



Global Initiatives of Academic Networks (GIAN)



**Course Title: Light scattering by different types of particles,
with applications in Physics**

By: Prof. Robert Botet
Université Paris-Sud, Orsay, France



Dates: April 05-13, 2016
Venue: Department of Physics, Assam University, Silchar

Overview

Prof. Robert Botet works on light scattering theories and its application in Astrophysics, especially in the area of interstellar medium. Prof. Botet will primarily take lectures on Physics associated with light scattering by various particles (including interstellar dust which are astrophysical in nature). So he will cover topics related to Astrophysics, though any student studying Electromagnetic Theory can take benefit out of it.

All the lectures delivered by him on light scattering (by dust particles) will have direct applications in industry, meteorology, solid state physics and other related areas. Students working in different areas of Physics and interdisciplinary areas from other institutes / universities will be equally benefitted by this set of lectures.

With his six lectures and three tutorials during one week, he will cover one credit in nine hours.

who can attend ...	• Executives, engineers and researchers working on light scattering, atmospheric dust, light pollution, industrial dust, astronomical dust, interplanetary medium, interstellar medium in Astrophysics can attend. • Students at all levels (B Tech/M Sc/M Tech/Ph D) or Faculties from reputed academic institutions and technical institutions.
Fees	The participation fees for taking the course is as follows: Participants from abroad : US \$500 Industry/ Research Organizations: 20000 Academic Institutions: ` 500 The above fees include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility. The participants will be provided with accommodation on payment basis.

Accommodation and T.A.	Accommodation and T.A. may be provided to limited number of participants, depending upon the availability of funds. Prospective participants who require accommodation and/or T.A. may apply with proper justification.
How to Apply	Registration form duly filled-in and forwarded by the Head of the Department/Supervisor should be sent to gian.ausphy@gmail.com before March 25, 2016 .
No. of Participants	Total number of participants to this course is fifty. The confirmation to the selected candidates will be intimated by March 31, 2016.

About the Faculty



Professor Robert Botet is a Research Director, of CNRS funded Laboratoire de Physique des Solides – bat.510 – CNRS/UMR8502 in Université Paris-Sud, Orsay, 91405, France. He has worked in the problems related to formation of dust particles and grains and applied this knowledge in different branches of Physics, including Astrophysics. He has worked on the simulations of particles with different structures, compositions and sizes. He had studied their light scattering properties, which have immense applications in the areas of interstellar medium, comets and asteroids.

He has executed many CNRS funded projects. He has also worked in many international projects including those with Japan, India, USA, Greece etc. He has more than 150 publications and 2 books to his credit.

Details about the Course

The theory of light scattering by particles (with size of the order of the wavelength) has many applications in Physics and other areas of Science.

The problem can be visualized in two parts. Finding an analytical solution for the intensity of scattered light by particles of different sizes, shapes, textures and compositions. And understanding how particles form in nature with different sizes, shapes, textures, composition etc.

Till today we have exact analytical solutions available only for particles which are solid / compact spheres. But naturally occurring particles have irregular shapes, sizes and structures. To study the light scattered by such irregular particles, some semi-exact solutions are available and some are being developed. The lecture series will focus on all such light scattering theories and codes to simulate the scattered intensity.

As mentioned, naturally occurring particles assume different sizes, shapes and textures (including porosity). These properties are decided by the processes through which the particles are formed and how they evolved in nature. The proposed lecture series will also discuss on some of the formations processes, their physics and the algorithms which may be used to simulate them for carrying out light scattering calculations.

This knowledge can be used to understand light scattering processes and particle formations in nature. Such studies will have implications, in understanding various processes, which include light pollution by atmospheric dust (a large amount of which are thrown by industries) and other processes taking place in our atmosphere, planetary atmosphere and in areas of Astrophysics including those happening in comets and interstellar medium.

Objectives

The primary objectives of the course are to understand:

- 1) how light is scattered by different types of particles**
- 2) how different types of particles are formed in nature**
- 3) how to run different simulation codes to generate light intensity and particles**
- 4) how to apply this knowledge in different branches of science and Astrophysics in particular**

Technical Details

Module A: Electromagnetic theory, light scattering

- o April 05 Tuesday - Inauguration 14:30-15:00 Lecture 1 : 15:30 to 16:30 hrs

Maxwell's Equations - light scattering – Rayleigh scattering – light scattering by regular solid spheres - Mie theory

- o April 06 Wednesday - Lecture 2 : 14:30 to 15:30 hrs

Light scattering by non-spherical particles : spheroids, cylinders etc. (Rayleigh-Gans theory)

- o Tutorial 1. 16:00 to 17:00 hours

Problem solving session with examples: with application in laboratory physics

- o April 07 Thursday - Lecture 3 : 14:30 to 15:30 hours

Light scattering by irregular shaped and porous particles. T-matrix theory

- o April 08 Friday - Lecture 4: 14:30 AM to 15:30 hours

Other light-scattering theories (DDA and effective-medium)

- o Tutorial 2 16:00 to 17.00 hours

Problem solving session with examples: with application is atmospheric physics

Module B: Physical processes producing different types of aggregates and their applications

- o April 11 Monday - Lecture 5 : 14:30 to 15:30 hours

Generation of aggregate particles using different types of algorithms

- o April 12 Tuesday - Lecture 6: 14:30 to 15:30 hours

Physics of BPCA, BCCA, DLCA, RLCA aggregates. Simulation codes and numerical generation

- o Tutorial 3. 16:00 to 17:00 hours

Problem solving session with examples:..... with application in Astrophysics

- o April 13 Wednesday : Examination for students (14:30-16:30)

Course Coordinator + PIs

Professor Asoke K Sen (PI), and **Drs. Pardeep Shukla, Utpal Sarkar and H S Das**

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Light Scattering by Different Types of Particles, with Applications in Physics

[Under the aegis of MHRD- Global Initiative of Academic Network (GIAN)]

(April 5-13, 2016)

Registration Form

Title (Mr./Ms./Mrs./Dr./Prof.):

Full Name:

Designation:

(For students, name of the course and the year are to be mentioned clearly)

Name of the Institution:

Address for Correspondence:

E-mail:

Phone:

Accommodation Required: YES/NO

Exemption from Registration Fee Required YES/NO

(If yes, give reason within 50 words on a separate sheet)

Reason for Participation:

(Within 150 words on a separate sheet)

Place:

(Signature of the Applicant)

Date:

Forwarded by HOD/Supervisor

Note: Duly filled-up signed and scanned registration form should be sent to the e-mail id: gian.ausphy@gmail.com before March 25, 2016.