Program	B.Sc. (Hons) Agriculture (Major: Soil Science)	Course Code	SS-402	Credit Hours	3(3-0)
Course Title	**APPLIED MATHEMATICS FOR SOIL SCIENCE**				

Course Introduction

This course enables students to learn the application of mathematics in soil science by numerically handling various assignments and calculations of significant importance.

Learning Outcomes

Upon completion of the course, students will:

1. Understand and apply exponential notation and logarithms in soil science contexts.
2. Perform calculations involving significant figures in various operations.
3. Convert units and measure concentrations accurately.
4. Determine oxidation states or numbers in soil chemical reactions.
5. Apply kinetics principles, including Michaelis-Menten kinetics, to soil processes.
6. Use isotope data for radioactive and stable isotope calculations.
7. Conduct microbial calculations for growth, yield coefficients, and mortality rates.
8. Calculate mineralization and immobilization rates in soils.
9. Convert and calculate fertilizer applications.
10. Utilize the universal soil loss equation to predict soil loss.
11. Perform waste management calculations, including C/N ratio, BOD, and bioremediation.
12. Design sampling schemes and estimate the number of samples required.
13. Calculate infiltration and runoff using ion sorption and decay models.
14. Develop mathematical models for pollutants.
15. Present data graphically, including one, two, and three-variable presentations.

Course Content (Theory)

Week	Unit	Topics	Assignments/Readings

1	Unit 1	Exponential notation	Review on exponential functions from recommended textbooks.
2	Unit 2	Logarithms	Assignment on solving logarithmic equations.
3	Unit 3	Significant Figures: Counting, multiplication, addition, subtraction	Exercises on significant figures in different operations.
4	Unit 4	Measures of Concentration: Unit conversion	Conversion exercises and practice problems.
5	Unit 5	Oxidation state or number	Case studies on oxidation-reduction reactions in soil.
6	Unit 6	Kinetics: Km value (Michaelis-Menten Kinetics): First order, Second order	Problems on reaction kinetics in soil systems.
7		Isotopes: Radioactive and Stable	Assignment on isotope usage in soil science.
8	Unit 7	Microbial Calculations: Ideal bacterial growth, maximum growth rate, yield coefficients, mortality rates, serial dilution, selection plating, most probable number, direct count calculation	
9		Practical exercises on microbial growth calculations	
10	Unit 8	Mineralization and immobilization rate	Review of nutrient cycling processes.
11		Fertilizer conversions: calculating fertilizer applications	Problems on fertilizer calculations for different crops.
12	Unit 9	Components of universal soil loss equation: Predicting soil loss, erodibility index	Exercises on soil loss prediction using USLE.
13	Unit 10	Waste management: C/N ratio and composting, biochemical oxygen demand (BOD), bioremediation,	

		calculating waste loading, rates for gasoline spills	
14		Case studies on waste management in agriculture	
15	Unit 11	Sampling Schemes: compositing samples, estimating the number of samples to take	Practical problems on sampling design and estimation.
16	Unit 12	Calculation of infiltration and runoff: ion sorption and decay models	Final review and summary report on infiltration and runoff calculations.

Textbooks and Reading Material

16. Jury, W.A. and R. Horton. 2004. *Soil Physics*. 6th Ed. Academic Press. John Wiley and Sons, Inc., Hoboken, NJ, USA.
17. Kreysig, E. 2000. *Advanced Engineering Mathematics*. 8th Ed. John Wiley and Sons, NY, USA.
18. Scott, H.D. 1998. *Applied Mathematical Methods in Life Sciences*. Univ. Arkansas Press, Fatteville, AR, USA.
19. Coyne, M.S. and J.A. Thompson. 2006. *Math for Soil Scientists*. Clifton Park, N.Y: Thomson/Delmar Learning.