2023
TP-153

# Course Specification
(Bachelor)

| | |
|---|---|
| Course Title: | **Calculus 2** |
| Course Code: | **MATH26214** |
| Program: | **BSc in Mathematics** |
| Department: | **Mathematics** |
| College: | **Science** |
| Institution: | **University of Bisha** |
| **Version**: | **1** |
| **Last Revision Date**: | 5 September 2023 |

## Table of Contents

## 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: (3rd level/ 2nd year)** | | | | | |
| **4. Course general Description:** | | | | | |

The fundamental principles of calculus were made independently by Isaac Newton (English) and Gottfried Leibniz (German) in the late seventeenth century. This course provides the most important theorems and methods of integration and its applications. It is designed as an advanced course of the course presented in the first year. The topics include, Maclaurin and Taylor Polynomials, Indefinite Integration, Methods of Integration, Hyperbolic Functions and Their Inverse, Definite Integration and Its Applications, and Improper Integrals.

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

**MATH26111**

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

**Nil**

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

The main purpose of this course is to develop theoretical and practical knowledge, skills and attitudes of students in calculus with emphasis on the methods of integration and its applications.

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

| No | Mode of Instruction | Contact Hours | Percentage |
|---|---|---|---|
| 1 | Traditional classroom | 60 | 100% |

| No | Mode of Instruction | Contact Hours | Percentage |
|---|---|---|---|
| 2 | E-learning | ---------- | ---------- |
| 3 | Hybrid<br>• Traditional classroom<br>• E-learning | ---------- | ---------- |
| 4 | Distance learning | ---------- | ---------- |

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

| No | Activity | Contact Hours |
|---|---|---|
| 1. | **Lectures** | 60 |
| 2. | **Laboratory/Studio** | ------ |
| 3. | **Field** | ------ |
| 4. | **Tutorial** | ------ |
| 5. | **Others (specify)** | ------ |
| **Total** | | 60 |

## 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: By successfully completing this course it is expected that the student will be able to:** | | | |
| 1.1 | State definitions and theorems about approximations and Taylor polynomials. | K2 | Lecture<br>Discussion<br>Active Learning<br>Cooperative Learning | Exercises<br>or<br>Written Tests |
| 1.2 | Define basic concepts of indefinite integration.<br>Understand methods of integration. | K2 | Lecture<br>Discussion<br>Active Learning<br>Cooperative Learning | Exercises<br>or<br>Written Tests |
| 1.3 | State definitions and properties of | K2 | Lecture<br>Discussion | Exercises<br>or |

| Code | Course Learning Outcomes | Code of CLOs aligned with program | Teaching Strategies | Assessment Methods |
|---|---|---|---|---|
| | transcendental functions and their inverses. State definitions, theorems and applications about definite integrals. Recognize basic concepts of improper integrals. | | Active Learning<br>Cooperative Learning | Written Tests |
| **2.0** | **Skills: By successfully completing this course it is expected that the student will be able to:** | | | |
| 2.1 | Solve problems related to applications of Taylor polynomial and mean-value theorem. Calculate definite, indefinite and improper integrals. | S2 | Lecture<br>Discussion<br>Active Learning<br>Cooperative Learning | Exercises<br>or<br>Written Tests |
| 2.2 | Apply methods of integrations. Apply problems related to transcendental functions and their inverses. | S2 | Lecture<br>Discussion<br>Active Learning<br>Cooperative Learning | Exercises<br>or<br>Written Tests |
| 2.3 | Prove theorems and properties of integrals. Test convergence of improper integrals using comparison. | S2 | Lecture<br>Discussion<br>Active Learning<br>Cooperative Learning | Exercises<br>or<br>Written Tests |
| **3.0** | **Values, autonomy, and responsibility: By successfully completing this course it is expected that the student will be able to:** | | | |
| 3.1 | Think logically, make decisions and apply theoretical ideas in real life problems. | V1 | Lecture<br>Discussion<br>Active Learning<br>Cooperative Learning | Exercises<br>or<br>Written Tests |

## C. Course Content

| No | List of Topics | Contact Hours |
|---|---|---|
| 1. | **Local Quadratic Approximations**<br>Formula for the local quadratic approximation of a function at zero. | 4 |
| 2. | **Maclaurin Polynomials:** | 4 |
| 3. | **Taylor Polynomials:**<br>Taylor polynomial for a differentiable function and the nth reminder. | 4 |
| 4. | **Indefinite Integration:**<br>Antiderivative, indefinite integral, integration formula, | 4 |
| 5. | **Properties of indefinite integral.** | 4 |
| 6. | **Methods of Integration:**<br>Substitution method, trigonometric substitution. | 4 |
| 7. | Integration by parts. | 4 |
| 8. | Integrating fractional functions by partial fractions. | 4 |
| 9. | **Hyperbolic Functions and Their Inverse:**<br>Hyperbolic functions, inverse of hyperbolic functions, hyperbolic identities, derivatives and integrals of hyperbolic functions. | 4 |
| 10. | Derivatives and integrals of inverse hyperbolic functions, the relation between inverse hyperbolic functions and natural logarithms. | 4 |
| 11. | **Definite Integration and Its Applications:**<br>Integrable function on a closed interval, definite integral, natural logarithm, the geometric meaning of definite integral, | 4 |
| 12. | The properties of definite integral, the fundamental theorem of calculus. | 4 |
| 13. | **The mean-value theorem for integrals.** | 4 |
| 14. | **Improper Integrals:**<br>Improper integrals, improper integral over finite interval, comparison theorems for improper integrals. | 4 |
| 15. | Improper integral over infinite interval**.** | 4 |
| | **Total** | **60** |

**The matrix of consistency between the content 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 | | √ | | | √ | | √ |
| 11 | | | √ | | | √ | √ |
| 12 | | | √ | | | √ | √ |
| 13 | | | √ | | | √ | √ |
| 14 | | | √ | | | √ | √ |
| 15 | | | √ | | | √ | √ |

## D. Students Assessment Activities

| No | Assessment Activities * | Assessment timing (in week no) | Percentage of Total Assessment Score |
|---|---|---|---|
| 1. | Exercises | 6th, 13th | 10% |
| 2. | Quiz 1 | 5th | 5% |
| 3. | Exam I | 7th | 15% |
| 4. | Quiz 2 | 10th | 5% |
| 5. | Exam II | 12th | 15% |
| 5. | 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

| | |
|---|---|
| Essential References | Howard Anton, Ir Bivens and Stephen Davis, "Calculus Early Transcendentals" 11th Ed., John Wiley & Sons, Inc, USA, (2016). |
| Supportive References | James Stewart, Daniel Clegg, Saleem watson, Lothar Redlin "Calculus Early Transcendentals" 9th Ed. Cengage Learning, USA, (2020). |
| Electronic Materials | ---------- |
| Other Learning Materials | ---------- |

## 2. Required Facilities and equipment

| Items | Resources |
|---|---|
| **facilities** (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.) | Classrooms for 30 students. |
| **Technology equipment** (projector, smart board, software) | Smart board. |
| **Other equipment** (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 | Student | Indirect |
| The extent to which CLOs have been achieved | Program Leader | Direct |
| Other | ----- | ------ |

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

**Assessment Methods** (Direct, Indirect)

## G. Specification Approval

| | |
|---|---|
| **COUNCIL /COMMITTEE** | College of Science Council |
| **REFERENCE NO.** | 1 |
| **DATE** | 5 September 2023 |