem Solving and Mathematics Education c. Problem Solving and the Conceptual Framework of the K to 12 Mathematics Curriculum	Interactive Discussion and Punctuated Lectures with – Pre-conception Check where the teacher administers a written assessment to get baseline data about students' knowledge and skills in problem solving; – Definition Web where the students are asked to create a definition web for "problem solving" by putting together ideas about what problem solving means and what the process entails – Graphic Organizer where students are asked to capture in a flow chart the steps in problem solving based on their actual problem solving during the Preconception Check – KWL activity sheet where students outline what they **k**now about the role of problem solving in the Kto12 Mathematics Framework, what they want to know, and what they learned	Pen and Paper Problem Solving Test (Pre-conception check) Graphic Organizer: Flow Chart of the Problem Solving Steps with annotations KWL Activity Output	1.1.1
Week 2-3	At the end of the week, the pre-service teacher (PST) should be able to: • describe factors that affect the problem solving process culled from personal experience and journal articles; • explain important pedagogical elements in the implementation problem solving in the classroom; • reflect on their experiences of problem solving and articulate	1.1.1 [A]	d. Factors Affecting Problem Solving e. Lessons from Research Studies on Implementing Problem Solving	Interactive Discussion with – 10-Minute Summary Report of Big Ideas where students are grouped and each group is asked to find a recent journal article on problem solving and to harvest from the article • assertions about the factors affecting problem solving • research findings on implementing problem solving in the classroom – Graphic Organizer where students are asked to reflect on their actual	10-Minute Summary Group Report Graphic Organizer: Personal Problem Solving Framework (process and factors) Reflection Paper where students are to write a one-page paper describing the insights they gained from the discussions	1.1.1

	personal problem solving frameworks.			problem solving experiences and prepare a one-page personal Problem Solving Framework depicting both the process and the factors affecting problem solving with brief explanatory annotations		
Week 4	At the end of the week, the pre-service teacher (PST) should be able to: • contrast and compare problem solving and mathematical investigation and modelling; • explain what constitutes a mathematical investigation; • formulate open-ended mathematical questions or problems at the start of open investigative tasks; • formulate and refine conjectures based on data from investigative tasks involving searching for a pattern	1.1.1 [A] 1.1.1 [A] 1.1.1 [C,D] 1.1.1 [B,D]	**II. Mathematical Investigation and Modelling** a. closed versus open-ended problems b. problem posing c. mathematical investigation: process versus activity d. mathematical modelling and the real-world	Interactive Discussion and Punctuated Lectures with – Study Session where the students are asked read the article "*Mathematical Investigation: Task, Process and Activity"* by Yeo & Har Yeap (2009) – Analogy Graphic Organizer where students delineate problem solving, mathematical investigation, and mathematical modelling – Guided Reciprocal Peer Questioning where students are asked to write questions to ask each other for the purpose of clarifying understanding – Group mathematical investigative activity where students are asked to work on a mathematical investigative task and to formulate open-ended questions/problems and conjectures	Analogy Graphic Organizer Open-ended Questions with conjectures Mathematical Investigation Project (students are instructed to start working on a mathematical investigation project which shall be the capstone requirement of the course to be submitted before the final examination)	1.1.1
Week 5-6	At the end of the week, the pre-service teacher (PST) should be able to: • identify patterns from a systematic exploration of a problem situation and formulate conjectures;	1.1.1 [B]	**III. Problem Solving Heuristics** a. Search for a Pattern and formulate conjectures b. Make a Diagram **c.** Organize Data and Use Logic	Interactive Discussion with – Problem Stations (similar to the concept of learning stations) where students are grouped into teams and tasked to solve problems rotating through the problem stations, spending at most 15 minutes at each station;	Double Entry Journal Log where students outline the solution to a problem in one column and describes his/her reasoning in the other column Oral Presentation of consolidated solution scripts including diagrams and tabulated data to be evaluated using a grading rubric	1.1.1

	• can make a diagram to clarify understanding of non-routine problems; • collect and record data systematically and use logic in solving a problem; • verify the correctness of a solution; • produce alternative solutions and make connections among concepts; • solve advanced (Olympiad level) multi-step problems in various topics from the secondary curriculum	1.1.1 [B] 1.1.1 [B] 1.1.1 [B] 1.1.1 [B,C] 1.1.1 [B]		– Think-Pair-Share problem solving activity where students are given problems to solve. Students write initial solutions/proofs as a Double Entry Journal Log, then are paired off to consolidate solutions/proofs with a peer for sharing to the whole class	Pen and Paper Test	
Week 7-8	At the end of the week, the pre-service teacher (PST) should be able to: • break a problem into cases and consider extreme cases when appropriate; • modify a problem, look for symmetry, or make it simpler; • explain the requirements of a problem and its solution; • check solutions using alternative (or invented) solution methods; • generate a new problem as an extension of a problem-solving task.	1.1.1 [B] 1.1.1 [B] 1.1.1 [B,E] 1.1.1 [B,C] 1.1.1 [C]	d. Modify the Problem e. Divide into Cases f. Consider Extreme Cases g. Look for Symmetry	Interactive Discussion with – **Think-Interview-Solve-Share where students** are asked to read and understand the problems individually a. pair up with a classmate and take turns in interviewing each other using questions intended to clarify his/her understanding of the problems b. solve the problems independently c. pair up with the same classmate to contrast and compare solutions, evaluate answers and prepare consolidated solutions for oral presentation – Group Problem Solving activity where students are asked to work cooperatively in understanding problems, generating solutions,	Oral Presentations of consolidated solution scripts to be evaluated using a grading rubric Problem Posing Output Pen and Paper Test	1.1.1

				and checking solutions through alternative or invented solution methods – Problem Posing activity where students are asked to generate a new problem as an extension of a given problem-solving task		
Week 9	**Summative Examination**					
Week 10-11	At the end of the week, the pre-service teacher (PST) should be able to: • work backwards by reversing operations (or drawing deductions) after assuming the conclusion in solving certain problems; • set and effectively use notations in problems solving or proving; • justify solutions using the pursue parity technique and coloring proof; • contrast and compare multiple solutions to a problem;	1.1.1 [B] 1.1.1 [B] 1.1.1 [B] 1.1.1 [B,C]	e. Choose Effective Notation f. Work Backward g. Pursue Parity h. Color and Prove	Interactive Discussion with – **Think-Interview-Solve-Share where students** are asked to read and understand the problems individually a. pair up with a classmate and take turns in interviewing each other to solicit/share ideas on what two possible heuristics to use in solving the problems b. agree as to who will use what heuristic and solve the problems differently and independently c. pair up with the same classmate to contrast and compare solutions, evaluate answers and prepare final multiple solutions for oral presentation – Analogy Organizer where students contrast and compare two different methods (e.g. working backward versus use of effective notation) that are both applicable in solving certain problems	Oral Presentation of consolidated solution scripts to be evaluated using a grading rubric Analogy Organizer Pen and Paper Test	1.1.1

Week 12-13	At the end of the week, the pre-service teacher (PST) should be able to: • identify what serves as pigeons and what serves as pigeonholes and apply the Pigeonhole Principle in proving existence propositions; • recognize invariants in problems involving algorithms or repeated tasks and reason accordingly toward a conclusion	1.1.1 [B] 1.1.1 [B]	**IV. Some Important Principles** a. Pigeonhole Principle b. Invariant principle	Interactive Discussion with – **Three-stay, One-stray problem solving activity where students are grouped with 4 members each and are asked to:** a. **cooperatively solve a problem or prove a proposition;** b. **send one member (to stray) to another group to describe their progress so the receiving group can gain alternative perspectives from the work of another group** c. **finalize solutions taking into considerations the inputs from the other groups** – Think-Pair-Share problem solving activity with Double Entry Journal Log	Double Entry Journal Log where students outline the solution to a problem in one column and describes his/her reasoning in the other column Oral Presentation of solution/proof scripts to be evaluated using a grading rubric Pen and Paper Test	1.1.1
Week 14-16	At the end of the week, the pre-service teacher (PST) should be able to: • articulate induction arguments to prove universal propositions; • formulate universal propositions based on tabulated data from mathematical exploration; • prove propositions by assuming the falsity of the conclusion and in the process derive a contradiction.	1.1.1 [B] 1.1.1 [B,D] 1.1.1 [B]	c. Principle of Mathematical Induction d. Argue by Contradiction	Interactive Discussion with – **Three-stay, One-stray proving activity** – Think-Pair-Share proving activity with Double Entry Journal Log	Oral Presentation of proof scripts to be evaluated using a grading rubric Double Entry Journal Log where students outline the solution to a problem in one column and describes his/her reasoning in the other column Pen and Paper Test	1.1.1
Week 17	At the end of the week, the pre-service teacher (PST) should be able to: • use technology in finding and presenting results of a mathematical investigation activity;	1.1.1 1.1.1 [B,E]	**V. Reporting Results of a Mathematical Investigation**	Interactive Discussion with – Follow-up Questioning where the teacher uses Q and A to probe into students' quality of reasoning – Peer Questioning	Written Report of Mathematical Investigation Project Oral Presentation of Mathematical Investigation	1.1.1

	• derive and prove results of a mathematical investigation activity; • describe the processes and results of a mathematical investigation activity, in writing and orally, clearly and coherently.	1.1.1 [B,D] 1.1.1 [B,D, E]				
Week 18	**Final Summative Examination**					

Suggested References

Engel, A. (1998). *Problem solving strategies*. New York, USA: Springer-Verlag.

Larson, L.C. (1983). *Problem solving through problems*. New York, USA: Springer-Verlag.

Lester, Frank K. Jr. (2013). Thoughts about research on mathematical problem- solving instruction," *The Mathematics Enthusiast*: Vol. 10 : No. 1, Article 12.

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Schoenfeld, A. H. (1992). Learning to think mathematically: Problem solving, metacognition, and sense-making in mathematics. In D. Grouws (Ed.), *Handbook for Research on Mathematics Teaching and Learning* (pp. 334-370). New York: MacMillan.

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Institution Logo	Name of Institution	Date Last Revised
	College Name	Revision Date
	Department	Semester Adopted

Vision	**Mission**
College Goals	

Program Outcomes (from CMO No. 75, s. 2017, p. 3 and 5)**:**

6.2.c. Facilitate learning using a wide range of teaching methodologies and delivery modes appropriate to specific learners and their environments
6.2.d. Develop innovative curricula, instructional plans, teaching approaches, and resources for diverse learners
6.2.e. Apply skills in the development and utilization of ICT to promote quality, relevant, and sustainable educational practices
6.3.3.b. Exhibit the proficiency in relating mathematics to other curricular areas
6.3.3.c. Manifest meaningful and comprehensive pedagogical content knowledge of mathematics
6.3.3.e. Demonstrate proficiency in problem-solving by solving and creating routine and non-routine problems with different levels of complexity
6.3.3.f. Use effectively appropriate approaches, methods, and techniques in teaching mathematics including technological tools
6.3.3.g. Appreciate mathematics as an opportunity for creative work, moments of enlightenment, discovery and gaining insights of the world

Class Information		**Instructor's Information**	
Section		Instructor's Name	
Schedule		Office Designation	
Time		Office Hours	
Venue		Office Telephone	
Term		E-mail Address	

Course Information			
Course Name	**Principles and Strategies in Teaching Mathematics**	Course Code	
Pre-requisite Subject		Course Credit	3 units, 3 hrs./wk. (18 weeks, 54 hrs. total)
Course Requirements			
Grading System			

Course Description	BTIs covered
This course deals with the application of current principles, methods, philosophical foundations, and strategies of teaching Mathematics that are learner-centered and research-based. This is anchored on the Conceptual Framework of Math K to 12 Education. It aims to equip students with the knowledge and skills on how to design appropriate learning activities, and create ICT-driven instructional materials that they can utilize for lesson planning and microteaching.	1.1.1 1.3.1 1.5.1 4.1.1 4.5.1
Course Learning Outcomes At the end of the course, the pre-service teachers should be able to:	BTIs covered
A. Display deeper knowledge and understanding on the principles and strategies in teaching mathematics using various teaching methods (e.g. inquiry method, integrative method, etc.) through demonstration teaching;	1.1.1 1.5.1
B. Display competence in designing, constructing, implementing and managing classroom structures and different teaching strategies to suit learners' needs and the available physical learning environment;	2.3.1, 3.1.1
C. Demonstrate pedagogical content and technological knowledge in Math to implement teaching strategies that develop 21st century skills and promote literacy and numeracy, using varied and appropriate Mathematical tools and software;	1.4.1 4.1.1 4.5.1
D. Manifest positive attitude towards learning by engaging in every exploratory and expository activities in Math classes.	1.1.1

Time Allotment	Intended Learning Outcomes (ILOs)	BTIs	Content	Suggested Teaching Learning Activities	Suggested Assessment	BTIs
WEEK 1	At the end of the week, the pre-service teacher (PST) should be able to:		***I. Conceptual Framework of Math Education***			
Session 1	1.1a. discuss how critical thinking skill is developed in Mathematics teaching 1.1b. discuss how problem-based strategy enhances learning Mathematics	1.1.1 1.5.1 [A]	**1.1 Goals in Mathematics Education**	**Round Robin Discussion**	Filled-out graphic organizer (T-chart)	1.1.1
Session 2	1.1c. distinguish the key features of Problem Solving and Problem-based strategy	1.1.1 1.5.1 [A]		**Think-Pair-Share**	Filled-out graphic organizer (Venn Diagram)	1.1.1
Session 3	1.2a. cite examples of: a. Argumentation and b. Conflict Resolution c. Conjecture reasons d. Patterning	1.1.1 1.5.1 [A]	**1.2 Critical Thinking Skills**	**Punctuated Lecture** *The teacher will provide input to students; the teacher will pause and elicit questions/ clarifications from the students. The teacher continues after providing answers to questions/clarifications.*	Filled-out graphic organizer (Spider Map)	1.1.1
WEEK 2	At the end of the week, the pre-service teacher (PST) should be able to:		***II. Underlying principles and strategies***	**Socratic Method** *(Students will formulate questions and discuss the answers. The teacher facilitate the question-answer in class)*	**Student formulated questions**	1.1.1
Session 1	2.1a. describe how constructivism as a strategy works in the teaching of Mathematics	1.1.1 [A]	**2.1 Constructivism in Mathematics teaching**			
Session 2	2.2a. describe how teaching for understanding can be used in mathematics teaching.	1.1.1 [A]	**2.2 Teaching for understanding in Mathematics teaching**	**Reciprocal Teaching** (small team of 4 where 1- Clarifies 1- Asks questions 1- Predicts 1- Summarizes	**Concept notes** as a result of Reciprocal Teaching	1.1.1
Session 3	2.3a. describe how Dale's Cone of Experience is applicable in	1.1.1 [A]	**2.3 a. Dale's Cone of experience**	**Interactive Lecture** *(The teacher will provide input to students; the teacher will pause and*	**Summary Sheet** *(Students will write a summary describing how Dale's Cone of*	1.1.1

	Mathematics teaching and learning 2.3b. describe how other constructivism strategies can improve teaching and enhance learning in Mathematics	1.1.1 [A]	**2.3b.Various constructivism strategies in Teaching Mathematics**	*asks questions to draw out answers that will lead to deeper discussion of the lesson.)*	*experience and various constructivism strategies enhance Mathematics teaching and learning)*	
WEEK 3 Session 1 Session 2 Session 3	At the end of the week, the pre-service teacher (PST) should be able to: 3.1a. identify different cooperative learning strategies (CLS) used in Mathematics teaching and learning 3.1b. construct instructions for a selected appropriate Mathematics teaching 3.2a. demonstrate how these CLS are utilized in teaching Mathematics 3.3a. identify various classroom management routines to be used during CLS. 3.3b. select appropriate classroom management routines and materials to be used during CLS. 3.3c. develop materials (markers, incentive board, etc.) to be used during CLS.	 2.3.1 3.1.1 [B] 2.3.1 3.1.1 [B] 2.3.1 3.1.1 [B]	***III. Understanding Cooperative Learning Structures (CLS)*** **3.1 Cooperative Learning Structures** **3.2 CLS in Mathematics Teaching** **3.3 Production of classroom management routine and materials to be used during CLS**	 **Writeshop of the different instructions for a certain CLS** **Simulation Activity** **Construction Activity** on Classroom Management Materials that facilitates team learning	 Written works - **CLS Instructions** **Scoring Rubric on Demonstration Teaching** **Product-based performance**: **Rule Markers** *(e.g. Rule 1: All eyes and ears on me.* *Incentive Package* *Scoring Board)*	1.1.1
WEEK 4 Session 1 Session 2	At the end of the week, the pre-service teacher (PST) should be able to: 4.1a. define what is reflective teaching 4.1b. describe the significance of reflective teaching 4.2a. identify the different critical reflection techniques that can be	 1.1.1 [A] 2.3.1 3.1.1	***IV. Reflective Teaching*** **4.1. Reflective Teaching and its significance** **4.2. Different Critical Reflection Techniques**	 **Interactive Lecture** **Think-Pair-Share**	 **Filled-out Graphic Organizer: T-Chart** **Double Entry Journal**	5.1.1 5.2.1

	utilized in Mathematics teaching and learning 4.3a. design a lesson worksheet on reflective teaching in Mathematics	[B]	• **Reflective Journal Writing** • **Learning Log** • **Learning Journal** **4.3. Reflective Teaching Lesson Worksheet**	**Writeshop: Reflective Teaching Worksheet**	Written Work: **Lesson Worksheet on Reflective Teaching**	
Session 3	4.4a. construct processing questions for the lesson worksheet on reflective teaching in Mathematics	4.1.1 [C]	**4.4. Processing Questions for Reflective Teaching**	**Writeshop: Constructing Processing Questions**	Written Work: **Formulated Questions that Process Experience**	
WEEK 5	At the end of the week, the pre-service teacher (PST) should be able to:		***V. Inquiry-based Teaching***			1.1.1 4.1.1 5.3.1
Session 1	5.1a. identify the components of 5E's teaching model 5.1b. describe how 5E's model is appropriate in Mathematics teaching and learning	1.1.1 4.1.1 1.5.1 [A,C]	**5.1 The 5E's Model**	**Interactive Lecture**	**Summary Sheet**	
Session 2	5.2a. design a lesson plan using 5E's model		**5.2 Lesson planning using 5E's in Mathematics**	**Small Group Discussion and planning**	Product-based Assessment: **5 E's plan of Instruction**	
Session 3	5.3a. demonstrate the designed lesson plan using 5E's model		**5.3 Execution of the 5 E's**	**Simulation Activity**	**Scoring Rubric on 5E's Instructions** **Micro-teaching**	
WEEK 6	At the end of the week, the pre-service teacher (PST) should be able to:		***VI. Direct Instructions***	Cooperative Learning Structure: **Circle the sage** *(The teacher will assign students to be sages who will be responsible with giving inputs to their classmates. The rest of the classmates will surround the sage, and the sage will explain what they know about the topic.*	**Exit card on Significant Learning and Most Confusing Ideas**	1.1.1
Session 1	6.1a. discuss the effective ways of using direct instructions as a strategy 6.2a. differentiate punctuated lecture from interactive lecture	1.1.1 2.3.1 3.1.1 [A,B]	**6.1. Direct Instructions as a strategy** **6.2. Punctuated Lecture vs Interactive Lecture**	**Round Robin Discussion**	**Filled-out T-Chart**	
Session 2	6.3a. formulate appropriate questions to be asked during lecture and/or discussion	4.1.1 [C]	**6.3 Asking Appropriate Questions**	**Writeshop: Formulation of Appropriate Questions**	**Written Script on Question-Answer showing probing, prompting, redirecting questions**	

Session 3	7.1a. discuss what is blended classroom learning 7.1b. discuss how blended classroom instruction can be effective in teaching and learning Mathematics	1.1.1 2.3.1 3.1.1 [A,B]	**VII. Flipping the Classroom:** **7.1 Blended Classroom Instruction**	**Brainstorming Activity**	**Written Work: Word wall on blended classroom Instruction** **Quiz**	
WEEK 7 Session 1 and Session 2	At the end of the week, the pre-service teacher (PST) should be able to: 7.2a. discuss how Writing to Learn Techniques facilitate learning in Mathematics teaching	1.1.1 2.3.1 3.1.1 [A,B]	**7.2 Writing to Learn Strategies** **a) Descriptive Writing** **b) Expository Writing** **c) Cause and Effect Writing** **d) Persuasive Writing** **e) Narrative Writing**	**Socratic Method**	**Hand Signals** *(The teacher will instruct the students to raise and do hand signals to assess if they have questions, clarifications, and additional inputs)*	1.1.1 5.1.1 5.2.1
Session 3	7.3a. construct Writing to Learn worksheet	1.4.1 4.1.1 [C]	**7.3. Construction of sample of the different Writing to Learn Strategies**	**Writeshop: Construction Activity**	**Product-based: Writing to Learn Samples**	
WEEK 8	At the end of the week, the pre-service teacher (PST) should be able to:		***VIII. Integrating ICT in Mathematics Teaching***			1.1.1 1.3.1 4.5.1
Session 1	8.1a. identify the different types of Asynchronous Communication System 8.1b. discuss how Asynchronous Communication System facilitate learning in Mathematics teaching	1.1.1 1.4.1 4.1.1 [A,C]	8.1 Asynchronous Communication System (Wikis and Blogs)	**Socratic Method**	**Oral Response Card** *(The students will write their response to the question during discussion on a meta card)*	
Session 2	8.2a. identify the different types of Synchronous Communication System 8.2b. discuss how Synchronous Communication System facilitate learning in Mathematics teaching	1.1.1 1.4.1 4.1.1 [A,C]	8.2 Synchronous Communication System (Instant Messaging, twitter, FB and Instagram) 8.3 Other Digital Tools	**Round Robin Discussion** **Brainstorming Activity**	**Written Work: Concept Notes** **Oral Response Card**	
Session 3	8.4a. utilize digital tools to construct communication text samples	1.1.1 1.4.1 4.1.1	8.4 Application of the different Digital tools for Communication	**Practical Works on Hands-on Activities**	**Product-based Assessment: Sample Communication Text using digital tools**	

		[A,C]	Skills Development in Mathematics Learning			
Week 9	**IX. Summative Examination**					
WEEK 10 Session 1 Session 2	At the end of the week, the pre-service teacher (PST) should be able to: 10.1a. articulate learning competencies and learning activities 10.2a. articulate learning intent for a specific learning competency	1.1.1 1.4.1 4.1.1 [A,C]	**X. Instructional Planning** 10.1 Writing Learning Outcomes • Revised Bloom's Taxonomy • Solo Taxonomy • Kendall's Taxonomy • Marzano's New Taxonomy 10.2 Articulating K to 12 competencies in Mathematics Learning with success indicators (Enabling Skills)	**Punctuated Lecture** **Writeshop: Articulating of learning competencies and learning activities** **Write shop: Articulating learning intent for a certain learning competency**	**Written Work: on Alignment Learning Outcomes and Strategies** Written Work: **Assessment Grid (Alignment of competencies with enabling skills and strategies)**	5.1.1 5.4.1
Week 11	At the end of the week, the pre-service teacher (PST) should be able to: 11.1a. design learning activities utilizing Constructivism and Discovery Learning	1.1.1 1.4.1 4.1.1 4.5.1 [A,C]	***XI. Designing Learning Activities in Mathematics by applying the following:*** 11.1 Constructivism and Discovery Learning	**Interactive Lecture and Write-shop**	Written Work: **Lesson activity on Constructivism and Discovery Learning**	5.1.1
Week 12	At the end of the week, the pre-service teacher (PST) should be able to: 11.2a. design learning activities utilizing Inquiry-based Learning with Reflective Teaching	1.1.1 1.4.1 4.1.1 4.5.1 [A,C]	11.2 Inquiry-based Learning with Reflective Teaching	**Interactive Lecture and Write-shop**	Written Work: **Lesson activity on Inquiry-based integrating Reflective Teaching**	5.1.1
Week 13	At the end of the week, the pre-service teacher (PST) should be able to: 11.3a. design learning activities utilizing Cooperative Learning Structure with Writing to Learn	1.1.1 1.4.1 4.1.1 4.5.1 [A,C]	11.3 Cooperative Learning with Writing to Learn	**Interactive Lecture and Write-shop**	Written Work: **Lesson Activity on Cooperative integrating "Writing to Learn"**	5..1.1

Week 14	At the end of the week, the pre-service teacher (PST) should be able to: 11.4a. design learning activities utilizing Blended Teaching Approach	1.1.1 1.4.1 4.1.1 4.5.1 [A,C]	11.4 Blended Teaching Approach (Flipping Classroom)	**Interactive Lecture and Write-shop**	Written Work: **Activity Description on the implementation of Flipped Classroom**	5.1.1
Week 15	At the end of the week, the pre-service teacher (PST) should be able to: 12.1a. design instructional materials to facilitate and manage students' behaviors in the classroom	1.1.1 1.4.1 2.3.1 4.1.1 4.5.1 [A,B, C]	***XII. Managing students' behaviors in the classroom*** *12.1. Instructional Materials on managing students' behaviors in the classroom*	**Interactive Simulation Activity**	Product-based Assessment: **Non-verbal instructional materials intervention for students with low profile** *(The pre-service teachers will design instructional materials for students who are developing and beginners to facilitate a more positive behavior towards learning Mathematics)* **Non-verbal instructional materials on reward system**	5.2.1
Week 16-18	At the end of the week, the pre-service teacher (PST) should be able to: 12.1a. conduct a demonstration teaching instructional materials to facilitate and manage students' behaviors in the classroom	1.1.1 1.4.1 2.3.1 4.1.1 4.5.1 [A,B, C,D]	**Learning Walk Activities**	▪ **Exhibit of Lesson Plans and Instructional Materials** ▪ **Presentation Demonstration** ▪ **Consolidation of comments and recommendations** ▪ **Finalizing lesson design**	**Individual Learning Space** **20-minute Micro-skill Demo**	5.3.1 5.4.1

Suggested References

Anderson, L. W. & Krathwohl, D.R. (Eds.) (2001). *A taxonomy for learning, teaching and assessing: A revision of Bloom's taxonomy of educational objectives.* (Abridge edition) New York: Longman.

Arends, R.I. (2011). *Learning to teach (9th Ed.).* Boston, MA: McGraw Hill.

Atkins, A.T. (2010). *Collaborating online: Digital strategies for group work.* Retrieved January 15, 2012, from http://wac.colostate.edu/books/writingspaces1/atkins--collaborating-online.pdf

Bean, J.C. (2011). *Engaging ideas: The professor's guide to integrating writing, critical thinking and active learning in the classroom* (2nd Ed.). San Francisco: John Wiley and Sons.

Institution Logo	Name of Institution	Date Last Revised
	College Name	Revision Date
	Department	Semester Adopted

Vision	**Mission**
College Goals	

Program Outcomes (from CMO No. 75, s. 2017, p. 3 and 5)**:**

6.1.b. effectively communicate in English and Filipino, both orally and in writing
6.2.b. demonstrate mastery of subject matter/discipline

6.3.3.a exhibit competence in mathematical concepts and procedures
6.3.3.g appreciate mathematics as an opportunity for creative work, moments of enlightenment, discovery and gaining insights of the world

Class Information		**Instructor's Information**	
Section		Instructor's Name	
Schedule		Office Designation	
Time		Office Hours	
Venue		Office Telephone	
Term		E-mail Address	

Course Information			
Course Name	**Abstract Algebra**	Course Code	
Pre-requisite Subject		Course Credit	3 units, 3 hrs./wk. (18 weeks, 54 hrs. total)
Course Requirements			
Grading System			

Course Description	BTIs covered
This course is designed to facilitate understanding of basic concepts and properties of algebraic structures. The topics include *Groups*, *Subgroups, Cyclic Groups, Permutation Groups, Cosets, Isomorphism, Normal and Factor Groups, Homomorphism, and introduction to rings*. It aims to develop symbolic thinking, enhance skills in writing proofs, and foster appreciation for mathematical structures which are all helpful in dealing with higher mathematics.	1.1.1
Course Learning Outcomes	BTIs covered
At the end of the course, the pre-service teachers should be able to:	
A. Demonstrate critical thinking in interpreting and applying fundamental concepts and proving claims concerning basic algebraic structures (e.g. groups, subgroups, homomorphisms)	1.1.1
B. Exhibit competence in identifying as well as producing examples and non-examples of particular algebraic structures using their properties and relevant mathematical concepts;	1.1.1
C. Show skills in working with functions to relate seemingly dissimilar algebraic structures;	1.1.1
D. Reconstruct algebraic concepts and reformulate principles based on mathematical investigations;	1.1.1
E. Communicate abstract algebra ideas in both written and oral form;	1.1.1
F. Design classroom activities and materials on selected abstract algebra concepts with the use of ICT.	4.5.1

Time Allotment	Intended Learning Outcomes (ILOs)	BTIs	Content	Suggested Teaching Learning Activities	Suggested Assessment	BTIs
Week 1-2	At the end of the week, the pre-service teacher (PST) should be able to: • use modulo concepts and properties to solve modular arithmetic problems and compose proofs; • Illustrate the concept of function, one-to-one function, onto function, one-to-one correspondence, inverse of a function, and equivalence relation; • Evaluate a function and identify its domain and range; • formulate proofs for propositions related to functions, function composition, and equivalence relations. • work with peers to collaboratively solve problems and present solutions;	1.1.1 [A] 1.1.1 [A] 1.1.1 [A] 1.1.1 [A,E] 1.1.1 [A]	**II. Preliminary Topics** a. Modular Arithmetic b. Functions c. Equivalence Relations	Punctuated Lecture and Interactive Discussion with: - Misconception/Preconception Check *activity* where students answer a teacher-made diagnostic test to check on students' knowledge of the preliminary concepts and uncover misconceptions and quality of preconception - Think Breaks where each student is asked to write question/s to be answered by the class to clarify understanding of the preliminary topics - Think-Pair-Share problem solving and proving activities where students are given problems to solve and propositions to prove. Students write initial solutions/proofs, then are paired off to consolidate solutions/proofs with a peer for sharing to the whole class	Double Entry Journal Log where students outline the solution to a problem in one column and describes his/her reasoning in the other column Oral Presentation of consolidated solution scripts and/or proof scripts to be evaluated using a rubric Pen and Paper Tests with items that require students to prove mathematical propositions on the preliminary topics	1.1.1
Week 3-4	At the end of the week, the pre-service teacher (PST) should be able to: • explain the definition of a group and identify as well as produce examples and non-examples; • prove the elementary properties of a group; • construct and/or complete Cayley tables for finite groups;	1.1.1 [B] 1.1.1 [A,E] 1.1.1 [A]	**III. Groups** a. Binary operations b. Groups c. Elementary Properties of Groups	Interactive Discussion and Punctuated Lectures with: - Study Session using a Four-Square Graphic Organizer assigned in advance where students are asked to give the definition of a group and provide examples and non-examples - Follow-up Questioning where the teacher uses Q and A to probe into students' quality of	Four - Square Graphic Organizer Output Paraphrasing of Properties of Groups Performance Task: Video of Oral Presentation of Solution/Proof Pen and Paper Test with items that require students to prove mathematical propositions	1.1.1

	• use the elementary properties of a group in proving related propositions. • use technology to communicate solutions and proofs to whole class	1.1.1 [A,E] 1.1.1 [A,E]		understanding of the concepts and properties of groups - Writing-to-Learn activity where students are directed to paraphrase the elementary properties of groups to check for understanding - Group Problem Solving involving pattern seeking and formulating of conjectures where students are asked to creatively prepare a video showing their discussion of solutions/proofs and other output for viewing by the whole class		
Week 5-6	At the end of the week, the pre-service teacher (PST) should be able to: • illustrate the order of a group, order of an element, and the subgroup concept by producing examples and non-examples; • explain the structures and characteristics of different subgroups like cyclic subgroup, center of a group and centralizer of an element; • assess and justify whether a given set of elements together with a binary operation is a subgroup; • compose proofs for related propositions using previous theorems	 1.1.1 [A,B] 1.1.1 [A,] 1.1.1 [A,] 1.1.1 [A,E]	**IV. Subgroups** a. Order of a Group and Order of an Element b. Subgroups c. Cyclic Subgroups	Interactive Discussion and Punctuated Lectures with: - Study Session using a Cerebral Chart Graphic Organizer (assigned in advance) where students are asked to show connection between concepts from group, subgroup, to cyclic, and other related concepts - Guided Reciprocal Peer Questioning where students are asked to write questions to ask each other for the purpose of clarifying understanding - Group Problem Solving and Proving where students are grouped and assigned to work on different problems including proving problems. Solutions and proofs are to be communicated to the whole class for discussion and ratification.	Graphic Organizer: Cerebral Chart Oral Presentation of Solution/Proof to be graded with a rubric Pen and Paper Test with items that require students to prove mathematical propositions	1.1.1

Week 7-8	At the end of the week, the pre-service teacher (PST) should be able to: • explain the structure of a cyclic group and determine examples and non-examples; • derive properties of cyclic based on exploration; • prove the properties of cyclic groups; • apply relevant theorems to determine the subgroups of a given cyclic group and draw its subgroup lattice.	1.1.1 [B] 1.1.1 [D] 1.1.1 [A,E] 1.1.1 [A]	**V. Cyclic Groups** a. Definition and Properties of Cyclic Groups b. Finite Cyclic Groups	Interactive Discussion and Punctuated Lectures with: - Graphic Organizer (cerebral chart) where students are asked to depict the relationship of the cyclic group concept to previous concepts. - Follow-up Questioning where the teacher uses Q and A to probe into students' quality of understanding of the concepts and properties of cyclic groups and their ability to identify examples and non-examples - Think-Pair-Share problem solving/proving activity where pairs of students are tasked to produce consolidated solutions/proofs for oral presentation to the whole class.	Graphic Organizer: Cerebral Chart Double Entry Journal Log where students outline the solution to a problem in one column and describes his/her reasoning in the other column Oral Presentation of Solution/Proof to be graded with rubrics Pen and Paper Test with items that require students to prove mathematical propositions	1.1.1
Week 9	**Midterm Summative Exam**					
Week 10-11	At the end of the week, the pre-service teacher (PST) should be able to: • transform permutations from array form to cycle form and the other way around; • express permutations as products of disjoint cycles or products of transpositions; • determine the order, inverse, product of permutations; • write solutions and proofs to problems involving the permutation groups.	1.1.1 [A] 1.1.1 [A] 1.1.1 [A] 1.1.1 [A,E]	**VI. Permutation Groups** a. Permutations and the Symmetric Groups b. Orbits and Cycles c. Properties of Permutations	Interactive Discussion and Punctuated Lectures with: - Guided Reciprocal Peer Questioning where students write questions to ask each other for the purpose of clarifying understanding - Graphic Organizer (cerebral chart) where students show their understanding of the relationships between and among the concepts of – permutation, permutation groups, symmetric groups, dihedral groups, alternating groups through concept mapping; - Think-Pair-Share problem solving and proving activities	Graphic Organizer: Cerebral Chart Double Entry Journal Log where students outline the solution to a problem in one column and describes his/her reasoning in the other column Oral Presentation of Solution/Proof to be graded with rubrics Pen and Paper Test with items that require students to prove mathematical propositions	1.1.1

				where students are given problems to solve and propositions to prove. Students write initial solutions/proofs, then are paired off to consolidate solutions/proofs with a peer for sharing to the whole class.		
Week 12	At the end of the week, the pre-service teacher (PST) should be able to: • explain the definition of a coset and illustrate through examples; • express in words and elucidate theorems written in symbolic form; • use the Lagrange's theorem to determine the subgroups of a given group; • apply properties of cosets in solving problems and composing proofs involving the coset concept.	1.1.1 [A,B] 1.1.1 [A] 1.1.1 [A,B] 1.1.1 [A,E]	**VII. Cosets and Lagrange's Theorem** a. Cosets b. Lagrange's Theorem	Interactive Discussion and Punctuated Lectures with: - Guided Reciprocal Peer Questioning where students are asked to write questions to ask each other for the purpose of clarifying understanding - Think-Group-Share activity where students are tasked produce solutions/proofs, then consolidate individual output in a group, and communicate results to the whole class - Exit Card where students provide responses to questions or prompts provided by the teacher at the end of a session to check for understanding	Double Entry Journal Log where students outline the solution to a problem in one column and describes his/her reasoning in the other column Oral Presentation of Solution/Proof to be graded with rubrics Pen and Paper Test with items that require students to prove mathematical propositions	1.1.1
Week 13	At the end of the week, the pre-service teacher (PST) should be able to: • explain the definition of an isomorphism and recognize examples and non-examples of isomorphism; • use function concepts to establish isomorphism between two groups; • prove theorems on isomorphism;	1.1.1 [A,B] 1.1.1 [A,C] 1.1.1 [A,E]	**VIII. Isomorphisms** a. Isomorphisms b. Automorphisms	Interactive Discussion and Punctuated Lectures with: - Study Session using a Four-Square Graphic Organizer assigned in advance where students are asked to give the definition of an isomorphism and provide examples and non-examples - Follow-up Questioning where the teacher uses Q and A to probe into students' quality of	Four-Square Graphic Organizer Double Entry Journal Log where students outline the solution to a problem in one column and describes his/her reasoning in the other column Oral Presentation of Solution/Proof to be graded with rubrics Pen and Paper Test with items that require students to prove mathematical propositions	1.1.1

	• produce proofs of new propositions arising from theorems about isomorphism;	1.1.1 [A,E]		understanding of the concepts and properties of isomorphism - Think-Pair-Share problem solving/proving activity where students produce solutions/proofs for oral presentation to the whole group.		
Week 14-15	At the end of the week, the pre-service teacher (PST) should be able to: • explain the definition and significance of a normal subgroup; • use the definition and theorems to appraise whether a given subgroup is normal; • construct the Cayley table of a Factor Group • compose proofs for propositions about normal subgroups and factor groups	1.1.1 [A] 1.1.1 [A,B] 1.1.1 [A] 1.1.1 [A,E]	**IX. Normal Subgroups and Factor Groups** a. Normal Subgroup b. Factor Groups	Interactive Discussion and Punctuated Lectures with: - Video Lecture where students are given access to a video lecture (option: study session using a printed reference) and a short problem set as homework; - Guided Reciprocal Peer Questioning where students are asked to write questions to ask each other for the purpose of clarifying understanding - Graphic Organizer (cerebral chart) where students show their understanding of the relationships between and among the concepts of – group, subgroup, cosets, normal subgroups, factor groups and other related concepts; - Think-Pair-Share problem solving/proving activity where students produce solutions/proofs for oral presentation to the whole class.	Double Entry Journal Log where students outline the solution to a problem in one column and describes his/her reasoning in the other column (Homework) Cerebral Chart Graphic Organizer Oral Presentation of Solution/Proof to be graded with rubrics Pen and Paper Test with items that require students to prove mathematical propositions	1.1.1
Week 16	At the end of the week, the pre-service teacher (PST) should be able to: • delineate between isomorphism, homomorphism, and automorphism;	1.1.1 [A,C]	**X. Group Homomorphism** a. Group Homorphisms b. Properties of Homomorphisms	Interactive Discussion and Punctuated Lectures with: - Analogy Graphic Organizer where students delineate between a new concept and a prior concept in terms of similarities and differences	Analogy Graphic Organizer Performance Task: Teaching Demonstration Oral Presentation of Solution/Proof to be graded with rubrics	1.1.1 4.5.1

	• write solutions to problems involving homomorphism; • articulate proofs for theorems and other claims about homomorphism; • use ICT in designing materials and in implementing a mini-teaching episode on an assigned property of homomorphism • implement a mini teaching episode covering a homomorphism property	1.1.1 [A,C, E] 1.1.1 [A,E] 1.1.1 [A,E] 1.1.1 4.5.1 [A,E, F]		- Follow-up Questioning where the teacher uses Q and A to probe into students' quality of understanding of the concept and properties of homomorphism and its relationship with the concept of isomorphism - Think-Pair-Share problem solving/proving activity where students produce solutions/proofs for oral presentation to the whole group.	Pen and Paper Test with items that require students to prove mathematical propositions	
Week 17	At the end of the week, the pre-service teacher (PST) should be able to: • explain the definition of a ring and a subring and produce examples; • prove the properties of a ring; • use the properties of a ring to prove arising propositions about a ring.	1.1.1 [A,B] 1.1.1 [A,E] 1.1.1 [A,E]	**XI. Introduction to Rings** a. Definition and Examples of Rings b. Properties of Rings c. Subrings	Interactive Discussion and Punctuated Lectures with: - Analogy Graphic Organizer where students contrast and compare the concepts - group versus ring and subgroup versus subring - Follow-up Questioning where the teacher uses Q and A to ensure that students see the connection between the group concept and the ring concept - Think-Pair-Share problem solving/proving activity where students produce solutions/proofs for oral presentation to the whole class	Analogy Graphic Organizer Oral Presentation of Solution/Proof to be graded with rubrics Pen and Paper Test with items that require students to prove mathematical propositions	1.1.1
Week 18	**Summative Final Exam**					

Suggested References

Fraleigh, J.B. (2014). *A first course in abstract algebra*, (7th Edition). USA: Pearson.

Gallian, J.A. (2016). *Contemporary abstract algebra*, (9th Edition). USA: Cengage.Learning.

Jaisingh, L.R. & Ayres, F. (2003). *Schaum's outline of theory and problems of abstract algebra (2nd Edition).* USA: McGraw-Hill.

Malik, D.S. (1997). *Fundamentals of abstract algebra*. Singapore: McGraw-Hill Companies.

Rotman, J.J (2005). *A first course in abstract algebra with applications*, (3rd Edition). New Jersey, USA: Prentice-Hall

Institution Logo	Name of Institution	Date Last Revised
	College Name	Revision Date
	Department	Semester Adopted

Vision	**Mission**

College Goals

Program Outcomes (from CMO No. 75, s. 2017, p. 3 and 5)**:**

6.1.a. Articulate and discuss the latest developments in the specific field of practice
6.1.d. Act in recognition of professional, social, and ethical responsibility

6.2.b. Demonstrate mastery of subject matter discipline

6.3.3.a. Exhibit competence in mathematical concepts and procedures
6.3.3.g. Appreciate mathematics as an opportunity for creative work, moments of enlightenment, discover and gaining insights of the world

Class Information		**Instructor's Information**	
Section		Instructor's Name	
Schedule		Office Designation	
Time		Office Hours	
Venue		Office Telephone	
Term		E-mail Address	

Course Information			
Course Name	**Research in Mathematics**	Course Code	
Pre-requisite Subject		Course Credit	3 units, 3 hrs./wk. (18 weeks, 54 hrs. total)
Course Requirements			
Grading System			

Course Description	BTIs covered
The course aims to prepare prospective mathematics teachers to undertake an undergraduate research project. It entails exposure to various theories and trends in Mathematics education and research culled from actual action research projects. It gives students the opportunity to conduct researches that address problems, issues, and concerns in mathematics teaching and learning showcasing research skills, knowledge of research ethical standards, as well as mathematical content and processes.	1.1.1 1.2.1
Course Learning Outcomes At the end of the course, the pre-service teachers should be able to:	BTIs covered
A. Demonstrate analytical skills in critiquing reported action research with respect to research processes and teaching and learning issues and trends embedded therein;	1.1.1
B. Show insightful understanding of the role of research in improving mathematics education by evaluating and reflecting current learning and teaching practices/issues in the Philippines and conceptualizing a relevant research project;	1.1.1 1.2.1
C. Show competence in the application of research skills and ethical standards in carrying out an action research project intended to improve teaching and learning mathematics;	1.1.1 1.2.1
D. Use ICT tools and basic principles of oral presentation in communicating action research results.	1.3.1, 4.5.1

Time Allotment	Intended Learning Outcomes (ILOs)	BTIs	Content	Suggested Teaching Learning Activities	Suggested Assessment	BTIs
Week 1	At the end of the lesson/s, the graduates should be able to: • identify various purposes of writing a research • discuss the importance of research in educational setting • identify different types of research designs	1.1.1 [A] 1.1.1 1.2.1 [A,B] 1.1.1 [A]	**1. The Purposes of Educational Research** **2. Types of Educational Research Designs**	**Punctuated Lecture** *The teacher will provide input to students; the teacher will pause and elicit questions/ clarifications from the students. The teacher continues after providing answers to questions/clarifications.*	**Filled-out Concept Map / Spider Map**	1.1.1 1.2.1
Week 2	At the end of the lesson/s, the graduates should be able to: • identify various theories Mathematics teaching and learning (these theories can be utilized as anchor theories for writing a research) • identify trends and issues in reported action research • identify trends and issues in Mathematics teaching and learning	1.1.1 [A] 1.2.1 [B] 1.1.1 [A]	**3. The use of research in validating theories and establishing trends in addressing issues in Mathematics Education**	**Research critiquing of journal article in Mathematics education** **Placemat Consensus** *The students (in each group) will discuss and each will write their answers in their individual writing space (placemat). The students will discuss what they have written to the group, if there is a consensus that the answer is important, the student-recorder will record the answer using an application card*	**Application Card** *(In the application card, the students will write down at least one real-world application for what they have just learned. This will determine how well the students can apply the theory to address the issue/problem,* ***--- In this context, application card will be used as an assessment rather than a TLA. The students' outputs (cards) are the evidence of students learning.***	1.1.1
Week 3	At the end of the lesson/s, the graduates should be able to: • identify basic ethical considerations in educational research • discuss ethical considerations and issues in research in Mathematics teaching and/or learning Mathematics	1.1.1 [C] 1.1.1 1.2.1 [C]	**11. Ethical Issues in Educational Research**	**Punctuated Lecture**	**Retrieval Information Chart**	1.1.1

Week 4	At the end of the lesson/s, the graduates should be able to: • discuss the basic framework of fundamental/basic research process vs. action research process • identify the procedure done in each step based on the sample reported action research article • differentiate research process between conducting fundamental/basic research and action research • identify research phenomena in the current teaching and learning practices in Mathematics • discuss the phenomena (issues/problems/practices) that can be addressed by conducting research to improve teaching and learning Mathematics	 1.1.1 [B] 1.1.1 [B] 1.1.1 [B] 1.1.1 1.2.1 [B] 1.1.1 1.2.1 [B,C]	**4. Fundamental research process and Action research process** **5. Identifying Research Phenomenon**	**Learning Station/Walk** *Each group will present one step in conducting fundamental research vs action research* **Rally Table** *The students will take turns passing a paper and pen, each student will write phenomenon, issue, and/or problem in teaching and learning Mathematics* **Project-based Learning:** Research Paper	**Similarities and Differences T-Chart** **Double Entry Chart**	1.1.1
Week 5-6	At the end of the lesson/s, the graduates should be able to: • generate possible research questions from the research phenomenon identified • select relevant and appropriate research questions that can be interest of study • develop research questions • discuss the relevance and appropriateness of the theoretical perspectives the researchers	 1.1.1 [B] 1.1.1 1.2.1 [B] 1.1.1 [A,B] 1.1.1 [B]	**6. Research Question/s Development** **7. Theoretical Framework Development**	**Round Robin Discussion** **Placemat Consensus** **Student Reporting** (Students with report updates of their research paper)	**Set of Research Questions** **Theoretical Framework Outline**	1.1.1 1.2.1

	(students) hold relating to the research phenomenon identified • evaluate the theory to be used as anchor theory of the research study	1.1.1 [B]				
Week 7	At the end of the lesson/s, the graduates should be able to: • identify relevant and appropriate literature and studies on the research problem/s identified • collect literature and studies relevant to the research problem/s identified	1.1.1 [B]	**8. Literature Reviews**	**Rally Table**	**Literature Review Outline**	1.1.1
Week 8	At the end of the lesson/s, the graduates should be able to: • synthesize relevant and appropriate literature and studies on the research problem/s identified	1.1.1 [B]	**9. Literature Review Writing**	**Library Work**	**Literature Review Manuscript**	1.1.1
Week 9	**10. *Summative Assessment (Midterm Exam)***			**Concept Paper Presentation** *Suggestion: The teacher may ask each group to have a 10-minute presentation of their concept paper.*	**Research Concept Paper**	1.1.1 1.2.1
Week 10	At the end of the lesson/s, the graduates should be able to: • identify samples, sampling technique that is appropriate to the research study • discuss validity and reliability • identify data to be gathered • identify sources of data	1.1.1 [C] 1.1.1 [C] 1.1.1 [C] 1.1.1 [C]	**12. Samples, Validity and Reliability** **13. Data gathering procedure**	**Rally Table** **Punctuated Lecture**	**Research Methodology Outline** **Data Gathering Procedure Matrix**	1.1.1

	• identify appropriate procedure of data gathering (based on the data to be gathered) • utilize appropriate ICT tools in gathering data	1.1.1 [C] 1.3.1 4.5.1 [D]				
Week 11	At the end of the lesson/s, the graduates should be able to: • identify appropriate research instrument to be utilized to gather data • identify the appropriateness of adapting and/or adopting research instrument • discuss the characteristics of good research instrument • develop research instrument appropriate to their research study	1.1.1 [C]	**14. Research Instrument Development**	**Interactive Lecture** *The teacher will provide input to students; the teacher will pause and asks questions to draw out answers that will lead to deeper discussion of the lesson.*	**Developed Research Instrument**	1.1.1
Week 12-13	At the end of the lesson/s, the graduates should be able to: • gather relevant information / data with intellectual honesty	1.1.1 [C]	**15. Collecting Data**	**Actual data gathering**	**Gathered data**	1.1.1
Week 14	At the end of the lesson/s, the graduates should be able to: • identify various statistical tools used in data analysis • select statistical tool appropriate to be used • utilize a software (SPSS, JASP, PSPP, etc) to run the data gathered	1.1.1 [C]	**16. The use of statistical tools**	**Hands-on activity**	**Generated data from the software used**	1.1.1 1.3.1 4.5.1

Week 15-16	At the end of the lesson/s, the graduates should be able to: • identify trends and patterns in action research data • examine the data under study/investigation • analyze results of data • write a clear research report	1.1.1 [B] 1.1.1 [B,C] 1.1.1 1.2.1 [C] 1.1.1 [B,C]	**17. Data Analysis** **18. Report Writing**	**Rally Table**	**Analyzed data** **Draft of the full-report of the Action Research Paper**	1.1.1 1.1.1
Week 17	At the end of the lesson/s, the graduates should be able to: • present a clear research report	1.1.1 [C,D]	***Summative Assessment*** **Reporting Results** (Presentation of the action research paper)	**Action Research Presentation**	**Full-Blown Action Research Paper**	1.1.1
Week 18	At the end of the lesson/s, the graduates should be able to: • present their action plan based on the results reported during the presentation.	1.1.1 [A,C]	**Action Planning**	**Action Planning** ****The students will present their action plan based on the results reported during the presentation***. *Students must learn that Action Researches are done in order to address specific problem in the area of concern; thus, a plan of action must be done – "taking informed action".* *Teachers will take part in the planning and/or implementation of the actions identified.*	**Action Plan Report**	1.1.1 1.2.1

Suggested References
Arthur, J., Waring, M., Coe, R., & Hedges, L.V. (2012). *Research methods and methodologies in education.* California: Sage Publications. Ary, D., Jacobs, L.C., Sorensen, C., & Razavieh, A. (2010). *Introduction to research in education.* California: Wadsworth Cengage Learning. Creswell, J. W. (2012). *Educational research: Planning, conducting and evaluating quantitative and qualitative research*. Boston: Pearson Education. Martella, R.C., Nelson, J.R., Morgan, R.L., & Martella-Marchand, N. (2013). *Understanding and interpreting educational research.* New York: The Guilford Press. McMillan, J.H. (1996). *Educational research: Fundamentals for the consumer.* New York: Harper Collins Publishers. Opie, C. (2011). *Doing educational research*. Retrieved from eric.ed.gov Postlethwaite, T.N. (2005). *Educational research: basic concepts and terminology*. Retrieved from www.sacmeq.org DOI: iiep/web doc/2005.01

Institution Logo	Name of Institution	Date Last Revised
	College Name	Revision Date
	Department	Semester Adopted

Vision	**Mission**

College Goals

Program Outcomes (from CMO No. 75, s. 2017, p. 3 and 5)**:**

6.1.b. Articulate and discuss the latest developments in the specific filed of practice

6.1.c. Work effectively and collaboratively with a substantial degree of independence in multi-disciplinary and multi-cultural teams

6.1.d. Act in recognition of professional, social, and ethical responsibility

6.2.e. Apply skills in the development and utilization of ICT to promote quality, relevant, and sustainable educational practices

6.3.3.f. Use effectively appropriate approaches, methods, and techniques in teaching (mathematics including technological tools

Class Information		**Instructor's Information**	
Section		Instructor's Name	
Schedule		Office Designation	
Time		Office Hours	
Venue		Office Telephone	
Term		E-mail Address	

Course Information			
Course Name	**Technology for Teaching and Learning 2 - Mathematics**	Course Code	
Pre-requisite Subject		Course Credit	3 units, 3 hrs./wk. (18 weeks, 54 hrs. total)
Course Requirements			
Grading System			

Course Description	BTIs covered
This is a 3-unit course that focuses on the application, design, production, utilization and evaluation of Information and Communications Technology (ICT) materials for teaching and learning Mathematics. This is in support of constructivist pedagogies for the 21st century learners. The major requirement for this course is an ICT-integrated and project-based learning plan aligned with the K to 12 curriculum. All the learning activities and course requirements will revolve around the student-teacher developed Learning Plan.	1.1.1 4.5.1
Course Learning Outcomes At the end of the course, the pre-service teachers should be able to:	BTIs covered
A. Use ICT tools and other ICT-based materials to develop 21st century skills in Mathematics – critical thinking, problem solving, reasoning, and communication skills (viewing, listening, speaking, reading, and writing);	1.3.1, 1.5.1
B. Develop projects/ problem-based /inquiry-based collaborative plans and activities using technology tools;	1.3.1
C. Use mathematical software and other open-ended tools to support the development of the project-based collaborative-based activities in Mathematics specific application;	1.3.1, 4.5.1
D. Produce learning resources using technology tools in various mathematics areas;	4.5.1
E. Evaluate the relevance and appropriateness of ICT tools and resources based on the learning contexts;	1.1.1
F. Use technology tools to collaborate and share resources among communities of practice;	1.3.1, 4.5.1
G. Exhibit responsible use of ICT tools and ICT-based materials in Mathematics teaching and learning by making informed professional decisions.	1.3.1, 4.5.1

Time Allotment	Intended Learning Outcomes (ILOs)	BTIs	Content	Suggested Teaching Learning Activities	Suggested Assessment	BTIs
Week 1	At the end of the week, the pre-service teacher (PST) should be able to: 1.1. identify different educational sites in Mathematics learning 1.2. discuss the various ICT tools in Mathematics that develops collaborative and communication skills 1.3. select appropriate ICT tools to be used to develop collaborative and communication skills 1.4. utilize ICT tools in different learning activities that develops collaborative and communication skills	 1.1.1 1.1.1 4.5.1 1.1.1 1.3.1 4.5.1 [A]	**1. ICT utilization in developing 21st century skills** A. Collaboration Skills B. Communication Skills	**Placemat Consensus** *The students (in each group) will discuss and each will write their answers in their individual writing space (placemat). The students will discuss what they have written to the group, if there is a consensus that the answer is important, the student-recorder will record the answer.*	**Repertory Grid** *Each group will come up with a Repertory Grid from the consolidated answers on placemat consensus activity.* **Learning Plan Outline** (emphasizing the use of ICT tool in a specific learning activity that develops collaborative and communication skills)	1.1.1 4.5.1
Week 2	At the end of the week, the pre-service teacher (PST) should be able to: 2.1. discuss the various ICT tools in Mathematics that develops critical thinking and problem-solving skills 2.3. select appropriate ICT tools to be used to develop critical thinking and problem-solving skills 2.4. utilize ICT tools in different learning activities that develops critical thinking and problem-solving skills	 1.1.1 4.5.1 1.1.1 1.3.1	**2. ICT utilization in developing 21st century skills (cont.)** C. Critical Thinking Skills D. Problem-Solving Skills	**Round Robin Discussion** *(The teacher may utilize the same grouping as that of the Placemat Consensus activity)*	**Repertory Grid** **Learning Plan Outline** (emphasizing the use of ICT tool in a specific learning activity that develops critical thinking and problem-solving skills)	1.1.1 1.5.1 4.5.1
Week 3	At the end of the week, the pre-service teacher (PST) should be able to: 3.1. identify the different learning activities in Mathematics using ICT 3.2. select appropriate learning activities and ICT tools to enhance Mathematics learning	 1.1.1 4.5.1	**3. Enhancement of Mathematics Learning Plan** A. Various learning activities for technology-driven lessons in Mathematics B. Integration of ICT in developing the 21st century skills in Mathematics teaching and learning	**Think-Pair-Share**	**Annotations** (on how some ICT tools may enhance sample unit plans in Mathematics) **Learning Plan** (that integrates learning activities and ICT tools that develops 21st century skills)	1.1.1 1.3.1 4.5.1

	3.3. integrate ICT tools in developing the 21st century skills (collaborative, communication, critical thinking and problem-solving) in Mathematics learning plan	1.1.1				
Week 4	At the end of the week, the pre-service teacher (PST) should be able to: 4.1. discuss the Problem-based and Project-based approaches 4.2. identify different ICT tools that can be utilized in Problem-based learning 4.3. select ICT tools appropriate for Problem-based learning 4.4. integrate appropriate ICT tools in the Problem-based instructional plan 4.5. develop an outline of Problem-based instructional plan	 1.1.1 1.1.1 1.3.1 1.1.1 1.1.1 4.5.1 [B,E, G]	**4. Problem-based Instructional Plan Development** A. Problem-based and Project-based approaches B. ICT tools in Problem-based learning	**Gallery Walk** *Each group will present different ICT tools that can be utilized in Problem-based learning. After the activity, the students will discuss which of the various ICT tools are appropriate and can be used in the context of the learners*	**Developed Checklist** (of the ICT tools that can be utilized in the Problem-based learning) **Problem-based instructional plan outline**	1.1.1 4.5.1
Week 5	At the end of the week, the pre-service teacher (PST) should be able to: 5.1. identify different ICT tools that can be utilized in Project-based learning (according to research articles) 5.2. select ICT tools appropriate for Project-based learning 5.3. integrate appropriate ICT tools in the Project-based instructional plan 5.4. develop an outline of Project-based instructional plan	 1.1.1 4.5.1 1.1.1 1.1.1 4.5.1	**5. Developing Project-based Instructional Plan** A. ICT tools in Project-based learning	**Three Stray, One Stay** *Three students from each group stray to different groups to share various ICT tools utilized in Project-based learning. Also, they will gather information from the "stay" in the group.* *The student who stayed in the group will also share and gather information from the "strays".*	**Developed Checklist** (of the ICT tools that can be utilized in the Project-based learning) **Project-based instructional plan outline**	1.1.1 4.5.1

		[B,E, G]				
Week 6	At the end of the week, the pre-service teacher (PST) should be able to: 6.1. develop intended learning outcomes/objectives from the identified Mathematics competencies (from the DepEd Curriculum Guide) in the chosen unit that best require ICT integration 6.2. select ICT tools that are aligned to Mathematics competencies, outcomes, and assessment with teaching and learning activities 6.3. develop problem-based and project-based instructional plans	1.1.1 1.1.1 4.5.1 1.1.1 4.5.1 [B,E, G]	**6. Problem-based and project-based instructional plans** A. Problem-based and project-based instructional plans development/write-shop	**Write-shop**	**Problem-based and Project-based instructional plans**	1.1.1 4.5.1
Week 7	At the end of the week, the pre-service teacher (PST) should be able to: 7.1. discuss the characteristics of appropriate IMs and ICT resources for Mathematics learning 7.2. identify the different types of educational IMs and technology tools for Mathematics teaching and learning 7.3. identify relevant and appropriate educational IMs and technology tools to be used in	1.1.1 1.1.1 1.1.1 [E,G]	**7. Characteristics of Good/Appropriate IMs and Technology tools** A. Online software/apps B. Offline software/apps	**Three-minute Review (hands-on activity)** *Teachers stop any time during a lecture or discussion and give students three minutes to review what has been said by using the mathematical software integrated in the discussion.* **The students are also given the opportunity to ask clarifying questions/instructions in utilizing of the software/s.* **The teacher can also do a demonstration on the utilization of software.*	**Criteria Checklist** (to determine the appropriateness of IMs and technology tools)	1.1.1

	teaching and learning Mathematics					
Week 8	At the end of the week, the pre-service teacher (PST) should be able to: 8.1. differentiate digital and non-digital learning resources that can be appropriately used in teaching and learning Mathematics 8.2. identify various digital and non-digital learning resources that can be used in teaching and learning Mathematics 8.3. select appropriate learning resources using digital and non-digital resources to improve teaching and learning Mathematics 8.4. develop digital and non-digital resources that are appropriate in teaching and learning Mathematics	1.1.1 1.1.1 1.1.1 4.5.1 1.1.1 1.3.1 4.5.1 [D,E, G]	**8. Learning Resources (Digital and Non-digital) Production** A. Digital Learning Resources B. Non-digital Learning Resources	**Scavenger Hunt** *The students will have to collect materials that can be used as learning materials in learning and teaching Mathematics*	**Developed learning resources (digital and non-digital IMs)**	1.1.1 1.3.1 4.5.1
Week 9	**9. Summative Examination (Midterm)**					
Week 10	At the end of the week, the pre-service teacher (PST) should be able to: 10.1. identify various productivity software application/tools for teaching and learning Mathematics 10.2. create sample outputs using Microsoft Word, Spreadsheets, and Publisher 10.3. create sample outputs using Powerpoint and Prezi	1.1.1 1.3.1 4.5.1 [C,D, G]	**10. Productivity Software Applications/Tools for teaching and learning** A. Word B. Spreadsheets C. Publisher D. Power point and Prezi	**Punctuated Lecture** *The teacher will provide inputs to students; the teacher will pause and solicit questions/ clarifications from the students. The teacher continues after providing answers to questions/clarifications.* **Workshop**	**Sample output using Microsoft Word, Spreadsheets, Publisher, Powerpoint and Prezi**	1.1.1 1.3.1 4.5.1

Week 11	At the end of the week, the pre-service teacher (PST) should be able to: 11.1. create materials using Podcast, Social Networking Sites in teaching Mathematics 11.2. create materials using Mobile Technology/ Educational apps for mobile phones for Teachers	1.1.1 1.3.1 4.5.1 [C,D, G]	**11. Open-ended tools in Mathematics teaching and learning** A. Podcast B. Social Networking Sites C. Mobile Technology	**Punctuated Lecture and Workshop**	**Sample output using Podcast, Social Networking Sites, and Mobile Technology in teaching Mathematics**	1.1.1 1.3.1 4.5.1
Week 12	At the end of the week, the pre-service teacher (PST) should be able to: 12.1. create materials using Gaming in Mathematics teaching	1.3.1 4.5.1 [C,D, E,G]	**12. Open-ended tools in Mathematics teaching and learning (cont.)** A. Gaming (Kahoot, Socrative, Quizlet, etc.)	**Punctuated Lecture and Workshop**	**Sample output using Gaming in Mathematics teaching**	1.1.1 1.3.1 4.5.1
Week 13	At the end of the week, the pre-service teacher (PST) should be able to: 13.1. discuss the relevance and appropriateness of ICT resources in Mathematics teaching and learning to the learning context 13.2. generate appropriate criteria to ICT resources in Mathematics teaching and learning to the learning context 13.3. develop assessment tool to evaluate relevant and appropriate ICT resources in Mathematics teaching and learning to the learning context	1.1.1 [E,G]	**13. Assessment ICT resources in Mathematics teaching and learning** A. Assessment of ICT resources in Mathematics teaching and learning	**Placemat Consensus**	**Assessment Tool** (that can evaluate the relevance and appropriateness of ICT resources to the learning context)	1.1.1
Week 14	At the end of the week, the pre-service teacher (PST) should be able to: 14.3. discuss the observed consistencies that match the	1.1.1 [E,G]	**14. Evaluation of ICT resources in Mathematics teaching and learning** A. Evaluation of ICT resources in Mathematics teaching and learning	**Think-Pair-Share**	**Accomplished Assessment Tool**	1.1.1

	identified standards/criteria on the assessment tool and the ICT resources in Mathematics teaching and learning to the learning context 14.4. evaluate the relevance and appropriateness of ICT resources using the assessment tool					
Week 15	At the end of the week, the pre-service teacher (PST) should be able to: 15.1. identify the features and uses of ICT tools for collaboration and sharing resources to enhance Mathematics teaching and learning 15.2. discuss how to promote collaborative and transformative learning in cyberspace 15.3. select appropriate ICT tools suitable for collaboration in teaching and learning Mathematics 15.4. utilize ICT tools for collaboration in teaching and learning Mathematics	1.1.1 1.1.1 1.1.1 4.5.1 1.1.1 1.3.1 [E,F]	**15. Technology tools for collaboration** A. ICT tools for collaboration and sharing resources	**Rally Table** *The students will take turns passing a paper and pen, each student will write one answer (features and uses of ICT tools for collaboration in teaching and learning Mathematics)*	**Double-Entry Journal** *Each student will choose one ICT tool suitable for collaboration to enhance Mathematics teaching and learning.* *The student will be asked to utilize the ICT tool he/she has chosen.* *The student will write a double-entry journal on the advantages of using ICT tool for collaboration (he/she has chosen) juxtapose his/her experiences in using the ICT tool.*	1.1.1
Week 16	At the end of the week, the pre-service teacher (PST) should be able to: 16.1. discuss various educational sites and portals suitable to Mathematics teaching and learning 16.2. identify appropriate educational sites and portals to be utilized in teaching and	1.1.1 [E] 1.1.1 [E]	16. **Educational sites and portals** A. Educational sites and portals suitable for Mathematics teaching and learning	**Gallery Walk** *The students will gather information from each group's output, and write it in the Retrieval Information Chart.* *After the discussion with their own group, the students will describe how the various educational sites and portals are suitable to teaching and learning specific content/concept in Mathematics*	**Retrieval Information Chart**	1.1.1

	learning specific Mathematics content/concept					
Week 17	At the end of the week, the pre-service teacher (PST) should be able to: 17.1 discuss the integration of collaborative activities using appropriate technology tools 17.2. develop learning outcomes from the identified Mathematics competencies (from the DepEd Curriculum Guide) in the chosen unit that best require integration of collaborative activities using appropriate technology tools 17.3. select collaborative activities and appropriate ICT tools that are aligned to Mathematics competencies, outcomes, and assessment with teaching and learning activities 17.4. develop learning plan incorporating collaborative activities using appropriate technology tools	1.1.1 4.5.1 [C,E, G]	17. **Learning Plan Development**	**Learning Plan Write shop**	**Developed Learning Plan**	1.1.1 4.5.1
Week 18			**FINAL EXAM** a. Demonstration of designed learning plans b. Showcase of Electronic Portfolio	**Microteaching** **Project-based Learning**	**E-portfolio (blog)**	

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Institution Logo	Name of Institution	Date Last Revised
	College Name	Revision Date
	Department	Semester Adopted

Vision	**Mission**

College Goals

Program Outcomes (from CMO No. 75, s. 2017, p. 3 and 5)**:**

6.3.3.a. Exhibit competence in mathematical concepts and procedures
6.3.3.b exhibit the proficiency in relating mathematics to other curricular areas
6.3.3.c manifest meaningful and comprehensive pedagogical content knowledge of mathematics
6.3.3.d demonstrate competence in designing, constructing, and utilizing different forms of assessment in mathematics
6.3.3.g appreciate mathematics as an opportunity for creative work, moments of enlightenment, discovery and gaining insights of the world

Class Information		**Instructor's Information**	
Section		Instructor's Name	
Schedule		Office Designation	
Time		Office Hours	
Venue		Office Telephone	
Term		E-mail Address	

Course Information			
Course Name	**Assessment and Evaluation in Mathematics**	Course Code	
Pre-requisite Subject		Course Credit	3 units, 3 hrs./wk. (18 weeks, 54 hrs. total)
Course Requirements			
Grading System			

Course Description	BTIs covered
This course is designed to provide students an in-depth knowledge and understanding of the principles of valid and useful assessment and evaluation practices and their role in the educative process. The course gives emphasis on the use and development of modified traditional type of assessment, authentic and alternative assessment strategies to gauge the extent of learning in Mathematics. Moreover, it discusses issues and trends in assessment in mathematics teaching. As a requirement, the students are to construct test types aligned with the competencies and performance standards of K to 12 as well as construct evaluation tools for performance-based assessment.	1.1.1 5.1.1 5.5.1 5.2.1
Course Learning Outcomes At the end of the course, the pre-service teachers should be able to:	BTIs covered
A. Exhibit knowledge and skills in designing formative and summative assessment on mathematics concepts and problem solving.	5.1.1
B. Display proficiency in integrating assessment practices in Mathematics with other subject area or disciplines.	1.1.1
C. Demonstrate understanding of meaningful assessment by aligning assessment with learning competencies and learning experiences.	4.2.1, 5.5.1
D. Demonstrate competence and skills in implementing different assessment techniques to facilitate student success in learning Mathematics using learner attainment data;	5.1.1, 5.2.1
E. Show appreciation in using authentic and alternative assessment methods in Mathematics learning.	1.1.1

Time Allotment	Intended Learning Outcomes (ILOs)	BTIs	Content	Suggested Teaching Learning Activities	Suggested Assessment	BTIs
WEEK 1 **Session 1** **Session 2** **Session 3**	At the end of the week, the pre-service teacher (PST) should be able to: 1.1a. discuss the significance of assessment and evaluation of learning in Mathematics 1.2a. discuss the DepEd policies on assessment of learning in Mathematics 1.3a. describe the skills and attitudes to be achieved in K to 12 Mathematics learning outcomes	1.1.1 6.3.1 [E]	**I. Outcomes-based Assessment** **1.1 Assessment and Evaluation of Learning in Mathematics** **1.2 DepEd Policies on Assessment especially on Mathematics K-12** **1.3 Skills and Attitudes in K-12 Mathematics Learning Outcomes**	Interactive Lecture Cooperative Learning Activity: Recall, Summarizing, Questioning, Comment (RSQC) Cooperative Learning Activity: Numbered Head (Identifying Skills from Attitude Learning Outcomes	Oral Response (Traffic Lights Cards) • Yellow- teacher is going fast • Red- student ask questions • Green – student would like to answer the question Short Quiz: Select-Response Type Short Quiz: Select-Response Type	1.1.1
WEEK 2	At the end of the week, the pre-service teacher (PST) should be able to: 2.1a. construct program learning outcomes, course learning outcomes, and intended learning outcomes 2.2a. map the program learning outcomes with course learning outcomes 2.3. map the course learning outcomes with intended learning outcomes	4.2.1 [C]	**II. Program Course and Intended Learning Outcomes** 2.1 Construction of: ▪ Program Learning Outcomes ▪ Course Learning Outcomes ▪ Intended Learning Outcomes 2.2 Mapping Program Learning Outcomes with Course Learning Outcomes based on the DepEd Mathematics Curriculum Guide 2.3 Mapping Course Learning Outcomes with Intended Learning Outcomes based on the DepEd Mathematics Curriculum Guide	Write-shop: Construction of Learning Outcomes	Written Work: Assessment Grid (Mapping Course Learning competencies with Intended Learning Outcomes)	4.2.1
WEEK 3	At the end of the week, the pre-service teacher (PST) should be able to: 3.1a. articulate performance standards into competencies 3.2a. articulate competencies into learning targets	5.5.1 [C]	**III. Performance Standards, Competencies, and Learning Targets in Mathematics** 3.1 Performance Standards, Competencies, and Objectives 3.1 Articulation of Performance Standards into Competencies 3.2 Articulation of Competencies into Learning Targets	Writeshop: Articulations of Standards into Competencies and Learning Targets	Written Work: Performance Standards into Competencies; Competencies into Learning Targets	5.5.1

WEEK 4	At the end of the week, the pre-service teacher (PST) should be able to: 4.1. identify various authentic assessment methods in Mathematics education 4.2. select appropriate authentic assessment method that can be utilized in Mathematics teaching and learning 4.3. design authentic assessment method that integrates other discipline (Sciences, Social Studies, etc.) in Mathematics project	5.1.1 [A]	**IV. Authentic Assessment Methods in Mathematics Education** 4.1 Designing Authentic Assessment ▪ Project-based Learning ▪ GRASPS Framework ▪ Three modes of Authentic Assessment (Observation, Performance Tasks, Actual Performance)	Punctuated Learning	Sample Authentic Assessment Strategies Assessment tool: Observation-based Assessment tools Oral Response	5.1.1
WEEK 5 **Session 1-2** **Session 3**	At the end of the week, the pre-service teacher (PST) should be able to: 3.1a. design a project-based using GRASPS framework 3.2a. present real life issues and concerns in GRASPS	4.2.1 1.1.1 [A,C]	**V. Summative Tests (Performance-based)** 5.1. Writing of Project-based in a GRASPS Framework 5.2. Presentation of Real-life Problems in GRASPS	Gallery Walk	Written Work: GRASPS Analytical Rubric	4.2.1
WEEK 6	At the end of the week, the pre-service teacher (PST) should be able to: 6.1. discuss how individual or group checklist is utilized in problem-solving in Mathematics 6.2. describe how interview sheet can be utilized in enhancing Mathematics learning 6.3. construct assessment tools appropriate in assessing students' learning in Mathematics	1.1.1 5.2.1 [D]	**VI. Evaluation Tools Used in Authentic Assessment** 6.1 Individual or Group Checklist in Problem-Solving in Mathematics 6.2 Interview Sheet 6.3 Assessment Tools	Interactive Lecture Write shop: Assessment Tool	Color Cards: Raising Green- Keep Going Yellow –I'm a little bit confused Written Work Sample Assessment Tools	5.2.1
WEEK 7	At the end of the week, the pre-service teacher (PST) should be able to:		**VII. Other formative Assessment** 7.1 Process-oriented Assessment 7.2 Analytical Scoring Rubric vs. Holistic Rubric	Mind Mapping Visual Mapping: T-Chart or Venn Diagram Writeshop:	Written Work Concept Note on Process-Oriented Assessment Samples: Holistic Rubric	5.1.1 5.2.1

	7.1. discuss process-oriented assessment is utilized Mathematics teaching and learning 7.2. differentiate analytical scoring rubric and holistic rubric 7.3. construct holistic and analytical scoring rubric	5.2.1 [D]	7.3 Construction of Holistic and Analytical Scoring Rubric	Construction Activity	Analytical Rubric	
WEEK 8	**VIII. Exhibit of the Students Written Works on Authentic Assessment and Tools**	1.1.1 [B]		Learning Walk : Posting Presentations and Editing Works	Written Work: Authentic Assessment Strategies Designs Process-oriented: Performance Assessment Checklist	1.1.1
Week 9	**IX. Summative Examination**					
WEEK 10 **Session 1**	At the end of the week, the pre-service teacher (PST) should be able to: 10.1a. Identify the learning outcomes of a quarter in certain grade level 10.1b. decide on the type of objective test 10.1c. identify total number of sessions 10.1d. compute for the number of items per learning outcome.	1.1.1 5.1.1 [A]	**X. Development of Varied Paper and Pencil Tests in Mathematics** 10.1 Planning and Constructing of Table of Specification for a Quarter	Workshop: Constructing TOS	Written Work: Sample Table of Specification for a Quarter	5.1.1
Session 2-3	At the end of the week, the pre-service teacher (PST) should be able to: 11.1a. identify what needs to be improved given a simple multiple-choice test item in Mathematics (in reference with guidelines in multiple choice instructions 11.2b. construct a multiple choice item	1.1.1 5.1.1 [A]	**XI. Test Items in Mathematics assessment** 11.1. Multiple Choice i. Traditional Multiple Choice ii. Modified Multiple Choice	Interactive Lecture Write-shop 1: Constructing Traditional Multiple Choice Test Items Write-shop 2 Constructing Modified Multiple Choice	Written Work: Sample Multiple Choice Test Items Written Work Sample 1: Multiple Choice (Traditional) Written Work Sample 2: Modified Multiple Choice	5.1.1

	11.2c. construct a modified multiple choice (2 or 3 tiered questions) *First- Applications of Concepts* *Second- Reason for the Choice* *Third- if possible the principle or concepts that support the answer*					
WEEK 11	At the end of the week, the pre-service teacher (PST) should be able to: 11.2a. identify what needs to be improved in True or False Items given a sample Teacher-constructed test items (in reference from the guidelines in True or False Constructions 11.2b construct True-False Items (traditional) 11.2c construct Modified True or False Items using If-then Prompt	1.1.1 5.1.1 [A]	**11.2. True or False Items** i. Traditional True or False ii. Modified True or False	Interactive Lecture Write-shop 1: Constructing True or False items Write-shop 2: Construction of Modified True or False Items using If-then Prompt	Written Work: Sample 1:True-False Items (Traditional) Sample 2: True-False Items (Modified)	5.1.1
WEEK 12	At the end of the week, the pre-service teacher (PST) should be able to: 11.3a. discuss the formulation of Completion type of test 11.3b. construct completion type of test in Problem-Solving	1.1.1 5.1.1 [A]	**11.3. Supply Type or Constructed Response Type**	Interactive Lecture Write-shop: Constructing Completion Type of Test in Problem Solving	Written Work: Sample Completion Type of Test	5.1.1
WEEK 13	At the end of the week, the pre-service teacher (PST) should be able to: 11.4a. describe the two types of essay 11.4b. discuss the different higher-order thinking skills assessed in essay and the question prompt for each thinking skill *(e.g. Application Question- Using the given mathematical model, solve for its discriminant and explain why the discriminant is real, rational, or irrational)*	1.1.1 5.1.1 [A]	**11.4. Supply Type of Test: Essay** i. Restricted Essay ii. Non-restricted Essay	Interactive Lecture Write-shop: Constructing Students Constructed Response Type	Visual Map: Tchart/ Venn Diagram Oral Response Type Written Work: Sample Student Constructed Response Type	1.1.1 5.1.1

	11.4c. construct sample essay test in Mathematics					
WEEK 14	At the end of the week, the pre-service teacher (PST) should be able to: 12.1a. construct a test draft of a quarter	5.1.1 [A]	**XII. Construction of Test Draft of** 12. TOS and test draft construction	Write-shop: Test Item Construction in reference with their TOS	Written Works: • TOS with test item Location • Sample Test Items	5.1.1
WEEK 15	At the end of the week, the pre-service teacher (PST) should be able to: 13.1a. discuss the significance of validation rate instructional decision in formative assessment 13.1b. profile student's performance based on the results utilizing appropriate ICT tools	5.5.1 [C]	**XIII. Interpreting Formative and Summative Results** 13.1. Validation Rate for Instructional Decision in Formative Assessment *E.g. Q_1 : 50-50 (50% of the class got 50% of the items* Decision: Proceed to the next lesson Q_2: 60-40 (60% of the class got 60% of the items Decision: Proceed to the next Lesson	Direct Instruction Workshop: Profiling Students Performance in a formative assessment	Written Work Student Profile of an Exam Result Written Work: • Student's Performance in Formative Exam • One Sentence summary (describing the instructional decision of the teacher based on the result)	5.2.1 5.5.1
WEEK 16	At the end of the week, the pre-service teacher (PST) should be able to: 13.2a. profile students' performance based on the summative examination result 16.4 generate some instructional decision regarding the result	5.5.1 [C]	**XIII. Interpreting Formative and Summative Results (cont.)** 13.2 Students' Performance in Summative Examination into: • Beginner (79 and below) • Developing (80 to 84) • Approaching Proficiency (85-89) • Proficient (90-94) • Outstanding (95 -100)	Direct Instruction Workshop Profiling students' performance given data of examination result (Summative Test) Brainstorming of ideas for intervention in instructions	Written Work Students' Achievement Profile in Summative Examination Written Work Concept Notes	5.5.1

WEEK 17	At the end of the week, the pre-service teacher (PST) should be able to: 14.1. show steps in grade computation using spreadsheet	1.1.1 5.2.1 [D]	**XIV. Grade Computations** **14.1. Grade Computations following the DepEd policy**	Hands-on Activity: ▪ Computation for Written Work Score Computation ▪ Performance Task Quarter Exam ▪ Final Grades	Sample of Grade Computation	5.2.1
WEEK 18	**XV. Culminating Activity**	1.1.1 [E]	**Performance-based Examination: Exhibit of Sample Assessment Strategies** **Capstone Project: Exhibit of the validated TOS and Quarter Exam** *(The student will exhibit the TOS and Quarter Exam validated and administered to JHS students. Also, a report of the 'test analysis' of the summative exam will be included.)*	Exhibit of Assessment Strategies and Techniques Round Robin Discussion on the insights and reflections on learning episodes on assessment and evaluation	Product-based assessment: Sample Assessment strategies	5.1.1 5.3.1

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The documents presented in this compendium are outputs of the collaborative efforts of the selected Centers of Excellence (COEs) and Centers of Development (CODs) in Teacher Education. The COEs/CODs are lead writers/developers in specific programs and secondary writers/developers for the rest of the programs.