A) COURSE

Course Id:	Course
0052	Calculus B

Class Hours per Week	Lab hours per week	Complementary practices	Credits	Total hour course
3	2	3	8	80

B) GENERAL COURSE INFORMATION:

	EE (IEA)	ME (IM)	MME (IMA)	EME (IME)	MTE (IMT)
Level:	II	II	II	II	II
Course Type (Required/Elective)	Required	Required	Required	Required	Required
Prerequisite Course:	Calculus A	Calculus A	Calculus A	Calculus A	Calculus A
CACEI Classification:	BS	BS	BS	BS	BS

C) COURSE OBJECTIVE

At the end of the course, the student will be capable of:
Identify, describe, graph and do practical applications in functions of several variables.

D) TOPICS (CONTENTS AND METHODOLOGY)

1. Review of Analytic geometry in three dimensions.		8 hours
Specific Objective:	The student will identify and describe the three-dimensional coordinate system and locate points will graph lines, planes and calculate distances between points and between a point and a plane to a line.	
1.1 Distance between points. 1.2 Angles, cosines and directors of a straight numbers. 1.3 Angle between straight. 1.4 Conditions of parallel and perpendicular. 1.5 Equation of the plane. 1.6 Distance from a point to a plane. 1.7 Equations of the line. 1.8 distances from a point to a line. 1.9 Angle of two planes.		
Readings and other resources	Books, Articles.	
Teaching Methodologies	Presentation in class, guided instruction, student interaction.	
Learning Activities	Assignments and discussion of these, collection practices and data analysis.	

2.- Several functions Variables	3 hours

Specific Objective:	The student identifies the functions of several variables mathematical and geometric representation. He also calculated the domain and range of functions of several variables.
Readings and other resources	Books, Articles.
Teaching Methodologies	Presentation in class, guided instruction, student interaction.
Learning Activities	Assignments and discussion of these, collection practices and data analysis.

3. Dimensions and Graphing of functions of several variables	**2 hours**
Specific Objective:	The student will graph functions of several variables in space. Identify functions, graphs and lines in different planes for quadratic functions
Readings and other resources	Books, Articles.
Teaching Methodologies	Presentation in class, guided instruction, student interaction.
Learning Activities	Assignments and discussion of these, collection practices and data analysis.

4. Limits and Continuity	**2 hours**
Specific Objective:	Students will learn and apply the concept of limit on three-dimensional surfaces, as well as techniques that exist in the solution of some indeterminate boundaries.
Readings and other resources	Books, Articles.
Teaching Methodologies	Presentation in class, guided instruction, student interaction.
Learning Activities	Assignments and discussion of these, collection practices and data analysis.

5. Partial Derivative	**12 hours**
Specific Objective:	The student will know, interpret, calculate and apply the derivative as a special limit, its existence, the rules of collection, both explicit and implicit, calculate the derivative of functions of functions, implicit functions, inverse functions and Jacobian.
5.1 Geometric interpretation of the partial derivative 5.2 Derivative partial functions of several variables. 5.3 Total Derivative. 5.4 Approach between the total derivative and increment. 5.5 Derivatives and differential function of functions. 5.6 Implicit functions, inverse and Jacobian functions.	
Readings and other resources	Books, Articles.
Teaching Methodologies	Presentation in class, guided instruction, student interaction.
Learning Activities	Assignments and discussion of these, collection practices and data analysis.

6. Review of Analytic geometry in three dimensions	**8 hours**
Specific Objective:	The student will aply the concepts to find tangent and normal line and the directional and normal derivate.
6.1 The tangent line and normal plane to a surface 6.2 Normal line and tangent plane to a surface. 6.3 direccional derivative and (gradient).	
Readings and other resources	Books, Articles.
Teaching Methodologies	Presentation in class, guided instruction, student interaction.
Learning Activities	Assignments and discussion of these, collection practices and data analysis.

7. Partial Derivative of Higher Order	**5 hours**

Specific Objective:	The student will understand and calculate higher derivatives to order explicit and implicit funtions.
7.1 Derivative explicit higher order functions. 7.2 Derivatives of higher order implicit functions.	
Readings and other resources	Books, Articles.
Teaching Methodologies	Presentation in class, guided instruction, student interaction.
Learning Activities	Assignments and discussion of these, collection practices and data analysis.

8. Application of partial derivatives	**5 hours**
Specific Objective:	The student will apply partial derivatives to calculate maximum and minimum of a function of several variables, as well as practical applications and functions of several variables subject to restrictions using the multiplier langrage.
8.1 Maximum and minimum of functions of several variables. 8.2 Maximum and minimum functions of boundary conditions. 8.3 Maximum and minimum problems.	
Readings and other resources	Books, Articles.
Teaching Methodologies	Presentation in class, guided instruction, student interaction.
Learning Activities	Assignments and discussion of these, collection practices and data analysis.

9. Integral defined a function of a single variable	**10 hours**
Specific Objective:	The student will understand, know and apply the definite integral of a variable to calculate flat areas and volumes of solids of revolution.
9.1Volume: The method of Disco. 9.2 Volume: The method of Layers. 9.3 Fluid pressure and a fluid force, moments, and centers of mass centroid. 9.4 Problems.	
Readings and other resources	Books, Articles.
Teaching Methodologies	Presentation in class, guided instruction, student interaction.
Learning Activities	Assignments and discussion of these, collection practices and data analysis.

10.- Double integral	**10 hours**
Specific Objective:	The student will understand, know and apply the double integral to calculate the area of a curved surface, a surface low volume, centroid and second moment of a flat area. It will evaluate double integrals in rectangular, polar and cylindrical coordinates.
10.1 Geometric interpretation of the double integral: Flat areas and volume under a surface. 10.2 Integral double iterated. 10.3 Evaluation of the double integral by the integral iterated in rectangular coordinates. 10.4 Volume under a surface. 10.5 Evaluation of the double integral in polar coordinates. 10.6 Volumes per double integral in cylindrical coordinates. 10.7 Area of a curved surface. 10.8 Centroid and second moment of a flat area.	
Readings and other resources	Books, Articles.
Teaching Methodologies	Presentation in class, guided instruction, student interaction.
Learning Activities	Assignments and discussion of these, collection practices and data analysis. Evaluate the double integrals.

11.- Integral Triple	**10 hours**

Specific Objective:	The student will understand, know and apply the triple integral to calculate the center of mass and moment of inertia of solids. The student will learn to evaluate triple integrals in rectangular, cylindrical and spherical coordinates.
11.1 Integral triple iterated. 11.2 Evaluation iterated triple integral by limits on: a) Rectangular coordinates. b) Cylindrical coordinates. c) Spherical coordinates. 11.3 Center mass and moments of inertia of solids.	
Readings and other resources	Books, Articles.
Teaching Methodologies	Presentation in class, guided instruction, student interaction.
Learning Activities	Assignments and discussion of these, collection practices and data analysis. Evaluate the triple integrals.

12.- Improper integrals	**5 hours**
Specific Objective:	The student will understand, know and calculate improper integrals.
Readings and other resources	Books, Articles.
Teaching Methodologies	Presentation in class, guided instruction, student interaction.
Learning Activities	Assignments and discussion of these, collection practices and data analysis. Evaluate the triple integrals.

E) TEACHING AND LEARNING METHODOLOGIES

1. Conventional exposure of each subject by the teacher.
2. Reading of scientific articles and outreach.
3. Development of research work by students.
4. Case-based Learning.
5. Practices of collection and data analysis.

F) EVALUATION CRITERIA:

Evaluation:	Schedule	Suggested Form of Evaluation and weighing	Topics
1st. Partial Evaluation	16 sessions	Exam 80%, Tasks 20%;	1,2,3
2nd Partial Evaluation	16 sessions	Exam 80%, Tasks 20%;	4, 5 y 6
3rd. Partial Evaluation	16 sessions	Exam 80%, Tasks 20%;	7, 8 y 9
4th Partial Evaluation	16 sessions	Exam 80%, Tasks 20%;	10, 11 y 12
Final Ordinary Evaluation		100% (Average of the Partial Evaluations)	
Other activities:			
Extraordinary Exam	Week 17 of the semester in course	Exam 100%	Topics 100%
Title Exam	According to the program of the School Secretary.	Exam 100%	Topics 100%
Regularization Exam	According to the	Exam 100%	Topics 100%

	schedule of the School Secretary		

G) BIBLIOGRAPHY AND ELECTRONIC RESOURCES

Main Books

1. Cálculo varias variables. Thomas/ Finney.Addison Wesley Longman . novena edición México 1999.
2. Cálculo. Stewart James. Thomson Learning. Cuarta edición México 2002.
3. Geometría Analítica . McGraw-Hill. Serie Schaum.
4. Calculo Larson/Hostetler/Edwards Volumen Quinta Edición México 1995.

Complementary Books

1. Cálculo con Geometría Analítica Edwin J. Purcell Dale Varberg VI Edición México 1993.
2. Cálculo con Geometría analítica Warl W.Smokowski Segunda Edición.
3. Cálculo Diferencial e Integral. Frank Agres Jv. Elliot Mendelson Mc Graw Hill.
4. Geometría AnalíticaLehman/ Limusa.

Internet Links