Forman Christian College, Lahore

(A Chartered University)
SPRING 2023

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Office Hours: Mon, Wed: **11:00 a.m. - 12:30 p.m.**
Fri: **11:00 a.m. – 01:00 p.m.**
Tues, Thurs: **11:30 a.m. - 12:30 p.m.**

Course Information: Multivariate Calculus   CSCS 201 (A)

Prerequisite: MATH 111   **Credit Hours:** 3
Class Room: S-316   **Class Timings:** 09:00 a.m. -09:50 a.m. (Mon, Wed, Fri)
Course Trailer Link: https://www.youtube.com/watch?v=xlwZyIIi9Co

Resources:

- Recorded video lectures and lecture notes will be uploaded on Moodle every week.

Text Books:

- Calculus Early Transcendentals, James Stewart, seventh edition, Thomson Learning Inc. U.S.A.
  https://drive.google.com/file/d/1DMM7FIKIDH8fx5a-gCVB-UjOjW4RAjRT/view

- Calculus Early Transcendentals, Anton, Biven, Davis, tenth edition, John Wiley & Sons Inc. U.S.A.

Course Contents:

This is a mandatory course for 4-year Baccalaureate degree in Computer Science. This course deals with multivariable calculus. Topics include multivariable functions, limits, continuity, partial derivatives, chain rule for partial derivatives, multiple integrals with applications, vector valued functions, line integrals, Green's, Stokes' and Gauss's theorem.

Course Objectives: In this course, the concept of differentiability and integration, which is used in calculus of single variable functions, will be extended to functions of two and three variables. Students will be able to apply these concepts to analyze and interpret information in their specific field. It will improve understanding of students about properties like limit, continuity, partial derivatives, and multiple integrals etc. of multivariable functions, and ability to independently increase their own understanding of multi-variable calculus. It will provide students with an opportunity to appreciate the wide range use of multi-variable calculus in different fields. Students successfully completing the course should be reasonably proficient in solving problems involving multivariable functions and related properties.

Course Requirements:

- **Attendance:** Students are expected to attend every class. Student whose attendance is less than 70% will not be allowed to take the final exam. Students must arrive at class on time, should remain in class for the entire class period and mobile phone should be switched off or on silent mode. Note that there is **5 marks for attendance, behavior, and class participation**, if a student arrives more than **10 minutes late** or **leaves class during lecture** or **uses mobile in class**, he/she will be marked **absent** for that day.
- **Assessments:** Course assessment will be through **quizzes, attendance and behavior, assignments, midterm, and final exam**. There is no make up for missed quizzes. Make up for quizzes, midterm and final exam is possible only under extremes cases if student provides strong documentary evidence within three days. In case of makeup exam, there will be a 0-20% deduction in marks depending upon case-to-case basis.
- **Academic dishonesty or cheating:** Students are expected to present their own work, failure to do this will result in zero points and will be referred to AIC (Academic Integrity Committee) at FCC for necessary action.

Learning Outcomes:

Students will be able to:

- develop and strengthen skills in dealing with multivariable functions and their properties.
- differentiate the vector valued functions and use them in practical problems.
- find multiple integrals of the vector valued functions and their applications.
- analyze, model, and interpret problems involving multivariable functions in their respective field.
- use Green's, Stokes' and Gauss's theorem to evaluate surface and line integrals.

Course Evaluation:

Grading will be based on following criteria:

- ❖ **Quizzes** (3 best quizzes out of 4 will be selected)   **15 %**
- ❖ **Attendance, class participation and behavior**   **05 %**
- ❖ **Assignments** (two assignments and each having 5% weightage)   **10 %**
- ❖ **Mid-term Exam**   **30 %**
- ❖ **Final Exam**   **40 %**

Grading Criteria:

Grades	Quality Points	Numerical Value	Meaning
A	4.00	93 - 100	Superior
A-	3.70	90 - 92	
B+	3.30	87 - 89	Good
B	3.00	83 - 86	
B-	2.70	80 - 82	Fair
C+	2.30	77 - 79	
C	2.00	73 - 76	Satisfactory
C-	1.70	70 - 72	
D+	1.30	67 - 69	
D	1.00	60 - 66	Passing
F	0.00	59 or below	Failing

Weekly Lesson Plan:

Week	Topics	Assessments
1 Feb 13, 15, 17	❖ Discussion of course plan: Course introduction, policies, requirements, and grading criteria ❖ Review of function of one variable, functions of two and three variables	
2 Feb 20, 22, 24	❖ Limit of a multi-variable function	
3 Feb 27, March 01, 03	❖ Continuity of a function of two variables	
4 March 06, 08, 10	❖ Continuity of a function of three variables ❖ Some problems related to continuity of a multivariable function	**Quiz-1**
5 March 13, 15, 17	❖ Partial derivatives, chain rule	**Assignment 1**
6 March 20, 22, 24	❖ Directional derivative, gradient of a multivariable function	
7 March 27, 29, 31	❖ Maximum value of directional derivative ❖ Iterated Integrals and their applications	**Quiz-2**

8 April 03, 05	❖ Double integrals over general regions	
9 April 12, 14	❖ Double integrals over general regions (continued…)	**Mid-term Exam**
10 April 17, 19	❖ Double integrals in polar co-ordinates and applications	
11 April 28	❖ Triple integrals and their applications	
12 May 03, 05	❖ Problems involving multiple integrals.	**Quiz-3**
13 May 08, 10, 12	❖ Vector and scalar fields, line integrals	
14 May 15, 17, 19	❖ Line integrals of scalar fields (continued…)	**Assignment 2**
15 May 22, 24, 26	❖ Green's theorem and its applications	
16 May 29, 31, June 02	❖ Stokes' theorem	
17 June 05, 07, 09	❖ Divergence Theorem of Gauss ❖ Revision and problems' discussion	**Quiz-4**
June 12 – June 21	Final examination will be conducted as per official schedule. Final examination period is from **June 12 – June 21.**	**Final Exam**