# Module (Course Syllabus) Catalogue

# 2023-2024

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| College/ Institute | College of Erbil Technical Engineering | |
| Department | Department of Information System Engineering | |
| Module Name | Calculus I | |
| Module Code | CAL202 | |
| Degree | Technical Diploma ☐ Bachelor ■<br>High Diploma ☐ Master ☐ PhD ☐ | |
| Semester | 2 | |
| Qualification | PhD and Master | |
| Scientific Title | Assistant Professor and Lecturer | |
| ECTS (Credits) | 8 | |
| Module type | Prerequisite ■ Core ☐ Assist. ☐ | |
| Weekly hours | | |
| Weekly hours (Theory) | ( 4 )hr Class | (120) Total hrs Workload |
| Weekly hours (Practical) | ( 3 )hr Class | (72) Total hrs Workload |
| Number of Weeks | 16 | |
| Lecturer (Theory) | Swar Ahmed and Ali Hussein Yousif | |
| E-Mail & Mobile NO. | swar.ahmed@su.edu.krd<br>ali.yousif@epu.edu.iq | |
| Lecturer (Tutorial) | Media Ibrahim , Ashna Kareem | |
| E-Mail & Mobile NO. | media.ibrahim@epu.edu.iq<br>ashna.kareem@epu.edu.iq | |
| Websites | | |

# Course Book

<table>
<tr><td>Course Description</td><td colspan="5">Calculus for Information System Engineering Students: Fundamentals, Real Problems, and Computers insists that mathematics cannot be separated from chemistry, mechanics, electricity, electronics, automation, and other disciplines. It emphasizes interdisciplinary problems as a way to show the importance of calculus in engineering tasks and problems. While concentrating on actual problems instead of theory, the book uses Thomas Calculus to help students incorporate lessons into their own studies. Assuming a working familiarity with calculus concepts, the book provides a hands-on opportunity for students to increase their calculus and mathematics skills while also learning about engineering applications.</td></tr>
<tr><td>Course objectives</td><td colspan="5">1. The student will be able to recognize the problem type, select an appropriate solution strategy and apply rules and procedures for solving the problem.<br>2. The student will begin to be able to apply theorems and major concepts of calculus to solve real-world problems.<br>3. The student will understand and appreciate the applicability of calculus to nature, business, science, etc.</td></tr>
<tr><td>Student's obligation</td><td colspan="5">The student is responsible for all material assigned or discussed in class. Attendance will be taken, and may be used along with class effort (as measured by participation - asking questions, answering other students' questions, group work, etc.) to resolve borderline grades.</td></tr>
<tr><td>Required Learning Materials</td><td colspan="5">1. White board<br>2. Projector (Data Show)</td></tr>
<tr><td rowspan="4">Evaluation</td><td colspan="2">Task</td><td>Weight (Marks)</td><td>Due Week</td><td>Relevant Learning Outcome</td></tr>
<tr><td colspan="2">Paper Review</td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">Assignments</td><td>Homework</td><td>10</td><td>2,4</td><td></td></tr>
<tr><td>Class Activity</td><td></td><td></td><td></td></tr>
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| | | Report | 32 | 6,8 | |
| | | Seminar | | | |
| | | Essay | | | |
| | | Project | | | |
| | Quiz | | 10 | 7,9 | |
| | Lab. | | | | |
| | Midterm Exam | | 24 | 13 | |
| | Final Exam | | 24 | 16 | |
| | Total | | | | |
| **Specific learning outcome:** | 1. To familiarize the students with the concept of differentiation, and especially the partial derivative.<br>2. To familiarize the students with complex numbers.<br>3. To increase the skill set of integration techniques that students know, including double and triple integration.<br>4. To familiarize the students with calculating the Area and Volume in the plane and space using double and triple integration.<br>5. To strengthen the notation and concept of summation (especially adding up an infinite number of terms in a sequence -- e.g. a limit, a series).<br>6. To introduce basic ideas of parametric equations, most especially polar coordinates, and functions of polar coordinates. | | | |
| **Course References:** | **Thomas Calculus 14th edition** | | | | |

| **Course topics (Theory) and (Tutorial)** | **Week** | **Learning Outcome** |
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| Differentiation Rules and Derivatives of Trigonometric Functions | 1 and 2 | introduces several rules that allow us to differentiate constant functions, power functions, polynomials, rational functions, and certain combinations of them, simply |

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| | | and directly, without having to take limits each time. Many phenomena of nature are approximately periodic (electromagnetic fields, heart rhythms, tides, weather). The derivatives of sines and cosines play a key role in describing periodic changes. |
| The Definite Integral and Definite Integral Substitutions and the Area Between Curve | 2 and 3 | In this section we consider the limit of general Riemann sums as the norm of the partitions of a closed interval [a, b] approaches zero. This limiting process leads us to the definition of the definite integral of a function over a closed interval [a, b] . |
| Techniques of Integration | 4 and 5 | Using Basic Integration Formulas, we combine the Substitution Rules with algebraic methods and trigonometric identities to help us. Integration by parts is a technique for simplifying integrals. Trigonometric integrals involve algebraic combinations of the six basic trigonometric functions. This section shows how to express a rational function (a quotient of polynomials) as a sum of simpler fractions, called partial fractions, which are easily integrated. |
| First-Order Differential Equations | 6 and 7 | We begin this section by defining general differential equations involving first derivatives. We then look at slope fields, which give a geometric picture of the solutions to such equations. First-Order Linear Equations |

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| | | We look at applications of first-order differential equations. |
| Areas of a bounded region in the plane, | 8 | we review what functions are and how they are visualized as graphs, how they are combined and transformed, and ways they can be classified |
| Trigonometric Functions | 9 | This section reviews radian measure and the basic trigonometric functions |
| Inverse Functions and Their Derivatives | 10 | Important inverse functions often show up in applications. Inverse functions also play a key role in the development and properties of exponential functions. |
| Natural Logarithms | 11 | In this section, we define the natural logarithm as an integral using the Fundamental Theorem of Calculus. While this indirect approach may at first seem strange, it provides an elegant and rigorous way to obtain the key characteristics of logarithmic and exponential functions. |
| Exponential Functions | 12 | We study exponential properties and compute its derivative and integral. We prove the power rule for derivatives involving general real exponents. Finally, we introduce general exponential functions, $a^x$, and general logarithmic functions, $\log_a x$. |
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## Questions Example Design

**Use the properties of logarithms to simplify the expressions**

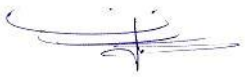
**a.** $\ln \sin\theta - \ln\left(\frac{\sin\theta}{5}\right)$ **b.** $\ln(3x^2 - 9x) + \ln\left(\frac{1}{3x}\right)$

**c.** $\frac{1}{2}\ln(4t^4) - \ln 2$

## Extra notes:

## External Evaluator

I confirm that the syllabus and content of this course book is sufficient and fulfilment for the lesson of "Calculus II" for the 2nd semester students in the department of "Information System Engineering". The course book covers the requirements of students to have enough knowledge in this field.



**Signature**

**Lec. Farah Sami Khoshaba**