# Course Specifications

| Course Title: | Calculus 2 |
|---|---|
| Course Code: | Math 120 |
| Program: | Information and Computer Sciences |
| Department: | Computer Science and Information |
| College: | College of Science at Az Zulfi |
| Institution: | Majmaah university |

## Table of Contents

# A. Course Identification

| | |
|---|---|
| **1. Credit hours:** (3) (2 Lec + 2 lab) | |

**2. Course type**

a. University ☐  College ☑  Department ☐  Others ☐

b. Required ☑  Elective ☐

**3. Level/year at which this course is offered:**
2<sup>nd</sup> level

**4. Pre-requisites for this course (if any): MATH 110**

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

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

| No | Mode of Instruction | Contact Hours | Percentage |
|---|---|---|---|
| 1 | Traditional classroom | 48 | 80% |
| 2 | Blended | 6 | 10% |
| 3 | E-learning | 6 | 10% |
| 4 | Correspondence | --- | --- |
| 5 | Other | --- | ---- |

## 7. Actual Learning Hours (based on academic semester)

| No | Activity | Learning Hours |
|---|---|---|
| **Contact Hours** | | |
| 1 | Lecture | 30 |
| 2 | Laboratory/Studio | 30 |
| 3 | Tutorial | |
| 4 | Others (specify) | |
| | Total | 60 |
| **Other Learning Hours*** | | |
| 1 | Study | 30 |
| 2 | Assignments | 30 |
| 3 | Library | |
| 4 | Projects/Research Essays/Theses | 10 |
| 5 | Others (specify) | 30 |
| | Total | 100 |

**\*** The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

## B. Course Objectives and Learning Outcomes

**1. Course Description :**

The current course aims to abstract the essentials of problems and formulate them mathematically and in symbolic form so as to facilitate their analysis and solution. The course is a firm continuation of Math110 with important strongly interrelated topics that furnish robust basis for the other materials in computer science.

The 1st topic :Is The Definite Integration: Introduction & Basic Concepts and Properties. Theorems Facilitating Evaluation of Definite Integrals, Improper Integrals of First And Second Kinds, Case Study: Special Functions Defined As Definite Integrals. Applications of definite integration: Using Cartesian, Parametric, and Polar coordinates in: Area between two curves, Length of plan curves.

The 2nd topic :Is The Partial Differentiation: Basic Concepts: of Functions of several variables, Partial derivatives of order one and higher orders, Chain rule for one parameter and more. Applications: Rates, Exact differential expression, Del operator: Gradient & Divergence & Curl.

The 3rd topic :Is The Analytic Geometry: Two Dimensions: The different forms of equations of straight line, The conic sections: equations and geometric properties. Three Dimensions: The Cartesian, Cylindrical, and Spherical Coordinates and their interrelations. The Directional Cosines and Ratios. The Plane, The Straight Line, The Quadric Surfaces.

The 4th topic :Is The Multiple Integral and Vector Calculus: Double Integral: The Cartesian coordinates, Change of order, Polar coordinates. Line Integral: Opened/Closed paths in different coordinate systems. Green's Theorem, Path independence.

The 5th topic :Is The sequences and Infinite Series: Definition: Sequence, Series, Convergence, Divergence. Tests for Convergence And Divergence For Positive Series: $N^{th}$ term test, Polynomial test, Comparison test, $N^{th}$ root test, Ratio test, Integral test. Alternating Series: Leibnitz theorem for Absolute and conditional convergence. Power Series: Formation, Interval of convergence**.**

**2. Course Main Objective:**

1. Use the manipulative and analytical skills to solve word problems.
2. The ability to select and apply appropriate mathematical processes.
3. Constructs algebraic tools that create well developed accurate solutions.
4. Verifies independent critical thinking and problem solving skills.

**3. Course Learning Outcomes**

| CLOs | | Aligned PLOs |
|---|---|---|
| 1 | **Knowledge:** | |
| 1.1 | Understand the concept of integration and its application to physical problems such as evaluation of areas, volumes of revolution, force, and work; fundamental formulas and various techniques of integration applied to both | K1 |

| | CLOs | Aligned PLOs |
|---|---|---|
| | single variable and multi- variable functions; tracing of functions of two variables. | |
| 1.2 | Ability to think analytically and critically | K2 |
| 1.3 | Ability to understand and analyze the mathematical problems | K3 |
| **2** | **Skills :** | |
| 2.1 | Ability to think analytically and critically | S1 |
| 2.2 | Ability to understand and analyze the mathematical problems | S2 |
| 2.3 | Sketch 3-dimensional regions bounded by several surfaces; and evaluate volumes of 3-dimensional regions bounded by two or more surfaces through the use of the double integral. | S3 |
| **3** | **Competence:** | |
| 3.1 | Determine the indicated sum of the elements in special sequences and series, and recognize the convergence/divergence of general sequence and series. | C1 |
| 3.2 | Students can actively and critically participate in class activities; | C2 |
| 3.3 | Students can act responsibly and ethically in conducting their work; | C3 |

## C. Course Content

| No | List of Topics | Contact Hours |
|---|---|---|
| 1 | Integral Calculus: The definite integration: Introduction & Basic Concepts and Properties of Definite Integrals, Theorems Facilitating Evaluation of Definite Integrals, Improper Integrals of First And Second Kinds, Case Study: Special Functions Defined As Definite Integrals. Applications of definite integration: Using Cartesian, Parametric, and Polar coordinates in: Area between two curves, Length of plan curves | 9 |
| 2 | Partial Differentiation: Basic Concepts: of Functions of several variables, Partial derivatives of order one and higher orders, Chain rule for one parameter and more. Applications: Rates, Exact differential expression, Del operator: Gradient & Divergence & Curl. | 6 |
| 3 | Analytic Geometry: Two Dimensions: The different forms of equations of straight line, The conic sections: equations and geometric properties. Applications: Rates, Exact differential expression, Del operator: Gradient & Divergence & Curl. Three Dimensions: The Cartesian, Cylindrical, and Spherical Coordinates and their interrelations. The Directional Cosines and Ratios. The Plane, The Straight Line, The Quadric Surfaces. | 9 |
| 4 | Multiple Integral And Vector Calculus: Double Integral: The Cartesian coordinates, Change of order, Polar coordinates. Line Integral: Opened/Closed paths in different coordinate systems. Green's Theorem, Path independence. | 9 |
| 5 | Sequences And Infinite Series : Definition: Sequence, Series, Convergence, Divergence. Tests for Convergence And Divergence For Positive Series: $N^{th}$ term test, Polynomial test, Comparison test, $N^{th}$ root test, Ratio test, Integral test. Alternating Series: Leibnitz theorem for Absolute and conditional convergence. Power Series: Formation, Interval of convergence | 16 |
| **Total** | | 49 |

## 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** | | |
| 1.1 | Understand the structure of compilers | Lectures demonstrations Case studies Individual presentations | Written Exam Homework assignments Class Activities Quizzes |
| 1.2 | Understand the basic techniques used in compiler construction such as lexical analysis, top-down, bottom-up parsing, context-sensitive analysis, and intermediate code generation. | | |
| 1.3 | Understand the basic data structures used in compiler construction such as abstract syntax trees, symbol tables, three-address code, and stack machines. | | |
| 1.4 | Explain the core issues of Compiler design. | | |
| **2.0** | **Skills** | | |
| 2.1 | Ability to think analytically and critically; | Lectures Class discussion | Written Exam Homework assignments Class Activities Quizzes |
| 2.2 | Ability to understand and analyze the mathematical problems | | |
| … | | | |
| **3.0** | **Competence** | | |
| 3.1 | Students can complete assignments in due time; | Peer and group Discussion Lectures Class discussion | Written Exam Homework assignments Class Activities Quizzes |
| 3.2 | Students can actively and critically participate in class activities; | | |
| … | Students can communicate, negotiate and evaluate their strengths and weaknesses as team members. | | |

### 2. Assessment Tasks for Students

| # | Assessment task* | Week Due | Percentage of Total Assessment Score |
|---|---|---|---|
| 1 | First written mid-term exam | 6 | 15% |
| 2 | Second written mid-term exam | 12 | 15% |
| 3 | Presentation, class activities, and group discussion | Every week | 10% |
| 4 | Homework assignments | After each chapter | 10% |
| 5 | Other Implementation | Every two weeks | 10% |
| 6 | Final written exam | 16 | 40% |

| # | Assessment task* | Week Due | Percentage of Total Assessment Score |
|---|---|---|---|
| 7 | Total | | 100% |

**\*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 :**
Office hours: Sun: 8-10, Mon. 10-12
Email: m.badawi@mu.edu.sa

## F. Learning Resources and Facilities

### 1.Learning Resources

| | |
|---|---|
| **Required Textbooks** | Carlos Polanco, Advanced Calculus: Fundamentals of Mathematics, Bentham Science Publishers, 2019 |
| **Essential References Materials** | Essential Calculus Skills Practice Workbook with Full Solutions Paperback, 2018 |
| **Electronic Materials** | http://mathcity.org/bsc/notes_of_calculus_with_analytic_geometry http://ilmikitabkhana.com |
| **Other Learning Materials** | Videos and presentations will be available on Blackboard |

### 2. Facilities Required

| Item | Resources |
|---|---|
| **Accommodation** (Classrooms, laboratories, demonstration rooms/labs, etc.) | Classroom and Labs as that available at college of science at AzZulfi are enough. |
| **Technology Resources** (AV, data show, Smart Board, software, etc.) | Smart Board |
| **Other Resources** (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list) | N/A |

## G. Course Quality Evaluation

| Evaluation Areas/Issues | Evaluators | Evaluation Methods |
|---|---|---|
| Questionnaires (course evaluation) achieved by the students and it is electronically organized by the university. | Students | Indirect |
| Student-faculty management meetings. | Program Leaders | Direct |
| Discussion within the staff members teaching the course | Peer Reviewer | Direct |

| Evaluation Areas/Issues | Evaluators | Evaluation Methods |
|---|---|---|
| Departmental internal review of the course. | Peer Reviewer | Direct |
| Reviewing the final exam questions and a sample of the answers of the students by others. | Peer Reviewer | Direct |
| Visiting the other institutions that introduce the same course one time per semester. | Faculty | Indirect |

**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** | Dr. Maria Altaib |
| **Reference No.** | |
| **Date** | 19/09/2019 |