MAPÚA INSTITUTE OF TECHNOLOGY
Department of Mathematics

VISION

The Mapua Institute of Technology shall be a global center of excellence in education by providing instructions that are current in content and state-of-the-art in delivery; by engaging in cutting-edge, high-impact research; and by aggressively taking on present-day global concerns.

MISSION

The Mapua Institute of Technology disseminates, generates, preserves and applies knowledge in various fields of study.

The Institute, using the most effective and efficient means, provides its students with highly relevant professional and advanced education in preparation for and furtherance of global practice.

The Institute engages in research with high socio-economic impact and reports on the results of such inquiries.

The Institute brings to bear humanity's vast store of knowledge on the problems of industry and community in order to make the Philippines and the world a better place.

PROGRAM EDUCATIONAL OBJECTIVES (BIOLOGICAL ENGINEERING, CHEMICAL ENGINEERING, CIVIL ENGINEERING, ENVIRONMENTAL AND SANITARY ENGINEERING, INDUSTRIAL ENGINEERING, MECHANICAL ENGINEERING AND MANUFACTURING ENGINEERING)	MISSION			
	a	b	c	d
1. To enable our graduates to practice as successful engineers for the advancement of society.	✓	✓	✓	✓
2. To promote professionalism in the engineering practice.	✓	✓	✓	✓

COURSE SYLLABUS

1. **Course Code** : **MATH 12-1**
2. **Course Title** : **PLANE AND SPHERICAL TRIGONOMETRY**
3. **Pre-requisite** : None
4. **Co-requisite** : None
5. **Credit** : 3 units
6. **Course Description** : The course covers topics on trigonometric functions, graphs and periodicity of trigonometric functions, inverse trigonometric functions , trigonometric identities, solutions of trigonometric equations, solutions of right and oblique plane triangles, and spherical trigonometry. It also covers exponential and logarithmic equations and their applications.

7. **Student Outcomes and Relationship to Program Educational Objectives**

Student Outcomes		Program Educational Objectives	
		1	2
(a)	an ability to apply knowledge of mathematics, science, and engineering	√	

(b)	an ability to design and conduct experiments, as well as to analyze and interpret from data	√	
(c)	an ability to design a system, component, or process to meet desired needs	√	
(d)	an ability to function on multidisciplinary teams	√	√
(e)	an ability to identify, formulate, and solve engineering problems	√	
(f)	an understanding of professional and ethical responsibility		√
(g)	an ability to communicate effectively	√	√
(h)	the broad education necessary to understand the impact of engineering solutions in the global and societal context	√	√
(i)	a recognition of the need for, and an ability to engage in life-long learning	√	√
(j)	a knowledge of contemporary issues	√	√
(k)	an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice	√	√
(l)	Knowledge and understanding of engineering and management principles as a member and leader in a team, to manage projects and in multidisciplinary environments	√	√

8. Course Outcomes (COs) and Relationship to Student Outcomes:

Course Outcomes The student should be able to:	Student Outcomes*											
	a	b	c	d	e	f	g	h	i	j	k	l
1. Solve problems involving angle measurement and right plane triangles and its applications; and evaluate trigonometric functions of any angle with accuracy.	D				D		D		I	I		
2. Analyze and solve correctly problems involving oblique plane triangles; as well as, demonstrate and interpret the graphs of trigonometric and inverse trigonometric functions.	D				D		D		I	I		
3. Show orderly proof of trigonometric identities; and find the exact solutions of trigonometric equations.	D				D		D		I	I		
4. Analyze and solve problems involving right and oblique spherical triangles, exponential and logarithmic functions.	D				D		D		I	I		

*** Level: I- Introduced, R- Reinforced, D- Demonstrated**

9. Course Coverage :

WEEK	TOPIC	TLA	AT	COURSE OUTCOME

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	Orientation and Introduction to the Course Discussion on COs, TLAs, and ATs of the course Overview on student-centered learning and eclectic approaches to be used in the course			
1	**Angle Measure** • Unit of Measurement - Degree, Radian, Conversion • Angles in Standard Position • Coterminal Angles • Length of a Circular Arc • Linear and Angular Speed • Relationship Between Linear and Angular Speed	- Working through Examples - Think-Pair-Share - Visually Guided Learning	Classwork 1 Class Produced Reviewer 1	**CO1**
2	**Trigonometry of Right Triangles** • Trigonometric Ratios • Trigonometric Ratios for Special Angles • Solutions of Right Triangles - Solving Right Triangles • Angle of Elevation / Depression • Bearing and Course			
3	**Trigonometric Functions of Angles** • Evaluation Trigonometric Functions of Any Angle - Signs of Trigonometric Functions - Trigonometric Ratios of Quadrant Angles - Reference Angles • Evaluating Trigonometric Functions Using the Reference Angle			
	LONG QUIZ 1			**CO 1**

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4	**Solutions of Oblique Triangles** • Law of Sines - Derivation of the Law of Sines • Case 1: Two Angles and a Side Given • Case 2: (The Ambiguous Case) Two Sides and The Angle Opposite One of Them Given - The One-Solution Case - The Two-Solution Case - The No-Solution Case • Application Problems Using Law of Sines • Law of Cosines -Derivation of the Law of Cosines • Case 3: Two Sides and the Included Angle Given • Case 4: Three Sides Given Application Problem Using Law of Cosines	- Visually Guided Learning -Group Dynamics -Technology Integrated Guided Learning - Working through Examples	- Class Produced Reviewer 2 -Class Work2	**CO 2**
5	**Graphs of Trigonometric Functions** • Graphs of Sine and Cosine Functions - Domain and Range - Amplitude and Period - Vertical and Horizontal Shifts • Graphs of Tangent and Cotangent Functions - Domain and Range - Periodic Properties - Vertical and Horizontal Shifts • Graphs of Secant and Cosecant Functions - Domain and Range - Periodic Properties • Vertical and Horizontal Shift			
6	**Inverse Trigonometric Functions** • Definition of Inverse Trigonometric Functions • Graphs of Inverse Trigonometric Functions • Evaluating Inverse Trigonometric Functions •			
	LONG QUIZ 2			**CO 2**
7	**Trigonometric Identities** • Fundamental Trigonometric Identities • Proving Trigonometric Identities • Addition and Subtraction Formulas and Proving Identities • Double, Half-Angle and Product-Sum Formulas	- Working through Examples - Think-Pair-Share	- Class Produced Reviewer 3 -Class Work3	**CO 3**

8	**Trigonometric Equations** • Solving Trigonometric Equations Applications			
	LONG QUIZ 3			CO 3
9	**Spherical Trigonometry** • Great Circle • Spherical Triangle • Spherical Right Triangle • Spherical Oblique Triangle • Law of Sine • Law of Cosine • Napier's Analogies • Terrestrial Sphere	- Visually Guided Learning - Working through Examples	- Class Produced Reviewer 4	CO4
10	**Exponential Function** • Definition of Exponential Function • Graphs of Exponential Functions • Natural Exponential Functions **Logarithmic Function** • Definition of Logarithmic Function • Logarithmic and Exponential Forms • Properties of Logarithms • Graphs of Logarithmic Functions • Common/Briggsian Logarithm • Natural/Napierian Logarithm • Laws of Logarithm • Expanding and Combining Logarithmic Expressions • Change of Base Formula			
	Exponential and Logarithmic Equations • Solving Exponential Equations • Solving Logarithmic Equations • Application Problems Involving Exponential and Logarithmic Functions			
	LONG QUIZ 4			**CO4**
11	**SUMMATIVE ASSESSMENT** **FINAL EXAMINATION**			**CO1, CO2, CO3, CO4**

10. Opportunities to Develop Lifelong Learning Skill

The primary Learning Outcome for this course to develop lifelong learning skill is the Student's Quantitative Reasoning, which is to understand and apply the mathematical principles in Trigonometry that will provide students with the needed working knowledge of mathematical concepts and methods, and an awareness of their relationship to increasingly complex world.

11. Contribution of Course to Meeting the Professional Component:

General Education:	0%
Engineering Topics:	0%
Basic Sciences and Mathematics:	100%

12. Textbook:

College Algebra and Trigonometry by Richard N. Aufmann, Vernon C. Barker, Richard D. Nation, 7th Ed., 2011

13. Course Evaluation

Student performance will be rated based on the following:

Assessment Tasks		Weight (%)	Minimum Average for Satisfactory Performance (%)
CO1	Classwork 1	3.0	12.60
	Class Produced Reviewer 1	2.5	
	Long Quiz 1	12.5	
CO2	Class Produced Reviewer 2	2.5	12.95
	Classwork 2	3.5	
	Long Quiz 2	13.0	
CO3	Class Produced Reviewer 3	2.5	12.95
	Classwork	3.5	
	Long Quiz 3	12.5	
CO4	Class Produced Reviewer 4	2.5	14.00
	Long Quiz 4	12.5	
	Project	5.0	
Summative Assessment Final Examination		25.0	17.50
TOTAL		100	70

The final grades will correspond to the weighted average scores shown below

Final Average	Final Grade
96≤ X < 100	1.00
93≤ X < 96	1.25
90≤ X < 93	1.50
86≤ X < 90	1.75
83≤ X < 86	2.00
80≤ X < 83	2.25
76≤ X < 80	2.50
73≤ X < 76	2.75
70 ≤ X < 73	3.00
Below 70	5.00 (Fail)

13.1 Other Course Policies

a. Attendance
According to CHED policy, total number of absences by the students should not be more than 20% of the total number of meetings or 9 hrs for a three-unit-course. Students incurring more than 9 hours of unexcused absences automatically gets a failing grade regardless of class standing.

b. Submission of Assessment Tasks (Student Outputs) should be on time, late submittal of courseworks will not be accepted.

c. Written Major Examination (Long Quiz and Final Exams) will be administered as scheduled. No special exam will be given unless with a valid reason subject to approval by the Chairman of the Mathematics Department.

d. Course Portfolio will be collected at the end of the quarter.

e. Language of Instruction
Lectures, discussion, and documentation will be in English. Written and spoken work may receive a lower mark if it is, in the opinion of the instructor, deficient in English.

f. Honor, Dress and Grooming Codes
All of us have been instructed on the Dress and Grooming Codes of the Institute. We have all committed to obey and sustain these codes. It will be expected in this class that each of us will honor the commitments that we have made.

For this course the Honor Code is that there will be no plagiarizing on written work and no cheating on exams. Proper citation must be given to authors whose works were used in the process of developing instructional materials and learning in this course. If a student is caught cheating on an exam, he or she will be given zero mark for the exam. If a student is caught cheating twice, the student will be referred to the Prefect of Student Affairs and be given a failing grade. Grave misconduct other than cheating will likewise be given a failing grade.

g. Consultation Schedule
Consultation schedules with the Professor are posted outside the Math Faculty room and in the School's web-page (http://math.mapua.edu.ph). It is recommended that the student first set an appointment to confirm the instructor's availability.

14. Other References

14.1 Books

a. College Algebra and Trigonometry by Louis Leithold, International Ed., 2001
b. College Algebra and Trigonometry by Matk Dugopolski, 2nd Ed.
c. College Algebra, enhances with Graphing Utilities by Michael Sullivan and Michael Sullivan III, 2nd Ed.
d. College Algebra and Trigonometry by Nax Sobel and Lemer Norbert, 5th Ed., 1998
e. Applied Algebra and Trigonometry by Linda Davis, 3rd Ed., 2003
f. Algebra and Trigonometry by James Stewart, Lothar Redlin and Saleem Watson, 2nd Ed., 2007
g. Plane and Spherical Trigonometry by Paul Rider
h. Plane and Spherical Trigonometry by Kern and Bland

14.2 Learning Management System

Enhanced Web Assign

15. Course Materials Made Available:

Course Calendar
Samples of Coursework / Project/Class Produced Reviewers
Samples of written examinations of students
End-of-course self-assessment

16. Committee Members:

Course Cluster Chair: Maria Rosario C. Exconde
CQI Cluster Chair: Reynaldo Lanuza
Members: Morris Martin M. Jaballas
Marlon B. Quendangan
Gerardo G. Usita
Alberto C. Villaluz

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