**Basic Math for Ph.D students in Conservation and Sustainability Studies at ATREE**

**Instructor:** Veena Srinivasan (veena.srinivasan@atree.org)

**Goal:** To provide a review of the fundamentals of Mathematics needed to understand quantitative methods in environmental, social and ecological sciences.

**Credit:** 1 (16 hours)

**Class schedule:** Thursday and Friday (11.00 to 11.50 AM)

**Grading Type:** Pass/not pass

**Required for whom:** After the first class, students who feel comfortable with the course material may take a Math Skill Assessment test on Monday, August 19th from 2-3:30 pm.

Students who fare well (>75%) are exempt from the class.

**Pre-Requisite:** 10th Standard Math.

**Approach:** Math is best learned through doing problems. So we will learn the basic concepts and skills by doing problems on each session. Please do read the relevant material and attempt the associated problem set <u>prior</u> to each class. We will then go over the concepts and work on the problems together during class.

**Textbooks/Source materials:** I have also set up a Google Drive folder – relevant course material will be uploaded there.

**Other resources:**

1. Karen Morrison, 2002. IGCSE Mathematics.  Cambridge University Press. Pp.308 (Several copies in ATREE library)

2. John Allen Paulos, 1988. Innumeracy: Mathematical Illiteracy and Its Consequences

3. http://www.khanacademy.org, http://www.mathisfun.org

**Syllabus:**

| Week | Subject | Learning Goal |
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| Friday, August 16 | Introduction to Numeracy | Course Syllabus<br>Learning Goals<br>Unit conversion<br>Precision |
| Monday, August 19 (2:00-3:30 pm) | | Math Skill Assessment Test (to drop course) |
| Thursday, August 22 | | Powers, exponents, logs, radicals<br>Applications. |
| Friday, August 23 | Sets | Set Operations: Union, Intersection, Venn diagrams |
| Thursday, August 29 | | Permutation, Combination. Introduction to |

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| (20 min Quiz) | | probability. |
| Friday, August 30 | Geometry | Basics (parallel, perpendicular lines), Polygons, Perimeter, Area and Volume Calculations |
| Thursday, September 05 | Basic Algebra | How to create an equation, Solve 1, 2 variable equations. Graphical and algebraic solutions. |
| Friday, September 06 | | Quadratic equations, Numerical solutions to higher order equations. |
| Thursday, September 12 (20 min Quiz) | Trigonometry | Right triangle trigonometry, trigonometric identities, inverse trigonometric Functions, simple equations. |
| Friday, September 13 | Pre-Calculus | What is a function? Interpret, plot, compare graphs |
| Thursday, September 19 | | Roots, Asymptotes, Inverse, Shifting and stretching axes |
| Friday, September 20 | | Composite Functions, Domain and Range, Periodic Functions |
| Thursday, September 26 (20 min quiz) | | Maxima, Minima, Rate of Change (Graphical only) |
| Friday, September 27 | Calculus | Limits, Derivatives. Maxima and minima using calculus |
| Thursday, October 03 | | Applications of derivatives |
| Friday, October 04 | | HOLIDAY |
| Thursday, October 10 | | Integration – intuition, summation, graphical understanding. Integration of simple polynomial functions. |
| Friday, October 11 (20 min quiz) | | Applications of Integration |

**Evaluation:**

There will be four quizzes. Each quiz is 20% of the grade. The remaining 20% of the grade is class participation. Since this class is about "learning by doing" and the problem sets are to be attempted prior to each class the problem sets will not be graded. Instead the 20% will be reserved for making an honest attempt to solve the problems.

**Office hours:** For students who are feeling overwhelmed, I will set aside an hour immediately after the Thursday Math class to address your doubts separately.