اعتماد
NCAAA

T4

2020

# Course Specifications

| Course Title: | Introduction to Calculus |
|---|---|
| Course Code: | MTH1101 |
| Program: | BSc. in Mathematics |
| Department: | Mathematical sciences |
| College: | Applied sciences |
| Institution: | Umm Al-Qura University |

# Table of Contents

## A. Course Identification

| | |
|---|---|
| 1. **Credit hours:** **4** | |

**2. Course type**

a.  University ☐   College ☐   Department ☒   Others ☐

b.  Required ☒   Elective ☐

**3. Level/year at which this course is offered:**   **First level/First year**

**4. Pre-requisites for this course** (if any):

**None**

**5. Co-requisites for this course** (if any):

**Not applicable**

### 6. Mode of Instruction (mark all that apply)

| No | Mode of Instruction | Contact Hours | Percentage |
|---|---|---|---|
| 1 | Traditional classroom | **Four hours/week** | **%100** |
| 2 | Blended | . | . |
| 3 | E-learning | . | . |
| 4 | Distance learning | . | . |
| 5 | Other | . | . |

### 7. Contact Hours (based on academic semester)

| No | Activity | Contact Hours |
|---|---|---|
| 1 | Lecture | **36** |
| 2 | Laboratory/Studio | **0** |
| 3 | Tutorial | **0** |
| 4 | Others (Exam, Quizzes, Activities,…) | **6** |
| | Total | **40** |

## B. Course Objectives and Learning Outcomes

**1. Course Description**

This introductory calculus course covers differentiation and integration of functions of one variable. It is the first in a three-course sequence of calculus. Key topics of the course include precalculus, limits and continuity, derivatives, integrals.

**2. Course Main Objective**

The primary objective of the course is to introduce students to the concepts of calculus and to develop the student's confidence and skill in dealing with mathematical expressions. To achieve this goal, the course will help the student understand the following basic concepts: limits, continuity , derivatives and integration involving real-valued functions of one variable (including algebraic and trigonometric functions).

**3. Course Learning Outcomes**

| CLOs | Aligned PLOs |
|---|---|
| 1 | Knowledge and Understanding: by the end of this course, the student is expected to be able to | |

| | CLOs | Aligned PLOs |
|---|---|---|
| 1.1 | Recognize the characteristics of a function expressed in symbolic or graphic form. | K1 |
| 1.2 | Outline the definitions of limits and continuity of a single-variable function and related theorems. | K2 |
| 1.3 | Define the basic concept of a derivative of a single-variable function and learn the different rules, formulas and theorems for computing the derivative of a function in calculus. | K1 |
| 1.4 | Define the basic concepts and techniques of integration of polynomial, rational, and trigonometric functions. | K1 |
| **2** | **Skills: by the end of this course, the student is expected to be able to** | |
| 2.1 | Analyze functions represented in a variety of ways: graphical, numerical or analytical | S1 |
| 2.2 | Determine the limits of functions and their continuity at points or on intervals. | S2 |
| 2.3 | Calculate the derivative of various type of functions using the rules and techniques of differentiation. | S1 |
| 2.4 | Evaluate integrals of real functions using basic rules and techniques of integration. | S2 |
| **3** | **Values: by the end of this course, the student is expected to be able to** | |
| 3.1 | Apply the computational and conceptual principles of calculus to the solutions of various mathematical problems. | V2 |
| 3.2 | Justify the choice of different steps in problem resolution procedure. | V1 |
| 3.3 | Solve problems using a range of formats and approaches in basic science. | V2 |
| 3.4 | Show the ability to work independently and within groups. | V2 |

## C. Course Content

| No | List of Topics | Contact Hours |
|---|---|---|
| 1 | **Pre Calculus:** <br> (i) Exponents and Radicals. <br> (ii) Solving Equations. <br> (iii) Inequalities and Absolute Values. <br> (iv) Lines | 8 |
| 2 | **Functions** <br> (i) Functions: Definition, Graphs and Operations <br> (ii) Trigonometric Functions and Identities. | 4 |
| 3 | **Limits and Continuity:** | 8 |

| | | | |
|---|---|---|---|
| | (i) Introduction to Limits<br>(ii) Theorems on limits<br>(iii) Limit at infinity and infinite limits<br>(iv) Continuity | | |
| 4 | **Differentiation**<br>(i) Definition of Derivative (Using Limits)<br>(ii) Rules and Theorems for Finding Derivatives<br>(iii)Derivative of Trigonometric Function<br>(iv)Chain Rule<br>(v) Higher Order Derivatives | 10 | |
| 5 | **Integration**<br>(i) Antiderivatives.<br>(ii) Fundamental Theorems of Calculus. | 4 | |
| 6 | **Others**<br>Preprimaries, Quizzes, Activities … | 6 | |
| | Total | 40 | |

## D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

| Code | Course Learning Outcomes | Teaching Strategies | Assessment Methods |
|---|---|---|---|
| **1.0** | **Knowledge and Understanding** | | |
| 1.1 | Recognize the characteristics of a function expressed in symbolic or graphic form. | Lecture and Tutorials | Exams, quizes |
| 1.2 | Outline the definitions of limits and continuity a single-variable function and related theorems. | Lecture and Tutorials | Exams, quizes |
| 1.3 | List the different rules, formulas and theorems for computing derivatives of functions. | Lecture and Tutorials | Exams, quizes |
| 1.4 | Define the basic concepts and techniques of integration of polynomial, rational, and trigonometric functions. | Lecture and Tutorials | Exams, quizes |
| **2.0** | **Skills** | | |
| 2.1 | Analyze functions represented in a variety of ways: graphical, numerical or analytical. | Lecture/ Individual or group work | Exams, quizes |
| 2.2 | Determine the limits of functions and their continuity at points or on intervals. | Lecture/ Individual or group work | Exams, quizes |
| 2.3 | Calculate the derivative of various type of functions using the rules and | Lecture/ Individual or group work | Exams, quizes |

| Code | Course Learning Outcomes | Teaching Strategies | Assessment Methods |
|------|--------------------------|---------------------|--------------------|
| | techniques of differentiation. | | |
| 2.4 | Apply the concept of derivative to completely analyze graph of a function. | Lecture/Individual or group work | Exams, quizes |
| 2.5 | Evaluate integrals of real functions using basic rules and techniques of integration. | Lecture/Individual or group work | Exams, quizes |
| **3.0** | **Values** | | |
| 3.1 | Apply the computational and conceptual principles of calculus to the solutions of various mathematical problems. | Lecture/Individual or group work | Exams, quizes |
| 3.2 | Justify the choice of different steps in problem resolution procedure. | Lecture/Individual or group work | Exams, quizes |
| 3.3 | Solve problems using a range of formats and approaches in basic science. | Lecture/Individual or group work | Exams, quizes |
| 3.4 | Show the ability to work independently and within groups. | Lecture/Individual or group work | Exams, quizes |

## 2. Assessment Tasks for Students

| # | Assessment task* | Week Due | Percentage of Total Assessment Score |
|---|------------------|----------|--------------------------------------|
| 1 | Midterm exam | Sixth week | 30% |
| 2 | Quizes and homeworks | During semester | 20% |
| 3 | Final exam | End of semester | 50% |

*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

# E. Student Academic Counseling and Support

**Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:**

All faculty members are required to be in their offices outside teaching hours. Each member allocates at least 4 hours per week to give academic advice to students and to better explain the concepts seen during the lectures.

Students are required to complete the homework problems. Students are welcome to work together on homework. However, each student must turn in his or her own assignments, and no copying from another student's work is permitted. Deadline extensions for homework will not be given. Students are encouraged to discuss with professor about homework problems.

# F. Learning Resources and Facilities

## 1. Learning Resources

| Required Textbooks | • Calculus (9th Edition), Dale Varberg, Edwin Purcell and Steven Rigdon, Prentice Hall (2006). |
|--------------------|-----------------------------------------------------------------------------------------------|
| Essential References Materials | • Thomas' Calculus (14th Edition), George B. Thomas <br> • Precalculus: Mathematics for Calculus (6th Edition), James Stewart |

| Electronic Materials | None |
|---|---|
| Other Learning Materials | None |

## 2. Facilities Required

| Item | Resources |
|---|---|
| **Accommodation**<br>(Classrooms, laboratories, demonstration rooms/labs, etc.) | Classrooms |
| **Technology Resources**<br>(AV, data show, Smart Board, software, etc.) | Data Show, Smart Board |
| **Other Resources**<br>(Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list) | None |

## G. Course Quality Evaluation

| Evaluation Areas/Issues | Evaluators | Evaluation Methods |
|---|---|---|
| Effectiveness of teaching and assessment | Students | Direct |
| Quality of learning resources | Students | Direct |
| Extent of achievement of course learning outcomes | Faculty Member | Direct |

**Evaluation areas** (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
**Evaluators** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
**Assessment Methods** (Direct, Indirect)

## H. Specification Approval Data

| Council / Committee | |
|---|---|
| Reference No. | |
| Date | |