VISION
2030
المملكة العربية السعودية
KINGDOM OF SAUDI ARABIA

اعتماد
NCAAA

هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

# Course Specifications

| Course Title: | Calculus |
|---|---|
| Course Code: | 201 MATH |
| Program: | Computer Science |
| Department: | Mathematics |
| College: | Science |
| Institution: | Jazan University |

## Table of Contents

## A. Course Identification

| 1. Credit hours: |
|---|

| 2. Course type |
|---|

**a.**  University ☐    College ✔    Department ☐    Others ☐

**b.**  Required ✔    Elective ☐

| 3. Level/year at which this course is offered:    Level 4/Year 2 |
|---|

| 4. Pre-requisites for this course (if any): **100 Math** |
|---|

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

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

| No | Mode of Instruction | Contact Hours | Percentage |
|---|---|---|---|
| 1 | Traditional classroom | 37.5 | 100% |
| 2 | Blended | | |
| 3 | E-learning | | |
| 4 | Correspondence | | |
| 5 | Other | | |

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

| No | Activity | Learning Hours |
|---|---|---|
| **Contact Hours** | | |
| 1 | Lecture | **37.5** |
| 2 | Laboratory/Studio | |
| 3 | Tutorial | |
| 4 | Others (specify) | |
| | Total | **37.5** |
| **Other Learning Hours*** | | |
| 1 | Study | **35** |
| 2 | Assignments | **5** |
| 3 | Library | **5** |
| 4 | Projects/Research Essays/Theses | |
| 5 | Others: <br> -Exam preparation (mid-1, mid-2, final) <br> -Office hours | **25** <br> **5** |
| | Total | **75** |
| **Grand Total** | | **112.5** |

**\*** 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**

This course is designed to provide students with

| | |
|---|---|
| ) | **|The functions**: Definition, Types of functions, domain of the functions, transformation of functions, composite functions, properties of functions, exponential functions, Inverse functions. | |
| ) | **The Limits and continuity**: The Limit of a function, Calculating Limits Using the Limit Laws(theorems, definitions and examples), Continuity, Limits at Infinity, Horizontal Asymptotes| |
| ) | **Derivatives of functions**: Techniques of differentiation, derivation rules, product and quotient rule, derivative of trigonometric function, chain rule, implicit and parametric differentiation, higher derivatives. | |
| ) | **Applications of differentiation:** The absolute and local maximum and minimum values of a function, critical points, increasing and decreasing, closed interval method.| |
| ) | **Integrations:** Indefinite Integration, Definite Integration, Integration by substitution, Integration by part and method of calculations them, application of definite integration, | |

## 2. Course Main Objective

After finishing the course, the student is expected to be familiar with the following:

- ) Studying Real numbers and real line
- ) Studying the properties of functions and how to draw the curve of the function
- ) Finding limit of the function and studying its Continuous
- ) Having a knowledge of Differentiation
- ) Studying the relationship between Differentiation and Continuity
- ) Finding the maximum and minimum values of the function
- ) Have the knowledge of how the function increased and decreased
- ) Having a knowledge of Integration

## 3. Course Learning Outcomes

| | CLOs | Aligned PLOs |
|---|---|---|
| 1 | **Knowledge:** | |
| 1.1 | Distinguishing mathematical concepts relevant to Functions, Limits and continuity, Derivatives of functions, Applications of differentiation, and Integrations | K1 |
| 1.2 | Analysis structures and features of Mathematics problems in Functions, Limits and continuity, Derivatives of functions, Applications of differentiation, and Integrations | K2 |
| 1.3 | Outline required notations and concepts in Functions, Limits and continuity, Derivatives of functions, Applications of differentiation, and Integrations | K3 |
| 2 | **Skills :** | |
| 2.1 | Apply aspects relevant to Functions, Limits and continuity, Derivatives of functions, Applications of differentiation, and Integrations | S1 |
| 2.2 | Apply how to compute rates/quantities and Approximate Solutions in Functions, Limits and continuity, Derivatives of functions, Applications of differentiation, and Integrations | S2 |
| 2.3 | Apply various math rules, techniques and theorems in Functions, Limits and continuity, Derivatives of functions, Applications of differentiation, and Integrations | S3 |

| | CLOs | Aligned PLOs |
|---|---|---|
| 2.4 | Apply mathematical problems using critical thinking and problem solving in Functions, Limits and continuity, Derivatives of functions, Applications of differentiation, and Integrations | S4 |
| **3** | **Competence:** | |
| 3.1 | Ability to work individually or within a team by independently and responsibility during group work and/or assignments. | C1 |
| 3.2 | Ability to practice mathematics knowledge and skills in different situations during interactive discussion, group assignments, and web-based activities. | C2 |
| 3.3 | Ability to provide ethics and friendly-ship environment in the real life during class discussion, participation in college and university activities, and be members of department committees and college committees. | C3 |

## C. Course Content

| No | List of Topics | Contact Hours |
|---|---|---|
| 1 | **The Functions** | 7.5 |
| 2 | **The Limits and continuity** | 7.5 |
| 3 | **Derivatives of functions** | 10 |
| 4 | **Applications of differentiation** | 5 |
| 5 | **Integrations** | 7.5 |
| **Total** | | 37.5 |

## 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 | Students will be able to understand the basic scientific facts, concepts, principles and techniques of Calculus. | Lectures, problem solving, web based work, Classroom dissections. | Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments |
| 1.2 | Have knowledge and understanding to carry out a piece of research on Calculus and its application. | | |
| 1.3 | Recognize the contribution and impacts of the Calculus in the development of mathematical sciences and also be able to state the physical problems by mathematical methods. | | |
| **2.0** | **Skills** | | |
| 2.1 | The student should understand, explain and interpret a general knowledge and ability to solve the problems related Calculus and its application. | Lectures, problem solving, web based work, Classroom dissections. | Written exam (Problem solve, MCQ, true/false, Proof, Short answer), Quizzes, Assignments |
| 2.2 | Students will have the ability to introduce the physical problems in a mathematical model. | | |
| 2.3 | Develop connections of calculus with other disciplines | | |

| Code | Course Learning Outcomes | Teaching Strategies | Assessment Methods |
|------|--------------------------|---------------------|---------------------|
| 2.4 | Enable students to analyze a mathematical problem and determine which numerical technique to use to solve it. | | |
| **3.0** | **Competence** | | |
| 3.1 | Ability to work individually or within a team by independently and responsibility during group work and/or assignments. | Group work, Home Assignment | Assignments |
| 3.2 | Ability to practice mathematics knowledge and skills in different situations during interactive discussion, group assignments, and web-based activities. | | |
| 3.2 | Ability to provide ethics and friendly-ship environment in the real life during class discussion, participation in college and university activities, and be members of department committees and college committees. | | |

## 2. Assessment Tasks for Students

| # | Assessment task* | Week Due | Percentage of Total Assessment Score |
|---|------------------|----------|--------------------------------------|
| **1** | Homework | 3 | 5% |
| **2** | First exam. | 6 | 20% |
| **3** | Second exam. | 12 | 20% |
| **4** | Homework | 14 | 5% |
| **5** | Final exam. | 16 | 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 :**

Each group of students assigned to a member of staff who will be available for help and academic guidance office hours at specific hours on daily basis. At least be available 10 hours per week.

# F. Learning Resources and Facilities

## 1.Learning Resources

| Required Textbooks | ⟩ J. Stewart, Calculus, Early Transcendentals, Sixth Edition, 2008. |
|--------------------|---------------------------------------------------------------------|
| **Essential References Materials** | ⟩ Calculus, R. E. Larson, R. P. Hostetler, and B. H. Edwards, 7 Edition, Houghton Mifflin Company, (2002) <br> ⟩ Calculus, G. B. Thomas, Early Transcendentals, 11 Edition, Addition-Wesley, New York (2006) |

| | |
|---|---|
| | ) Calculus,E. Swokowski, M. Olinic, and D. Pence, 6 Edition, PWS Publishing Company, (1994) |
| **Electronic Materials** | Web sites, Facebook, Twitter, YouTube, Blackboard etc. |
| **Other Learning Materials** | - Mathematical Software packages (Example: Matlab, WinEdt, Mapple, )<br>- Power point presentations |

## 2. Facilities Required

| Item | Resources |
|---|---|
| **Accommodation**<br>(Classrooms, laboratories, demonstration rooms/labs, etc.) | Classroom, Computer Lab, Library. |
| **Technology Resources**<br>(AV, data show, Smart Board, software, etc.) | Data show; Smart Board; Mathematical Software |
| **Other Resources**<br>(Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list) | |

## G. Course Quality Evaluation

| Evaluation Areas/Issues | Evaluators | Evaluation Methods |
|---|---|---|
| Effectiveness of teaching | Students, Peer and program leader | Indirect (Course Evaluation Survey)- Indirect peer evaluation |
| Assessment | Students, Program assessment committee | Direct/ Indirect |
| Extent of achievement of course learning outcomes | Instructor | Direct/Indirect |
| Quality of learning resources | Students, Faculty members | 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 | **Board Of Mathematics Department** |
|---|---|
| **Reference No.** | **5th Meeting Of The Board Of Mathematics Department 1440-1441** |
| **Date** | **13/03/1441 AH.;  11/11/2019 A. D.** |