University of Hawaii Maui College
MATH 119 - ENGINEERING PRECALCULUS

1. **Course Alpha. Please click on the ? to the right for help.**

   MATH

2. **Course Number. Please click on the ? to the right for help.**

   119

3. **Course Title/Catalog Title. Please click on the ? to the right for help.**

   ENGINEERING PRECALCULUS

4. **Number of Credits. Please click on the ? to the right for help.**

   4

5. **Contact Hours/Type. Please click on the ? to the right for help.**

   - Hour lecture (4)

6. **Course Description. Please click on the ? to the right for help.**

   Studies linear, polynomial, rational, exponential, logarithmic, and trigonometric functions, matrices and determinants, polar coordinates, vectors, complex numbers, ratio and proportion, sequences and series and related topics with emphasis on applications in electronics and computer engineering technology.

7. **Pre-Requisites. Please click on the ? to the right for help.**

   MATH 103 with grade C or better, or placement at MATH 135, or consent.

8. **Co-requisites.**

9. **Recommended Preparation.**

   None

10. **Is this a cross-listed course? Please click on the ? to the right for help.**

    NO

11. **Reason for Proposal. Why is this course being proposed or modified? This question requires specific information as part of the explanation. Please click on the ? to the right for help.**

    This course will replace MATH 107 to create a new math pathway for the ECET program.

12. **Effective Semester and Year. For new or modified courses, the effective year is one year from the semester proposed. For example, if proposed in Spring 2012, the effective**

semester is Spring 2013. Please click on the ? to the right for help.

Fall 2015

13. Grading Method. What grading methods may be used for this course? Please click on the ? to the right for help.

- Standard (Letter,Cr/NCr,Audit) (0)

14. Is this course repeatable for credit? How often can this course be counted toward a degree or certificate? Please click on the ? to the right for help.

NO

15. Course Student Learning Outcomes (SLOs). DO NOT ENTER TEXT IN THE TEXT BOX BELOW. Click on the yellow button "COURSE LEARNING OUTCOMES" and enter in that screen. Please click on the ? to the right for help.

Course SLO/Competency	A	B	C	D	E	F	G	H
Apply appropriate mathematical processes to solve problems that can be modeled by functions including, but not limited to, linear, polynomial, rational, exponential and logarithmic, and trigonometric as well as linear systems of equations.	☑	☑	☑	☑	☑	☑	☑	☑
Demonstrate effective use of technology in solving such problems.	☑		☑					☑
Communicate the solution of such problems using Standard English and numeric, graphic or symbolic representations and interpret the solution using ETRO-specific terminology when necessary.		☑		☑	☑	☑	☑	

LEGEND

A. Find the inverse of a function and the composite of two functions.
B. *Solve linear equations such as the ones relating to Ohm's Law and systems of equations such as the ones relating to Kirchhoff's Law.*
C. Calculate and apply the trigonometric ratios of acute angles and analyze, graph, and use trigonometric and inverse trigonomtric functions
D. Use the special exponential and logarithmic algebraic properties to rewrite expressions and solve equations, such as equations relating to AC time constants.
E. Translate Cartesian coordinates to polar coordinates using trigonometry.
F. Graph complex numbers in polar form and use them to solve applied problems such as Impedance,and phasors.
G. Use the concept of ratio and proportion to solve applied problems such as designing Wheatstone Bridge.
H. Find the terms of an arithmetic and a geometric sequence as well as the infinite sum of a geometric series.

Course SLO/PSLO	A	B	C	D
Apply appropriate mathematical processes to solve problems that can be modeled by functions including, but not limited to, linear, polynomial, rational, exponential and logarithmic, and trigonometric as well as linear systems of equations.		☑		
Demonstrate effective use of technology in solving such problems.		☑		☑

Communicate the solution of such problems using Standard English and numeric, graphic or symbolic representations and interpret the solution using ETRO-specific terminology when necessary.	☑	☑

LEGEND

A. Analyze, design, and implement electro-optic systems, control systems, instrumentation systems, communication systems, computer systems, or power systems.
B. Utilize appropriate mathematics at the level of algebra and trigonometry to solve technical problems.
C. Demonstrate critical engineering technology skills and experiences such as: making existing technology operate, creating/selecting new technology, troubleshooting, calibrating, characterizing, and optimizing.
D. Demonstrate engineer's way of thinking, analyzing technology as systems.

16. Course Competencies. DO NOT ENTER TEXT IN THE TEXT BOX BELOW. Click on the yellow button "COURSE COMPETENCIES/ISSUES/SKILLS" and enter text in that screen. Course competencies are smaller, simpler tasks that connect to and facilitate the SLOs.

Competency
Find the inverse of a function and the composite of two functions.
Solve linear equations such as the ones relating to Ohm's Law and systems of equations such as the ones relating to Kirchhoff's Law.
Calculate and apply the trigonometric ratios of acute angles and analyze, graph, and use trigonometric and inverse trigonomtric functions
Use the special exponential and logarithmic algebraic properties to rewrite expressions and solve equations, such as equations relating to AC time constants.
Translate Cartesian coordinates to polar coordinates using trigonometry.
Graph complex numbers in polar form and use them to solve applied problems such as Impedance,and phasors.
Use the concept of ratio and proportion to solve applied problems such as designing Wheatstone Bridge.
Find the terms of an arithmetic and a geometric sequence as well as the infinite sum of a geometric series.

17. Recommended Course Content and Timeline. The course content facilitates the course competencies. Course content may be organized by weeks, units, topics or the like.

Content
Basic Concepts of Functions and Related Operations (2 weeks)
Trigonometric Ratios and Functions (3 weeks)
Vectors, Matrices, and Determinants (3 weeks)
Polar Coordinates and Complex Numbers (2 weeks)
Ratio, Proportion, and Variation (1 week)
Exponential and Logarithmic Functions (2 weeks)
Sequence, Series, and the Binomial Theorem (2 weeks)

18. Program Learning Outcomes. DO NOT ENTER TEXT IN THE TEXT BOX BELOW. Click on the yellow button "PLOs" and enter text in that screen. Program Student Learning Outcomes (PLOs) supported by this course. If you are not a "program" use the Liberal Arts PLOs, view them by clicking on ? icon to the right.

Program SLO
Analyze, design, and implement electro-optic systems, control systems, instrumentation systems, communication systems, computer systems, or power systems.
Utilize appropriate mathematics at the level of algebra and trigonometry to solve technical problems.
Demonstrate critical engineering technology skills and experiences such as: making existing technology operate, creating/selecting new technology, troubleshooting, calibrating, characterizing, and optimizing.
Demonstrate engineer's way of thinking, analyzing technology as systems.

19. College-wide Academic Student Learning Outcomes (CASLOs). FIRST, fill out the CASLO grid located in the UHMC tab above. Click on the HELP icon for tips on determining support for the CASLOs and indicate your choices below by clicking on the box in front of each supported CASLO. NOTE: Our campus does not use the Preparatory Level, Level 1 and Level 2 designations in the chart below.

	Creativity - Able to express originality through a variety of forms.
☑	**Critical Thinking** - Apply critical thinking skills to effectively address the challenges and solve problems. ☑ Preparatory Level
	Information Retrieval and Technology - Access, evaluate, and utilize information effectively, ethically, and responsibly.
	Oral Communication - Practice ethical and responsible oral communications appropriately to a variety of audiences and purposes.
☑	**Quantitative Reasoning** - Synthesize and articulate information using appropriate mathematical methods to solve problems of quantative reasoning accurately and appropriately. ☑ Preparatory Level
	Written Communication - Write effectively to convey ideas that meet the needs of specific audiences and purposes.

GenED SLO
Critical Thinking - Apply critical thinking skills to effectively address the challenges and solve problems.
Quantitative Reasoning - Synthesize and articulate information using appropriate mathematical methods to solve problems of quantative reasoning accurately and appropriately.

20. Linking. CLICK ON CHAIN LINK ICON IN UPPER RIGHT HAND CORNER TO BEGIN LINKING. Please click on the ? to the right for help.

21. Method(s) of delivery appropriate for this course. Please click on the ? to the right for help.

- Cable TV (0)
- Classroom/Lab (0)
- Hybrid (0)
- Online (0)

22. Text and Materials, Reference Materials, and Auxiliary Materials. Please click on the ? to the right for help.

This is just a suggestion. Other textbooks, online resources, and handouts may be used.

- Calter. Technical Mathematics with Calculus. 6th. Wiley, , 978-0470-46472-4.
- WileyPLUS Online Assessment Tool. Wiley, .

23. Maximum enrollment. Please click on the ? to the right for help.

35

24. Particular room type requirement. Is this course restricted to particular room type? Please click on the ? to the right for help.

NO

25. Special scheduling considerations. Are there special scheduling considerations for this course? Please click on the ? to the right for help.

NO

26. Are special or additional resources needed for this course? Please click on the ? to the right for help.

No

27. Does this course require special fees to be paid for by students? Please click on the ? to the right for help.

NO

28. Does this course change the number of required credit hours in a degree or certificate? Please click on the ? to the right for help.

No

29. Course designation(s) for the Liberal Arts A.A. degree and/or for the college's other associate degrees. Please click on the ? to the right for help.

Degree	Program	Category
Associate in Arts:	Liberal Arts	LE - Elective FS - Symbolic Reasoning
AS:	ECET - All	PR - Program Requirement
AAS:	ANY	PE - Program Elective
BAS:		
Developmental/ Remedial:		

30. Course designation(s) for other colleges in the UH system.

Not at this point, but it can be adopted.

31. Indicate the year and page # of UHMC catalog referred to. For new or modified courses, please indicate the catalog pages that need to be modified and provide a sheet outlining those changes.

UHMC general catalog 2014-2015 page 131.

32. College-wide Academic Student Learner Outcomes (CASLOs). Please click on the HELP icon for more information.

Standard 1 - Written Communication Write effectively to convey ideas that meet the needs of specific audiences and purposes.		
Outcome 1.1 - Use writing to discover and articulate ideas.		1
Outcome 1.2 - Identify and analyze the audience and purpose for any intended communication.		1
Outcome 1.3 - Choose language, style, and organization appropriate to particular purposes and audiences.		1
Outcome 1.4 - Gather information and document sources appropriately.		0
Outcome 1.5 - Express a main idea as a thesis, hypothesis, or other appropriate statement.		1
Outcome 1.6 - Develop a main idea clearly and concisely with appropriate content.		1
Outcome 1.7 - Demonstrate a mastery of the conventions of writing, including grammar,		0

spelling, and mechanics.		
Outcome 1.8 - Demonstrate proficiency in revision and editing.		0
Outcome 1.9 - Develop a personal voice in written communication.		1
Standard 2 - Quantitative Reasoning Synthesize and articulate information using appropriate mathematical methods to solve problems of quantative reasoning accurately and appropriately.		
Outcome 2.1 - Apply numeric, graphic, and symbolic skills and other forms of quantitative reasoning accurately and appropriately.		3
Outcome 2.2 - Demonstrate mastery of mathematical concepts, skills, and applications, using technology when appropriate.		3
Outcome 2.3 - Communicate clearly and concisely the methods and results of quantitative problem solving.		3
Outcome 2.4 - Formulate and test hypotheses using numerical experimentation.		0
Outcome 2.5 - Define quantitative issues and problems, gather relevant information, analyze that information, and present results.		2
Outcome 2.6 - Assess the validity of statistical conclusions.		0
Standard 3 - Information Retrieval and Technology. Access, evaluate, and utilize information effectively, ethically, and responsibly.		
Outcome 3.1 - Use print and electronic information technology ethically and responsibly.		1
Outcome 3.2 - Demonstrate knowledge of basic vocabulary, concepts, and operations of information retrieval and technology.		0
Outcome 3.3 - Recognize, identify, and define an information need.		0
Outcome 3.4 - Access and retrieve information through print and electronic media, evaluating the accuracy and authenticity of that information.		1
Outcome 3.5 - Create, manage, organize, and communicate information through electronic media.		1
Outcome 3.6 - Recognize changing technologies and make informed choices about their appropriateness and use.		0
Standard 4 - Oral Communication Practice ethical and responsible oral communications appropriately to a variety of audiences and purposes.		
Outcome 4.1 - Identify and analyze the audience and purpose of any intended communication.		0
Outcome 4.2 - Gather, evaluate, select, and organize information for the communication.		1
Outcome 4.3 - Use language, techniques, and strategies appropriate to the audience and occasion.		2
Outcome 4.4 - Speak clearly and confidently, using the voice, volume, tone, and articulation appropriate to the audience and occasion.		1
Outcome 4.5 - Summarize, analyze, and evaluate oral communications and ask coherent questions as needed.		1

Outcome 4.6 - Use competent oral expression to initiate and sustain discussions.		1
Standard 5 - Critical Thinking Apply critical thinking skills to effectively address the challenges and solve problems.		
Outcome 5.1 - Identify and state problems, issues, arguments, and questions contained in a body of information.		2
Outcome 5.2 - Identify and analyze assumptions and underlying points of view relating to an issue or problem.		2
Outcome 5.3 - Formulate research questions that require descriptive and explanatory analyses.		1
Outcome 5.4 - Recognize and understand multiple modes of inquiry, including investigative methods based on observation and analysis.		2
Outcome 5.5 - Evaluate a problem, distinguishing between relevant and irrelevant facts, opinions, assumptions, issues, values, and biases through the use of appropriate evidence.		2
Outcome 5.6 - Apply problem-solving techniques and skills, including the rules of logic and logical sequence.		3
Outcome 5.7 - Synthesize information from various sources, drawing appropriate conclusions.		2
Outcome 5.8 - Communicate clearly and concisely the methods and results of logical reasoning.		2
Outcome 5.9 - Reflect upon and evaluate their thought processes, value system, and world views in comparison to those of others.		1
Standard 6 - Creativity Able to express originality through a variety of forms.		
Outcome 6.1: Generate responses to problems and challenges through intuition and non-linear thinking.		1
Outcome 6.2: Explore diverse approaches to solving a problem or addressing a challenge.		1
Outcome 6.3: Sustain engagement in activities without a preconceived purpose.		1
Outcome 6.4: Apply creative principles to discover and express new ideas.		1
Outcome 6.5: Demonstrate the ability to trust and follow one's instincts in the absence of external direction		1
Outcome 6.6: Build upon or adapt the ideas of others to create novel expressions or new solutions.		1

33. Additional Information

Attachments

- FS-Symbolic Reasoning

UNIVERSITY OF HAWAI'I MAUI COLLEGE
ASSOCIATE IN ARTS DEGREE
REVIEW OF COURSES FOR AA CATEGORY INCLUSION

SUBJECT ALPHA: MATH **COURSE NUMBER:** 119

COURSE TITLE: Engineering Precalculus

CATEGORY: I – FOUNDATIONS

SUB-CATEGORY: Symbolic Reasoning (FS): 4 credits
FS Hallmarks & Explanatory Notes (Hallmarks in bold; Notes in italics) Last updated Spring 2014

Introduction: Courses in Symbolic Reasoning (FS) should present symbolism as a means to facilitate reasoning and not merely as a technique to represent course content. They should engage students in the active use and application of symbolic techniques, but should not present the use of symbolization strategies and techniques in a strictly mechanical way. Rather, they should focus on presenting concepts and tools of symbolic reasoning to further understanding of the course material. The majority of a FS course should address issues of symbolic reasoning, and impart an appreciation of the power and clarity that such reasoning brings to our thinking and understanding. Courses that apply for the FS designation should meet all six hallmarks.

To satisfy the Symbolic Reasoning requirement, a course will

1. **expose students to the beauty, power, clarity and precision of formal systems.**

• *Students should understand the impact of formal or symbolic reasoning in its application to other disciplines and/or its historical place in civilization.*
• *An objective of the FS requirement is to enhance students' appreciation of abstraction and formal systems of analysis and to elevate their power of critical thinking through logical analysis and use of evidence.*
• *Students may be exposed to the power, clarity and precision of formal systems by reading and understanding proofs, derivations of formulae, or expositions of applications. Students may also be exposed to the power, clarity and precision of formal systems by constructing proofs (including symbolic proofs of validity), deriving formulas of appreciable applicability, or justifying the uses of applications in concrete context. In any of these situations, formal reasoning and/or symbolism should play a significant or essential role.*
• *The exposure to the beauty of formal systems can be provided by the presentation of elegant proofs, tricky, i.e., creative, applications of formulae, or the derivation of unexpected applications.*

2. **help students understand the concept of proof as a chain of inferences.**

• *A non-trivial component of the course should be deductive proof.*
• *Students should be required to demonstrate an understanding of the difference between a correct and incorrect proof.*
• *Students should understand the distinction between inductive and deductive, formal and informal reasoning.*
• *Students should be familiar with all aspects of basic argumentation: (1) the recognition of premises, given statements or hypothesis, (2) the recognition of the conclusion as well as noticing that a proof has appropriately come to an end since the conclusion has been justified, (3) the recognition of the application of the principles of logic to the premises, earlier steps or recognized truths to justify subsequent steps.*
• *Students should be able to construct formal arguments and be expected to justify most steps of an argument.*

3. **teach students how to apply formal rules or algorithms.**

• *Students should be able to correctly apply rules of a formal system.*
• *Students should be introduced to a process of applying formal rules, so that students will understand the importance of paying attention to detail and why precision is crucial, and how rule generation works in carrying out mechanical, logical, and/or computational procedures.*

4. **require students to use appropriate symbolic techniques in the context of problem solving, and in the presentation and critical evaluation of evidence.**

Students should be able to recognize the elements, structure and standards of rigorous arguments and distinguish between correct and incorrect argument.

- *Students should be able to recognize appropriate and inappropriate use of words and symbolism, statements as opposed to meaningless sentences, valid and invalid arguments, as well as valid and invalid applications of symbolic reasoning.*

5. **include computational and/or quantitative skills.** [modified by the Foundations Multicampus Group, 5/2/12]

- *The course will not focus solely on computational skills, i.e., the application of algorithmic processes leading to determinant answers. [added 5/2/12]*
- *Students should be challenged to use symbolic trails of reasoning not only minimally but in maximally efficient and elegant ways.*
- *Students should not be simply trained in mechanical, computational or formulaic techniques.*

6. **build a bridge from theory to practice and show students how to traverse this bridge.**

- *Students should be able to abstract from a real-world situation to formal, symbolic representation.*
- *Students should be able to translate word problems or arguments into an appropriate symbolic formalism.*
- *Students should see the development of a "useful" application from a theoretical or formal idea. In that development it should be made especially clear that the use of symbolism facilitated the exposition that lead from theory to practice.*
- *Students will learn that arguments and procedures expressed in ordinary language can be checked with great precision by placing the reasoning patterns in symbolic form and manipulated via symbolic rules of inference.*

Amir Amiraslani	A. Amiraslani	11/20/2014
Instructor's Printed Name	Instructor's Signature	Date
Maggie Bruck		
Approved by: Foundations Chair Printed Name	Foundations Chair Signature	Date

MATH ROUTES FOR SPECIFIC MAJORS

Begin at the appropriate course, as determined by your math placement score and your particular career path.

Business: CULN

MATH ~~18~~22 → ~~MATH 50H~~CULN 100

Vocational: AG, FT, SUSTAINABLE CONSTRUCTION TECH

MATH ~~18~~22

Vocational: ABRP, AMT

MATH ~~18~~22 → ~~MATH 50C~~M 107

Vocational: ECET

MATH ~~18~~22 → MATH 82 → ~~MATH~~ MATH ~~107~~119

MATH 103

See program map for specific requirement.

Business: ACC, BUS, BUSN, HOST

MATH ~~18~~ → BUSN 189

→ ~~22~~MATH 82 → MATH 100 or MATH 115

→ MATH 82 → MATH 103 → MATH 135 → MATH 203

Liberal Arts (non-calculus), Public Service: AJ, HSER, NURS *(See Program Maps, pages 27-52)*

MATH ~~18~~22 → MATH 82 → MATH 100 / MATH 111 → ~~112~~ MATH / or MATH 115

Liberal Arts (calculus)

MATH 203

MATH ~~18~~22 → MATH 82 → MATH 103 → MATH 135

MATH 140

MATH 205 → MATH 206 → MATH 231 → MATH 232

BAS ENGT Engineering Technology

MATH 103

MATH ~~18~~22 → MATH 82 → ~~MATH~~ MATH ~~107~~119 → MATH ~~219~~205

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add MATH 103 to ECET & ENGT