SMA 2101 Calculus I (45 Contact Hours)

Pre-Requisites:

None

Purpose:

The aim of this unit is to provide learners with an introduction to limits and continuity of functions, the main ideas of differential calculus as well as an introduction to integral calculus, so as to provide the required background for the study of further course units in mathematics.

Learning Outcomes:

Upon successful completion of this course unit, learners should be able to:

1. Calculate limits of functions using properties of limits.
2. Investigate continuity and differentiability of functions.
3. Determine derivatives of powers, sums, products, and quotients, trigonometric, logarithmic and exponential functions of a single variable.
4. Apply differentiation techniques in evaluating limits using L'Hospitals rule.
5. Calculate the average and instantaneous rates of change.
6. Apply differentiation in solving maximum and minimum problems and related rate problems
7. Determine linear approximations to functions using differentials.
8. Apply anti-derivatives to areas, volumes, economic and financial models.

Course Description:

Limits: rational and simple trigonometric functions. Continuity and differentiability by graphical illustration. Differentiation by first principles and by rule for x^n (integral and fractional n), sums, products, quotients, chain rule, trigonometric, logarithmic and exponential functions of a single variable. Parametric differentiation. Applications such as equations of tangent and normal, kinematics, rates of change, stationary points and economics and financial models. Integration: anti-derivatives and their applications such as areas, volumes, and economic and financial models.

Teaching and Learning Methodology:

Lectures, tutorials, class discussions, online.

Instructional Materials/Equipment:

Whiteboards/smart boards, whiteboard markers, duster, computers and projector, and hand-outs.

Course Assessment Procedures:

Continuous Assessment Tests (25%); Assignments (5%); End-of-Semester Examination (70%).

Course Textbooks:

1. Thomas G. B. (2002), *Calculus and Analytic Geometry*, 9th ed., Addison Wesley, ISBN-13: 9780321193636.

2. William L.B., & Lyle C., Bernard G., (2018), *Calculus Early Transcedentals Single Variable*, 3rd., Pearson, ISBN-13: 978-0134766850.

3. Anton H. (2012), *Calculus*, 10th ed., Wiley, ISBN: 9780470647721.

Reference Textbooks:

1. Croft A. & Davison R. (2000), *Mathematics for Engineers: A Modern Interactive Approach*, 2nd ed., Prentice Hall, ISBN 13: 9780130333483.

2. Philip J. D. & Philip R. (2007), *Methods of Numerical Integration*, 2nd ed., Dover Publications, ASIN: B00M3ULWYS.

3. Stroud K. A. (2001), *Engineering Mathematics*, 5th ed., Industrial Press, ISBN-13: 9780831131524.

Course Journals:

1. International Journal of Mathematical Education in Science and Technology, ISSN: 0020-739X (print); ISSN: 1464-5211 (online).

2. Applied Mathematics, ISSN: 2152-7393.

3. SIAM Journal on Applied Mathematics, ISSN: 1095-712X; ISSN: 0036-1399.

Reference Journals:

1. Journal of Mathematics Research, ISSN: 1916-9795; e-ISSN: 1916-9809.

2. Journal of Computational and Applied Mathematics, ISSN: 0377-0427.

3. Pure and Applied Mathematics Journal, ISSN: 2326-9790 (print); ISSN: 2326-9812 (online).