

Preface

You just opened the first volume of the sequence of two books: *Lectures on General Physics I* and *Lectures on General Physics II*, the calculus based version of *Lectures on Introductory Physics I* and *Lectures on Introductory Physics I*, respectively.

With these books I intend to implement my dream, which I first had in 1966 when I was a student of the St. Petersburg State University, St. Petersburg, Russia, and later as a professor in Russia. It was impossible to achieve it there because of the lack of available publishing facilities.

The idea is to equip students with a supplemental tool to record their notes during the lectures. Such a supplemental workbook provides students with a great amount of material discussed in class and prevents students from the necessity of copying from the chalkboard or from the screen. It eliminates numerous misprints, which students could make while rushing to make all the notes and trying to understand and comprehend the teacher's words. The material printed in the hard copy of this supplement duplicates exactly the screen copy, which is arranged pedagogically and presented by the professor in class during the lecture in a PowerPoint format.

The students are expected to concentrate on the professor's words and just make notes in the margins of their hard copy of the book.

Lectures on General Physics I is such a workbook and it was created based on my handouts, which I have examined in my General Physics classes for the last several years at the College of Charleston, Charleston, SC, where I have taught since 1993. The teaching-learning effectiveness has been increased, and positive feedback has been received from students and faculty of the College of Charleston and some other Universities.

Lectures on General Physics I promotes my vision of the teaching and learning process by means of both the contents and the way the materials are presented.

The goal is to increase the teaching-learning effectiveness. The publication includes:

- **Original photographs, drawings, diagrams.**

Living in an Era of Information forces all of us to pay attention to theories of acquiring information –theories of learning methods and their classification. One should be open-minded when making conclusions on the choice of the learning methods.

Some audio learners reject aids designed for the visual learners, ignoring the fact that the majority of information they receive and absorb is visual regardless of their preferred style of learning.

The entire method of presenting information to students is based on the theory of Multidimensional Interaction in Physics Classroom Activity (*) (**) (***) .

During your reading of the *Lectures on General Physics I* after attending the lecture, the photographs are supposed to remind you of the teacher's presentation in class. Your feeling of participation in the process is expected to help you comprehend the material. In most of the cases the material discussed verbally will be presented in the format of diagrams, which will then be transferred into equations. It seems easier to remember the origin of the equations when it is presented in the format of diagrams and sketches.

- **Derivations.**

I truly believe that, if you read these words, then you still have my book in your hands, and then you are not questioning the importance of derivations in education. Those who would consider derivations not as a sequence of logical considerations, but only as manipulation with the rules of algebra and /or calculus, wouldn't read this far.

Derivations presented in this volume are more explicit than those given in most textbooks. The professor could use them in class in a variety of ways. The purpose of this material is to give the Professor the opportunity to explain each step of the derivations while saving time usually spent on writing, explaining what and why s/he is doing and waiting until students finish recording both the professors' words and what s/he wrote on the chalkboard.

*) Mikhail Agrest. Multi-Dimensional Interaction in Physics Classroom Activity. AAPT Announcer. /Winter 2002/ Vol. 32, #4. P. 96. 126th AAPT National Meeting. Winter 2003 Austin, TX . January 11-15, 2003

**) M.Agrest Multi-Sensory Interaction in Physics Classroom Activity. Southern Atlantic Coast Section of the American Association of Physics Teachers Spring 2002 Meeting. Gainesville College, Gainesville, GA. April 5,6, 2002

***) M.Agrest Multi-Sensory Interaction in Math and Natural Sciences Classroom Activity. Second Annual Charleston Connections Conference Innovations in Higher Education. The Citadel. Charleston, SC May 31, 2002

- **Selected Problems** are presented at the end of the book.

The provided problems give students a chance to apply their knowledge of the principles they learned. Students are expected to transfer the described situation or a process into the Language of Physics with the following translation into the Language of Mathematics. The mathematical solution then has to be analyzed and translated back into Language of Physics with the following translation into English.

Lectures on General Physics I is designed for the Calculus based Physics Course. Here Language of Mathematics mostly means algebraic equations and inequalities.

Students are expected to solve all the problems provided in this volume.

Professors who would teach this course could require students to solve more problems.

- **Solutions** for the provided problems are presented at the end of the book.

It is important to understand the concept of the situation and/or the process and translate it into the Language of Mathematics. It is important to understand that “study the solution” goes beyond understanding what was done and why it was done in this particular problem. To “study the solutions” means to learn what, why and how to act in situations similar to, but not exactly same as those described in the given problem.

Remembering the last formula in the solution if the given problem is not a way to learn at all.

The bottom line is not always “The Bottom Line”. It is the top line, which is often should be considered as “The Bottom Line”.

Providing my original solutions, I explain how concepts should be used to solve problems.

- **Visual aids: Transparencies / PowerPoint Presentation on CD/**

(Also see note to *Original photographs, drawings, diagrams.*)

Based on my experience of teaching students with a diversity of backgrounds, educational goals and objectives (and the College of Charleston is a bright example of such a pool of students), I designed a number of examples, which relate concepts of Physics to a variety of concepts in other areas of knowledge and/or human activity. This helps me approach and reach students in my classes.

The set of visual aids I designed to promote my method of understanding and relating concepts should be used by the teacher who would chose to try my method and advise students to buy the workbook.

Even though this workbook will not be able to replace the textbook, it could not be substituted by the textbook either.

Using *Lectures on Physics* will

- help the professor to cover more material in less time in class, which isn't the major goal, but it will give more time for solving problems, interactive communication with students, answering questions, etc.
- reduce the amount of mechanical writing and free the student's brain for thinking in class.

Availability of *Lectures on Physics* for students at home will give them the opportunity to prepare for class and to know what to expect in class by reading a smaller volume rather than a next chapter of the textbook (every professor's dream).

Many of these materials were used in presentations at the SACS-AAPT, National AAPT Conferences and Charleston Connection Conferences and others.

My colleagues gave me a positive feedback.

Being published, *Lectures on Physics* will start its own life.

I realize the responsibility in upgrading and updating the materials to keep the connection.

This volume is the first in my sequence of *Lectures on General Physics* issues.

I hope that you will like it and afterwards you would use my *Lectures on General Physics II*.

My *Lectures on Introductory Physics I* and *II* (both Algebra based) are also available.

Mikhail Agrest

PS. Important message to students:

Some people are visual learners; some are audio learners...

The success of the learning process strongly depends on how much one can employ all senses: sense of sight¹, sense of hearing², sense of touch³, sense of smell⁴, sense of taste⁴, and of course, the *sixth* sense - sense of humor⁴.

¹ You will see the material in class and in the *Lectures on Physics* again.

² You will hear from the lecturer the material in class and you should read loud the *Lectures on Physics* so you could hear it again.

³ You will skip tremendous amount of writing in class and you should write some of the material of the *Lectures on General Physics* so you could employ sense of touch to help you learn.

⁴ You will use your sense of smell, sense of taste, and of course, the sixth sense - sense of Humor in class, but you should never forget to employ them when you use *Lectures on Physics*.