

Academic Year: (2019 / 2020)

Review date: 15-12-2019

Department assigned to the subject: Mathematics Department

Coordinating teacher: MOLERA MOLERA, JUAN MANUEL

Type: Basic Core ECTS Credits : 6.0

Year : 1 Semester : 1

Branch of knowledge: Engineering and Architecture

OBJECTIVES

By the end of this content area, students will be able to have:

1. Knowledge and understanding of the mathematical principles of Real Calculus in one variable underlying their branch of engineering.
2. The ability to apply their knowledge and understanding of Real Calculus to identify, formulate and solve mathematical problems using established methods.
3. The ability to select and use appropriate tools and methods of Real Calculus: limits, differentiation, integrals, sequences and series, to solve mathematical problems.
4. The ability to combine theory and practice to solve mathematical problems that require Real Calculus.
5. The ability to understand mathematical methods and procedures of Real Calculus, their area of application and their limitations.

DESCRIPTION OF CONTENTS: PROGRAMME

CHAPTER 1: Functions and Limits

- Real Numbers
- Functions
- Limits
- Continuity
- Limits and Infinity

CHAPTER 2: Differentiation

- The derivative and the tangent line
- Basic differentiation rules
- The chain rule
- Implicit differentiation
- Rates of change

CHAPTER 3: Rolle-s and mean-value theorems

- Extrema
- Rolle-s and mean-value theorems
- Consequences of Rolle-s theorem
- L'Hôpital-s rule
- Taylor Polynomial

CHAPTER 4: Applications of differentiation

- Curve sketching
- Optimization problems
- Introduction to Differential Equations

CHAPTER 5: Indefinite Integrals

- Antiderivatives and indefinite integration
- Basic integration rules
- Special methods of integrations

CHAPTER 6: Definite Integrals

- Area
- Riemann sums and definite integrals
- The Fundamental Theorem of Calculus

- Improper integrals

CHAPTER 7: Logarithmic, exponential and other transcendental functions

- The natural logarithmic function
- Inverse functions
- Exponential functions
- Inverse trigonometric functions
- Hyperbolic functions

CHAPTER 8: Applications of Integration

- Area between two curves
- Volumes of solids of revolution
- Arc length and surfaces of revolution
- Applications to Physics

CHAPTER 9: Sequences and series

- Sequences
- Series and convergence
- Convergence tests

CHAPTER 10: Power and Taylor series

- Power series
- Representation of functions by power series
- Taylor and Maclaurin series
- Application of power series to differential equations

LEARNING ACTIVITIES AND METHODOLOGY

The methodology will be the usual one for classes in the classroom, writing on the blackboard, with the occasional help of some resources on-line to illustrate some graphic or computational aspects of the course. Also, the classroom notes will be uploaded in Aula Global at the end of each chapter, along with the problem sheets that will be solved and discussed in the small groups.

ASSESSMENT SYSTEM

The final grade will be assigned through the students' performance in two kinds of tests: two in-class tests, with a weight of 40% in the final grade, together with a final exam, amounting to 60% of the final grade. Failing to attend any of the in-class tests implies obtaining 0 points in that test. The weights above, as well as the points obtained in the in-class tests, will be kept for those students who have to take the extraordinary exam.

% end-of-term-examination:	60
% of continuous assessment (assignments, laboratory, practicals...):	40

BASIC BIBLIOGRAPHY

- M. D. Weir, H. Haas and G. B. Thomas Thomas' Calculus, John Wiley and Sons, 2010, 12th edition
- R. Larson, B.H. Edwards Calculus, Brooks-Cole Cengage Learning, 2010, 10th edition
- S.L. Salas, G.J. Etgen & E. Hille Calculus: One and Several Variables, Wiley, 2007, 10th edition

ADDITIONAL BIBLIOGRAPHY

- J. Stewart Calculus, Brooks/Cole Cengage, 2010, 7th edition
- M. Spivak Calculus, Publish or Perish, 1994, 3rd edition
- T. M. Apostol Mathematical Analysis, Pearson, 1974, 2nd edition
- T.M. Apostol Calculus vol. 1, Wiley, 1991