Module (Course Syllabus) Catalogue 2022-2023

College/ Institute	Erbil Technology College	
Department	Road and Surveying Department	
Module Name	Mathematics	
Module Code	MAT104	
Degree	Technical Diploma ■ Bachler ☐ High Diploma ☐ Master ☐ PhD ☐	
Semester	First	
Credits	7	
Module type	Prerequisite ☐ Core ☐ Assist. ■	
Weekly hours	4	
Weekly hours (Theory)	( )hr Class	(168)hr Workload
Weekly hours (Practical)	( )hr Class	( )hr Workload
Lecturer (Theory)	Hemin Gaylany Ahmed	
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Lecturer (Practical)	Hemin Gaylany Ahmed	
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Course Book

Course Description	The mathematics is very essential subjects for students to be acknowledged with logical and practical problems and it is basic for all subjects are taught in Surveying department Throughout this subject, the lecturer efforts to broaden his student's horizon and adapt them with methods and techniques to ease function, trigonometric, limit of function, continuity, differentiation, integrity, optimization and matrices. Attempting to correct that misconception is that a major in math is if no use unless teaching. This to be explained that multitude of interesting and rewarding jobs for people with degrees in math. We'll list some of those jobs in a moment, but first let's consider what math can do for you regardless of your career choice. Lecturer will develop pride & confidence in students' ability to understand complicated things.
Course objectives	The course aims to be considered the importance of Mathematics in all field of surveying. The objective of this course is to introduce Technical surveying Department students to the fundamentals, basic, principles, and application of Mathematics. This includes solving of equations (Lines, Conical sections, etc), finding the Derivatives, Integrations, Intervals, Limits, Matrices and Determinates with its applications.... etc. Furthermore, learning all this mathematical topics will help students to solve any problems that related to mathematic topic, when they will graduate and start practical life, for example, surveyor in any projects, particularly road project, from surveying process to excavation, and construction work such as culvert
Student's obligation	Quality control improvements in exam policies entail improvement in exam. There are only two theoretical exams. the first one is the midterm exam which weighs 14 marks and second is final weighs 40 marks
Required Learning Materials	The subject is taught based on theoretical lectures and applications.
Assessment scheme	10% Homework 2% Class Activity 16% (Report, Seminar, Paper, Essay, Project) 8% Quiz

	24% Mid Term (Theory and practical) 40% Final
Specific learning outcome:	The lectures are Four hours per week. Two hours for theoretical lectures, includes backgrounds and principles about the topic. Microsoft word and/or power point will be used during the lecture time. Students will be provided with notes and handouts, which contain the detail of the topics. Two hours practical lectures devoted to solve many problems and questions, with participation of students. It is will help them to prepare and face the examination with greater confidence.
Course References:	▪ Useful references: ➢ *O'Neil, P. V., 2007. ADVANCED ENGINEERING MATHEMATICS. 3rd ed. Chris Carson.* ➢ *NARAYAN, S., 2000. INTEGRAL CALCULUS. INDIA: S. CHAND & COMPANY LTD.* ➢ *Thomas', G.B., Weir, M.D., and Hass, J.R., 2010. Thomas' Calculus. Twelfth ed. America: Addison- Wesly.* ➢ *BHARDWJ, D., 2008. INTEGRAL CALCULUS. 2nd ed. New Delhi: FIREWALL MEDIA* ➢ *Gupta, T.C., 2008. Problems and Solutions in Higher Engineering Mathematics.1st ed. New Delhi: LAXMI PUBLICATIONS (p) LTD.* ➢ *Weir, M.D., 2008. THOMAS' CALCULUS EARLY TRANSCENDENTALS. eleventh ed. America: Addison Wesly.*

Course topics (Theory)	**Week**	**Learning Outcome**
Absolute Value, Cartesian coordinate systems, Slope and angle of inclination of the line, Straight line equation	1st	To learn the basics of coordinate geometry and relationship between concept of straight line in geometry and its algebraic representation.
Straight line equation, Parallel and perpendicular lines, Distance between two points,	2nd	
Distance from point to the line, Parabola, Sketching a graph,	3rd	
Function types:- linear functions, power functions, negative power functions, fractional power functions, sine and cosine, logarithmic functions, exponential functions. **Six basic trigonometric functions, Basic trigonometric angles, Periodic functions,**	4th	To know what functions are and how they are pictured as a graphs, how they are combined and transformed, and ways they can be classified.
Matrix, Same special types of matrices, The sum and difference of matrices, Multiplication of matrix by scalar,	5th	What is Matrix, special types of it and operation on it.
Determinants of Square Matrices, evaluating determinants using Cofactor,	6th	Evaluating determinant for matrices.

Multiplication of two matrices. The Transpose of Matrix, The Inverse of a Matrix, Solving of linear equation by matrix inverse.	7th	Solving Linear equation by matrix.
Differentiation, Differentiation rules, Derivative of trigonometric functions,	8th	To solve a wide range of problems involving tangents and rates of range.
Chain rule, Implicit differentiation,	9th	How to differentiate the composite and the implicit functions.
Integration, The Indefinite Integral,	10th	To calculate quantities important to mathematics and science, such as areas, volumes, length of curved paths .....
The Definite Integral,	11th	
Area between curves	12th	To apply definite integral to calculate area between to curves.
Practical Topics	**Week**	**Learning Outcome**
Questions Example Design		

EXAMPLE 4 Evaluate $|\mathbf{A}|$ by expanding across the third row.

$$\mathbf{A} = \begin{bmatrix} -8 & 0 & 6 \\ 4 & -6 & 7 \\ -1 & -3 & 5 \end{bmatrix}$$

Solution We have

$$\begin{aligned} |\mathbf{A}| &= (-1)A_{31} + (-3)A_{32} + 5A_{33} \\ &= (-1)(-1)^{3+1} \cdot \begin{vmatrix} 0 & 6 \\ -6 & 7 \end{vmatrix} + (-3)(-1)^{3+2} \cdot \begin{vmatrix} -8 & 6 \\ 4 & 7 \end{vmatrix} \\ &\quad + 5(-1)^{3+3} \cdot \begin{vmatrix} -8 & 0 \\ 4 & -6 \end{vmatrix} \\ &= (-1) \cdot 1 \cdot [0 \cdot 7 - (-6)6] + (-3)(-1)[-8 \cdot 7 - 4 \cdot 6] \\ &\quad + 5 \cdot 1 \cdot [-8(-6) - 4 \cdot 0] \\ &= -[36] + 3[-80] + 5[48] \\ &= -36 - 240 + 240 = -36. \end{aligned}$$

Calculate the area bounded by the x-axis and the parabola $y = 6 - x - x^2$.

Solution We find where the curve crosses the x-axis by setting

$$y = 0 = 6 - x - x^2 = (3 + x)(2 - x),$$

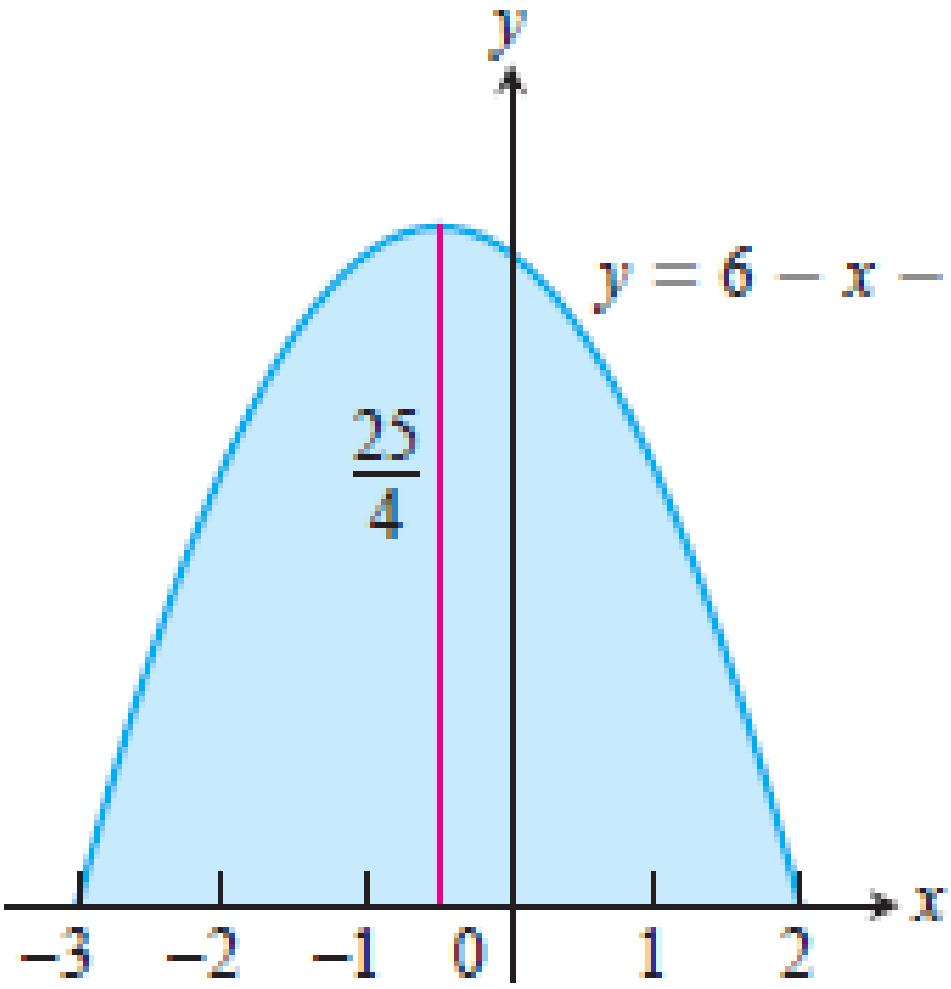
which gives

$$x = -3 \quad \text{or} \quad x = 2.$$

The curve is sketched in Figure 5.21, and is nonnegative on $[-3, 2]$.

The area is

$$\begin{aligned} \int_{-3}^{2} (6 - x - x^2)\, dx &= \left[6x - \frac{x^2}{2} - \frac{x^3}{3}\right]_{-3}^{2} \\ &= \left(12 - 2 - \frac{8}{3}\right) - \left(-18 - \frac{9}{2} + \frac{27}{3}\right) = 20\tfrac{5}{6}. \end{aligned}$$



Extra notes:

External Evaluator

This course book is reviewed by (Hemn Saeed Ahmad) as he is a lecturer in Surveying department in Hawler Institute. He assessed and approved all content of the Mathematics subject as he admitted the course book is almost covered the several terms of Mathematics in its theoretical aspects. The course can be presented in the classes for entire curriculum year.

Hemn Saeed Ahmad
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