



# Course Specification

— (Bachelor)

Course Title: **Calculus-1**

Course Code: **MATH26111**

Program: **Stream of Sciences and Engineering**

Department: **Mathematics**

College: **Science**

Institution: **University of Bisha**

Version: **4**

Last Revision Date: **9 August 2023**



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## A. General information about the course:

### 1. Course Identification

1. Credit hours: ( 3 )

#### 2. Course type

A.  University  College  Department  Track  Others  
B.  Required  Elective

3. Level/year at which this course is offered: (1st level / 1st year)

#### 4. Course general Description:

This course covers the basic elements and concepts of differentiation. It is designed as a preparatory course for the students of the stream of sciences and engineering. The topics included are those that are most commonly used or referred to in the literature.

5. Pre-requirements for this course (if any):

Nil

6. Pre-requirements for this course (if any):

Nil

#### 7. Course Main Objective(s):

The main purpose of this course is to provide the first-year students with basic knowledge, skills and attitudes in calculus emphasis on differentiation and its applications in science and engineering.

### 2. Teaching mode (mark all that apply)

| No | Mode of Instruction  | Contact Hours | Percentage |
|----|--|---------------|------------|
| 1  | Traditional classroom  | 45            | 100%       |
| 2  | E-learning   | -----         | -----      |
| 3  | Hybrid <ul style="list-style-type: none"> <li>• Traditional classroom</li> <li>• E-learning</li> </ul> | -----         | -----      |
| 4  | Distance learning  | -----         | -----      |



### 3. Contact Hours (based on the academic semester)

| No           | Activity          | Contact Hours |
|--------------|-------------------|---------------|
| 1.           | Lectures          | 45            |
| 2.           | Laboratory/Studio | -----         |
| 3.           | Field             | -----         |
| 4.           | Tutorial          | -----         |
| 5.           | Others (specify)  | -----         |
| <b>Total</b> |                   | <b>45</b>     |

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

| Code       | Course Learning Outcomes  | Code of CLOs aligned with program | Teaching Strategies  | Assessment Methods            |
|------------|---|-----------------------------------|--|-------------------------------|
| <b>1.0</b> | <b>Knowledge and understanding: By successfully completing this course it is expected that the student will be able to:</b> |                                   |  |                               |
| 1.1        | Define basic concepts of functions.   | K1                                | Lecture<br>Discussion<br>Active Learning<br>Cooperative Learning | Exercises or<br>Written Tests |
| 1.2        | State definitions and theorems about limits and continuity.   | K1                                | Lecture<br>Discussion<br>Active Learning<br>Cooperative Learning | Exercises or<br>Written Tests |
| 1.3        | State definitions related to differentiation and its applications.  | K1                                | Lecture<br>Discussion<br>Active Learning<br>Cooperative Learning | Exercises or<br>Written Tests |
| <b>2.0</b> | <b>Skills: By successfully completing this course it is expected that the student will be able to:</b>                      |                                   |  |                               |
| 2.1        | Apply concepts and theorems to investigate functions' properties.   | S1                                | Lecture<br>Discussion<br>Active Learning<br>Cooperative Learning | Exercises or<br>Written Tests |
| 2.2        | Find different types of limits. Discuss continuity.   | S1                                | Lecture<br>Discussion<br>Active Learning<br>Cooperative Learning | Exercises or<br>Written Tests |
| 2.3        | Solve problems related to applications of differentiation.  | S1                                | Lecture<br>Discussion<br>Active Learning<br>Cooperative Learning | Exercises or<br>Written Tests |



| Code | Course Learning Outcomes                       | Code of CLOs aligned with program | Teaching Strategies  | Assessment Methods            |
|------|--|-----------------------------------|--|-------------------------------|
| 3.0  | Values, autonomy, and responsibility           |                                   |  |                               |
| 3.1  | Apply theoretical ideas in real life problems. | V1                                | Lecture<br>Discussion<br>Active Learning<br>Cooperative Learning | Exercises or<br>Written Tests |

### C. Course Content

| No  | List of Topics  | Contact Hours |
|-----|---|---------------|
| 1.  | <b>Functions:</b><br>Sets and Subsets, Operations on Sets, Real Numbers and Intervals, Functions of One Variable, Graph of Function, Polynomials    | 3             |
| 2.  | <b>Functions:</b><br>The Absolute Value Function, Piecewise-defined Function, Rational Function, Power Function, Arithmetic Operations on Functions | 3             |
| 3.  | <b>Functions:</b><br>Trigonometric and Inverse Trigonometric Functions, Exponential and Logarithmic Functions.                                      | 3             |
| 4.  | <b>Limits and Continuity:</b><br>Limits, One-Sided Limit  | 3             |
| 5.  | <b>Limits and Continuity:</b><br>Techniques for Computing Limits, Limits Properties   | 3             |
| 6.  | <b>Limits and Continuity:</b><br>Infinity Limits, Limits at infinity.   | 3             |
| 7.  | <b>Limits and Continuity:</b><br>Continuity, Continuity on an Interval, Properties of Continuous Functions, Types of Discontinuity.                 | 3             |
| 8.  | <b>Derivatives:</b><br>Differentiability and Tangent Line, One Sided Derivative,  | 3             |
| 9.  | <b>Derivatives:</b><br>Differentiation Formulas of Some Algebraic Functions, Derivatives of Trigonometric Functions                                 | 3             |
| 10. | <b>Derivatives:</b>   | 3             |





|              |  |           |
|--------------|--|-----------|
|              | Derivatives of Composite Functions: The Chain Rule, The Derivatives of Logarithmic and Exponential Functions,  |           |
| 11.          | <b>Derivatives:</b><br>Derivatives of Inverse Trigonometric Functions, Derivatives of Hyperbolic Functions, Derivatives of Parametric Functions                        | 3         |
| 12.          | <b>Derivatives:</b><br>Derivatives of the Implicit Functions, Higher Order Derivatives, Indeterminate Forms and L'Hopital's Rule, linear Approximation, Differentials. | 3         |
| 13.          | <b>Application of Differentiation:</b><br>Increasing or Decreasing Functions and Differentiation,  | 3         |
| 14.          | <b>Application of Differentiation:</b><br>Concavity and Inflection Points, Analysis and Graphing of Functions  | 3         |
| 15.          | <b>Application of Differentiation:</b><br>Absolute Maxima and Minima and Optimization Problems   | 3         |
| <b>Total</b> |  | <b>45</b> |

### The matrix of consistency between the contents and the learning outcomes of the course

| Course Learning Outcomes |     |     |     |     |     |     |     |
|--------------------------|-----|-----|-----|-----|-----|-----|-----|
| Topics                   | 1.1 | 1.2 | 1.3 | 2.1 | 2.2 | 2.3 | 3.1 |
| 1                        | √   |     |     | √   |     |     |     |
| 2                        | √   |     |     | √   |     |     |     |
| 3                        |     | √   |     |     | √   |     |     |
| 4                        |     | √   |     |     | √   |     |     |
| 5                        |     | √   |     |     | √   |     | √   |
| 6                        |     |     | √   |     |     | √   | √   |
| 7                        |     |     | √   |     |     | √   | √   |
| 8                        |     |     | √   |     |     | √   | √   |
| 9                        |     |     | √   |     |     | √   | √   |
| 10                       |     |     | √   |     |     | √   | √   |



## D. Students Assessment Activities

| No | Assessment Activities * | Assessment timing (in week no)     | Percentage of Total Assessment Score |
|----|-------------------------|------------------------------------|--------------------------------------|
| 1. | Exercises               | 3 <sup>rd</sup> , 8 <sup>th</sup>  | 10%                                  |
| 2. | Quizzes                 | 4 <sup>rd</sup> , 9 <sup>th</sup>  | 10%                                  |
| 3. | Midterm Exam            | 7 <sup>th</sup> , 12 <sup>th</sup> | 30%                                  |
| 4. | Final Exam              | End of Semester                    | 50%                                  |

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

## E. Learning Resources and Facilities

### 1. References and Learning Resources

|                                 |  |
|---------------------------------|--|
| <b>Essential References</b>     | 1. Saud Abdullah Al-Owyed, Ahmed Elhassanein Elsayed and Khaled Suliman Aboodh "General Mathematics" Al Motanabi Book Shop (2021).<br>2. Howard Anton, Ir Bivens and Stephen Davis, "Calculus Early Transcendentals" 11th Ed. John Wiley & Sons, Inc, USA, (2016). |
| <b>Supportive References</b>    | James Stewart, Daniel Clegg, Saleem watson "Calculus Early Transcendentals" 9th Ed. Cengage Learning, USA, (2020).   |
| <b>Electronic Materials</b>     | University course management system (Blackboard).  |
| <b>Other Learning Materials</b> | 1. Saud Abdullah Al-Owyed, Ahmed Elhassanein Elsayed and Khaled Suliman Aboodh "General Mathematics" Al Motanabi Book Shop (2021).<br>2. Howard Anton, Ir Bivens and Stephen Davis, "Calculus Early Transcendentals" 11th Ed. John Wiley & Sons, Inc, USA, (2016). |

### 2. Required Facilities and equipment

| Items   | Resources                  |
|---|----------------------------|
| <b>facilities</b><br>(Classrooms, laboratories, exhibition rooms, simulation rooms, etc.) | Classrooms for 30 students |
| <b>Technology equipment</b><br>(projector, smart board, software)                         | Smart board.               |
| <b>Other equipment</b><br>(depending on the nature of the specialty)                      | -----                      |

## F. Assessment of Course Quality

| Assessment Areas/Issues                     | Assessor        | Assessment Methods |
|---|-----------------|--------------------|
| Effectiveness of teaching                   | Students.       | Indirect.          |
| Effectiveness of Students assessment        | Peer Reviewer.  | Indirect.          |
| Quality of learning resources               | Students.       | Indirect.          |
| The extent to which CLOs have been achieved | Program Leaders | Direct.            |
| Other                                       |                 |                    |

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

**Assessment Methods** (Direct, Indirect)

## G. Specification Approval

|                           |                        |
|---------------------------|------------------------|
| <b>COUNCIL /COMMITTEE</b> | Mathematics department |
| <b>REFERENCE NO.</b>      |                        |
| <b>DATE</b>               |                        |

