Course Specification
(Bachelor)

Course Title:	**Precalculus**
Course Code:	**MAT 1122**
Program:	**Bachelor of Science in Engineering**
Department:	**Mathematics and Statistics**
College:	**Science**
Institution:	**Imam Mohammad Ibn Saud Islamic University**
Version:	**2024 – V1**
Last Revision Date:	**08/10/2024**

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours:					
3 (2 Lectures, 0 Lab, 2 Tutorial)					
2. Course type					
A.	☐University	☒ College	☐ Program	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: Level 1 / Year 1					
4. Course general Description:					
This course describes the most basic mathematical tools needed further in coming courses especially MAT 1115 – Calculus (1) for engineers. The course includes the essential fundamentals of equations, inequalities, functions and graphs, polynomial and rational functions, exponential and logarithmic functions, introduction to trigonometry and applications, and sequences. The emphasis is on calculations, and some applications are mentioned.					
5. Pre-requirements for this course (if any):					
None.					
6. Co-requisites for this course (if any):					
None.					
7. Course Main Objective(s):					
The main purpose of this course is to provide the student with the basic understanding of fundamental notions and computations needed further in coming courses.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	E-learning	0	0%
3	Hybrid • Traditional classroom • E-learning	0	0%
4	Distance learning	0	0%

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	30
2.	**Laboratory/Studio**	0
3.	**Field**	0
4.	**Tutorial**	30
5.	**Others (specify)**	0
Total		30

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Define key concepts related to linear equations, absolute value inequalities, and polynomial factoring.	K1,	Lectures and tutorials	Quizzes and written definitions
1.2	Describe the fundamental characteristics of functions, including domain, range, and composition.	K1, K2	Interactive discussions and group work	Concept maps and homework assignments
1.3	Introduce trigonometry and sequences.	K1	Tutorials and guided problem-solving sessions	Multiple-choice exams and problem sets
2.0	**Skills**			
2.1	Develop techniques of problem solving.	S1	Problem-based learning, workshops, tutorials, and hands-on practice.	Problem sets in assignments
2.2	Communicate mathematics clearly and precisely both orally and in writing.	S2	Hands-on workshops with graphing software, tutorials, and guided practice.	Assignments; and Class participation and feedback.
2.3	Carry out calculations orally and mentally.	S3, S4	Lectures on convergence tests, group discussions, tutorials, and presentations.	Exams and class participation
3.0	**Values, autonomy, and responsibility**			
3.1	1. Demonstrate ethical responsibility by collaborating effectively with peers, fostering a respectful and inclusive learning environment during group activities and projects.	V1	Group activities, peer review sessions, tutorials, and collaborative projects.	Direct: Group evaluations; Indirect: Reflection on group dynamics and peer feedback.
3.2	2. Cultivate self-directed learning by engaging in independent study and reflection, recognizing the importance of personal responsibility in mastering calculus concepts.	V2	Independent study assignments, self-directed projects, tutorials, and reflective journaling.	Direct: Individual assignments; Indirect: Reflective journals and self-assessment.

C. Course Content

No	List of Topics	Contact Hours
1.	**Equations and Inequalities:** Linear Equations; Linear Inequalities; Absolute value, Equations and Inequalities involving Absolute value; Complex Numbers; Quadratic Equations and Factoring.	10
2.	**Functions and Graphs:** The Coordinate Plane; Distance in the Plan; Circles; Equation of a Line; Functions; Graphs of Functions; Getting Information from the Graph of a Function; Transformations of Functions; Quadratic Functions; Combining Functions; One-to-One Functions and Their Inverses.	10
3.	**Polynomial and Rational Functions:** Polynomial Functions and Their Graphs; Dividing Polynomials; Rational Functions; Polynomial and Rational Inequalities.	8
4.	**Exponential and Logarithmic Functions:** Exponential Functions; The Natural Exponential Function; Logarithmic Functions; Laws of Exponents and Logarithms; Exponential and Logarithmic Equations.	8
5.	**Trigonometry:** The Unit Circle; Angles and their measurements; Right Triangles Trigonometry; Trigonometric Functions and Their Graphs; Inverse Trigonometric Functions and Their Graphs.	8
6.	**Analytic Trigonometry and Applications:** Trigonometric Identities; Addition and Subtraction Formulas; Double-Angle, Half-Angle, and Product-Sum Formulas; Trigonometric Equations; The Law of Sines and the Law of Cosines; Complex Numbers in Polar Form; Demoivre's Theorem.	8
7.	**Sequences and Series: Sequences and Summation notation; Arithmetic sequences and series; Geometric sequences and series; Mathematical Induction.**	8
Total		**60**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Homeworks, Quizzes, participation	During the term	10%
2.	First Midterm	Week 5-6	25%
3.	Second Midterm	Week 10-11	25%
4.	Final Exam	Week 15-16	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	***Calculus***, 4th Edition, R. T. Smith, R. B. Minton, McGraw-Hill, 2012.
Supportive References	1. ***Calculus***; O. Swokowski, et al, PWS Pub. Co.; 6th Edition, 1994. 2. ***Calculus: Early Transcendentals***, 7th Edition; C. Henry Edwards, David E. Penney, Pearson Prentice Hall, 2008. 3. ***Essential Calculus with Application***; Richard A. Silverman, Dover Publications, 1989. 4. ***Schaum's Outline of Calculus***, 6th Edition; Frank Ayres, Elliott Mendelson, McGraw-Hill, 2013.
Electronic Materials	**None**
Other Learning Materials	**None**

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• **Classrooms:** Equipped with whiteboards, projectors, and Smart Boards for interactive lessons and group discussions. • **Laboratories:** Feature computers with internet access, enabling hands-on activities and exploration of algebraic and trigonometric concepts. • **Exhibition Rooms:** Spaces for showcasing projects and presentations to encourage collaborative learning.
Technology equipment (projector, smart board, software)	• **Data Show Projectors:** For clear presentations in classrooms and labs. • **Smart Boards:** To enhance interactivity during lessons. • **Mathematical Software:** Essential for graphing and analysis.
Other equipment (depending on the nature of the specialty)	• **Computers:** For mini-project and homework and practical applications in laboratories. • **Advanced Calculators:** For computations and problem-solving and supporting the study of limits, continuity, and differentiation. • **Whiteboards and Markers:** To facilitate brainstorming and collaboration.

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	**Student and teaching staff**	**Surveys and Questionnaires**
Effectiveness of Students assessment	**Course Coordinator**	**Peer Reviews**
Quality of learning resources	**Students and teaching staff**	**Classroom Observations**
The extent to which CLOs have been achieved	**Student Representatives**	**Student Performance Evaluations (exams, projects) CLOs Excel sheet.**
Other	**None**	

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	MATHEMATICS AND STATISTICS DEPARTMENT COUNCIL
REFERENCE NO.	8/1446
DATE	05/04/1446 (08/10/2024)