

## Module (Mathematics II) Catalogue 2023-2024

College/ Institute	Erbil Technical Engineering College	
Department	Technical Mechanical and Energy Engineering Department	
Module Name	Mathematics I	
Module Code	MAT105	
Degree	Technical Diploma <input type="checkbox"/> Bachler <input checked="" type="checkbox"/> High Diploma <input type="checkbox"/> Master <input type="checkbox"/> PhD <input type="checkbox"/>	
Semester	Second	
Qualification	PhD	
Scientific Title	Lecturer	
ECTS (Credits)	7	
Module type	Prerequisite <input type="checkbox"/> Core <input checked="" type="checkbox"/> Assist. <input type="checkbox"/>	
Weekly hours	4 hrs	
Weekly hours (Theory)	( 4)hr Class	(52)Total hrs Workload
Weekly hours (Practical)	( )hr Class	( )Total hrs Workload
Number of Weeks	12	
Lecturer (Theory)	Dr. Sally Afram Polus	
E-Mail & Mobile NO.	<a href="mailto:Sally.polus@epu.edu.iq">Sally.polus@epu.edu.iq</a> 07507666511	
Lecturer (Practical)	Ms. Shilan fareeq Abdulwahab	
E-Mail & Mobile NO.	07507544708	
Websites	<a href="https://moodle.epu.edu.iq/course/view.php?id=709#section-0">https://moodle.epu.edu.iq/course/view.php?id=709#section-0</a>	

# Course Book

<p><b>Course Description</b></p>	<p>Calculus is the base for different scientific specifications. To explain any natural phenomenon, we translate this phenomenon to a mathematical model which lets us deal with the problem easily. Also, when we have lab data, we can graph these data and get best curve for these points and find a function for this curve by using calculus. Topics studied include Integration, application of definite integrals, transcendental functions, techniques of integration, introduction to matrices and how to solve linear equation. It is very important to emphasize that this is a problem-oriented class and the only way that the material can be mastered is with practice solving problems in addition to homework problems.</p>			
<p><b>Course objectives</b></p>	<p>At the end of this course the student will be able to: 1. To provide an introduction to the fundamentals of calculus. 2. To learn the application of mathematics in real life problems and analyzing the results.</p>			
<p><b>Student's obligation</b></p>	<ul style="list-style-type: none"> <li>• Homework will be assigned periodically.</li> <li>• Students are responsible to do homework on their own.</li> <li>• There will be several quizzes during the academic year, not necessarily announced. The quiz contains the materials covered in previous lectures, homework or to be covered that day.</li> <li>• Any quiz or test missed without a supported documented and excused absence will represent a zero.</li> <li>• Attendance and participation in the lecture are mandatory and will be considered in the grading.</li> <li>• Students should bring calculators, rulers, pen and pencils to be used during the lectures.</li> </ul>			
<p><b>Required Learning Materials</b></p>	<p>Data show and white board are used throughout the lectures and the lecture notes will be uploaded to the Moodle platform before the lecture day.</p>			
<p><b>Evaluation</b></p>	<p><b>Task</b></p>	<p><b>Weight (Marks)</b></p>	<p><b>Due Week</b></p>	<p><b>Relevant Learning Outcome</b></p>

Assessing m e n t s	Paper Review				
	Homework	10%	All the weeks		
	Class Activity	2%	All the weeks		
	Report	8%	Week 9		
	Seminar	8%	Week 6		
	Essay				
	Project		Week 9		
	Quiz	8%	Every lecture		
	Lab.				
	Midterm Exam	24%			
Final Exam	40%				
Total	100%				
<b>Specific learning outcome:</b>	By the end of the year the student should be able to demonstrate ability to explain the mathematical skills that related to the engineering information's. Know the basic science related to mathematics				
<b>Course References:</b>	<ol style="list-style-type: none"> <li>1. Calculus by Thomas, 11th Edition, 2005.</li> <li>2. Calculus by James Stewart, 5th Edition, 2003.</li> <li>3. Calculus and Its Applications by Marvin L. Bittinger, 10th Edition, 2011.</li> <li>4. Schaum's Outline of Calculus</li> </ol>				
Course topics (Theory)		Week	Learning Outcome		
Integration: indefinite integrals, integral of trigonometric functions, integration of products and power of trigonometric.		1	Ability to compute definite and indefinite integrals of algebraic, logarithmic and exponential functions .		
The definite integral, velocity and acceleration, definite integrals of symmetric functions.		2	Solve problems in a range of mathematical applications using the integral.		

Transcendental functions: natural logarithms, properties of logarithms, logarithmic differentiation.	3	Compute trigonometric, inverse trigonometric, exponential, logarithmic, and logarithmic differentiation.
The exponential function, laws of exponents, derivative and integral of exponential function.	4	Compute exponential functions
$a^x$ and $\log a^x$ , derivative and integral of $a^x$ and $\log a^x$ , inverse trigonometric functions, derivative and integral of inverse trigonometric functions.	5	Students will be able to graph different functions including exponential functions and log.
Hyperbolic functions, derivative and integral of hyperbolic functions, inverse hyperbolic functions, derivative and integral of inverse hyperbolic functions.	6	At the end of this week, students will be able to use right triangles to evaluate the six Hyperbolic functions. Students also will be able to know and draw the graphs of the six Hyperbolic functions and their variations
Techniques of integration.	7	Students will be able to find integral for different functions.
Techniques of integration	8	Students will be able to find integral for different functions.
Application of definite integrals: area under a curve, area between two curves, Length of a curve in plane	9	Solve problems in a range of mathematical applications using the integral.
Area of surface of revolution, Volume	10	Solve problems in a range of mathematical applications using the integral.
Determinants: determinant, first order, second order, third order, minor and cofactors	11	Compute determinant
Properties of determinants, Cramer's rule,	12	Solving equation using Cramer's rule
<b>Practical Topics</b>	<b>Week</b>	<b>Learning Outcome</b>
<b>Questions Example Design</b>		

**Q1/** Use logarithmic differentiation to find the derivative of  $y$  with respect to the given independent variable: **(30 marks)**

a)  $y = \frac{\theta \sin \theta}{\sqrt{\sec \theta}}$

b)  $y = \frac{x(1-x^2)^2}{(1+x^2)^{1/2}}$

c)  $y = \sqrt[3]{\frac{x(x-2)}{x^2+1}}$

**Q2/** Find the derivative of the following functions: **(35 marks)**

a)  $y = \log_3 \left[ \left( \frac{x+1}{x-1} \right)^{\ln 3} \right]$

b)  $y = \ln(\cot^{-1} e^t)$

c)  $y = (1-t) \sinh^{-1} \sqrt{t}$

d)  $y = 5^{\sin \theta} \ln 5$

e)  $y = \ln(\ln x)$

**Q3/** Evaluate the following integrals: **(35 marks)**

a)  $\int \frac{dx}{9x^2-6x+5}$

b)  $\int_{10}^{20} \frac{dx}{x^2 \sqrt{x^2-16}}$

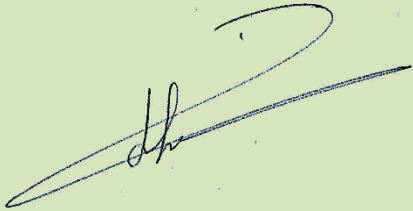
c)  $\int_1^4 \sec^{-1} \sqrt{x} dx$

### Extra notes:

No extra notes

## External Evaluator

I confirm that this module catalogue is extremely useful and sufficient in terms of scope and quality for the first-year students in the Department of Mechanical and Energy Engineering at Erbil Polytechnic University.



Dr. Dlair O. Ramadan