COTTON COLLEGE STATE UNIVERSITY

PANBAZAR, GUWAHATI-781001, ASSAM, INDIA

Course Number: SHS101CMP
Course Name: Natural Science for Social Sciences & Humanities- I
Course duration: 16 contact hours (1 credit)
Target Audience- Post Graduate Students of CCSU

Course Goals: This course aims at exposing students of humanities and social sciences to the art of *"observing, reasoning, concluding & testing/applying"* -- a methodology that is at the heart of any scientific process, and to inculcate in them that "*seeing (alone) must not lead to believing!*

The curriculum has been designed for students of humanities and social sciences who have very little exposure to the natural sciences through formal curricula. Emphasis will be on classroom demonstrations through table-top experiments, video demonstrations as well as computer simulations and lectures rather than detailed analytical derivations. Conclusions will be attempted through brainstorming sessions at the end of these demonstrations using common sense arguments rather than through rote learning.

The aim of the course is to rouse interests of students in the world around them and to help them uncover its beauties -- visible as well as those that are apparently hidden.

Mathematics being the language of science, it is important to know how to use it. This course should not require one to have familiarity with mathematics beyond what is taught in high school. However during the course, the student may expect to learn to use mathematics in ways that are new to them.

The course will be taught at a basic level drawing on everyday experiences covering most, but not necessarily all of the topics listed here, depending on the progress and feedback of the students.

Course Outline:

1. **Fun with Physics:** Demonstration of basic physical principles using examples encountered in our everyday lives: (5 lectures)
   - ✓ Principles governing motion; interesting properties of matter, fascinating properties of light, sound, heat, electricity and magnets.
   - ✓ Energy and Forces in Nature: Gravitational, Electromagnetic, Nuclear
   - ✓ Physics of sports, optical illusions

2. **The beautiful world of Mathematics:**   (5 lectures)
   - ✓ Occurrence of numbers and patterns in nature, in works of art, architecture, music: the Golden ratio
   - ✓ Infinity: Zeno's paradoxes; comparing infinities; Simple measurements using geometry.Simple geometric models for mathematical formulas: Pascal's triangle, finding the value of π (pi); derivation of the formula: $(a + b)^2 = a^2 + 2ab + b^2$
   - ✓ Mathematics through games: Konigsberg bridge, Tower of Hanoi, deriving the value of π (pi) from a game of darts; Mental mathematics: calculations without calculators.

3. **Colourful world of Chemistry:** (4 lectures)
   - ✓ Structure of the atom: analogy with the postal addressing system; Bonds; Preliminary introduction to molecular levels: basis of colours we see all around us – colour changes with seasons.
   - ✓ Chemistry all around us: in the kitchen, medicines, various compounds etc.

4. **Representation of data:** (2 lectures)
   - ✓ Graphs and their interpretations: usefulness in easy extraction of information from data.
   - ✓ Very basic statistical concepts: mean, median and mode; correlations from scatter plots.

Resource persons for 2015: Abhijit Barthakur and Wasim Raja, Cotton