King Saud University
College of Science
Differential and Integral Calculus
Course Syllabus
First Semester 1436 - 1437

1. Course General Information:

Course Title: Differential and Integral Calculus	**Course Code: MATH 203**
Course Level: 3	**Course Prerequisite: MATH 106, MATH 107** **Co-requisites for this course (if any): None**
Lecture Time: 10-11 am	**Credit Hours: 4**

2. Faculty Member Responsible for the Course:

Name	Rank	Office Number and Location	Office Hours	Email Address
Dr. Sharief Deshmukh	Professor	0114675650 Main Campus	-	shariefd@ksu.edu.sa

3. Course Description:

Students are introduced to: Convergence of Sequences and Series, Different types of tests for convergence, Alternating series and its convergence, Power series, Radius and interval of convergence of a Power Series, Maclaurin and Taylor series, Double integrals, techniques of evaluating double integrals, Applications to Area and Volume of bounded Regions, Double integrals in polar coordinates, Triple integrals, Finding mass center of mass and moments of Inertia of plane and solid regions, Line integrals, Green's Theorem, Work done by a force, Divergence, Curl of a vector filed, Path independence of a line integral, Surface integrals, Flux of a force through a surface, Divergence and Stokes theorem.

4. Course Academic Calendar

Week	Basic material to be covered
(1-2)	Introduction to sequences and Series, Convergence and Divergence, Finding sum of a convergent series in certain cases, Basic Comparison test and Limit Comparison test. Integral test and P-Series.
(3-4)	Ratio test and Root test, Alternating series, Power series, Interval and Radius of convergence, Maclaurin Series and Taylor series, Approximating certain irrational numbers and certain integrals using these series.
(5-6)	Double integrals, Reversing the order of the double integral, Double integrals in polar coordinates, Area and volume of bounded regions. Triple integrals.
(7-9)	Mass, Center of mass, Moment of Inertia of planar and solid regions. Use of Cylindrical and Spherical coordinates.
(10-12)	Line integrals, Work done by a force, Path independence of a line integral, Green's theorem. Surface integral and Flux of a force through a surface.
(12-15)	Divergence and Curl of a force, Divergence theorem, use of divergence theorem to find the flux of a force through a closed surface. Stoke's theorem.
(16)	Final Examination

5. Course Objectives:

The main purpose for this course is to introduce the following concepts:

- Series and Sequences their convergence and divergence. Tests of convergence, of series, Power series and its interval of convergence, Developing a function in Maclaurin and Taylor series and applications to approximation.
- Double integral and Triple integrals and techniques of evaluating these integrals and their applications to evaluating area and volume of bounded regions.
- Path integrals, and Green's Theorem, Surface integrals and Flux of a force through a surface.
- Divergence and Curl of a force, Divergence theorem. Application of Divergence theorem for finding flux of a force through a closed surface.
- Stoke's theorem.

6. Course References:

6.1 Textbooks:
1- Calculus, Swokowski, Olinick an Pence, Sixth Edition, PWS Publishing Company, Boston-1992.

6.2 Websites:
1- http://faculty.ksu.edu.sa/63187
2- Internet sites relevant to the course

7. Teaching Methods:

- To initiate the course, several laws from physics and economics are invoked which naturally gives rise to Convergence and use of multiple integrals, that raises interest among the students of the relevance as well as importance of the course.

- Integrals of functions of one variable are used to motivate the idea of double and triple integrals, line integrals and surface integrals and shown how they are useful in Engineering and physical problems, specially problems like work done by a force, flux, finding mass if density is gives and finding moments of inertia about certain axis.

- At the beginning of each lecture, questions are put to the students retrieving what they have learned in earlier lecture in order to establish a link between the previous lectures and the current lecture.
- Discussions in the class
- Homework assignments
- Independent study
- Student's' Representation.

8. Learning Outcomes:

8.1 Knowledge and Understanding:
After studying this course, the student will acquire the following knowledge and be able to:

- Recognize the type of a sequence and Series for an appropriate test to decide whether it is convergent or divergent. Moreover, expansions of functions in a power series will be applied to approximate certain irrational numbers and difficult integrals.
- Given a planar or a solid region, double and triple integrals will be used to find respective area or volume of the region.
- Will be able to apply his knowledge of line integrals and surface integrals to find the work done by a force as well as the flux of a force through a surface respectively. Also will be able to check whether the force is conservative.
- Will be able to solve difficult triple integrals using appropriate cylindrical or spherical coordinates.
- Will become expert in applying Green's theorem, Divergence theorem and Stoke's theorem.

8.2 Cognitive Skills (Thinking and Analysis):

After studying this course, the student will able to:

- Predict whether the Sequence or the series is convergent or divergent. Predicting the interval of convergence of a power series. Approximating values of transcendental numbers such as *pi*, *e* and other difficult integrals.
- Finding area Mass Center of Mass of a bounded planar region, as well as Volume, Center of Mass and Moment of Inertia of solid regions.
- Finding whether he should apply Cylindrical or Spherical coordinates to evaluate a triple integral which is otherwise difficult to evaluate in Rectangular coordinates.
- Predict whether a force is conservative or not and accordingly will be able to determine whether the line integral is independent of path or not.
- Intelligent use of Green's theorem and Divergence theorem in finding path and surface integrals respectively for a closed curve and a closed surface. As well as use of Stoke's theorem.

8.3 Interpersonal Skills and Responsibility:
After studying this course, the student is expected to:

- To participate in the discussion
- Study, learn and work independently.
- Work effectively in teams.
- Meet deadlines and manage time properly.
- Exhibit ethical behaviour and respect different points of view.

8.4 Communication, Information Technology and Numerical Skills
After studying this course, the student is expected to be able to:

- Present mathematics to others, both in oral and written form clearly and in a well-organized manner.
- Use IT facilities as an aid to mathematical processes and for acquiring available information.
- Use library to locate mathematical information.

9. Methods of Assessment:

Course Assessment	Mark
Class activates (in class quizzes, and homework)	10
Midterm exams I	25
Midterm exams II	25
Final Examination	40
Total	**100**

10. Course Policies:

- All exams are closed book.
- The final exam will be comprehensive.

11. Attendance Policy:

Absence from lectures and/or tutorials shall not exceed 25%. Students who exceed the 25% limit without an accepted medical or emergency excuse shall not be allowed to take the final examination and shall receive a grade of "DN" for the course.