



## Algorithmic Thinking and Problem Solving

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### WORKSHOP REPORT

Prasanthi Nilayam Campus

Department of **Physics**

#### Introduction

Computers are used for solving numerous problems, to obtain optimal solutions (wherever possible/practical/feasible), in various domains such as Engineering, Sciences, Healthcare, Transportation, Urban Planning, Banking and Finance, Retail/Commerce, etc. In the increasingly technology driven world, it is essential for students in Science, Engineering, and Management to have the capabilities of critical thinking, problem analysis, and problem solving to develop algorithmic solutions to numerous real-world and societal problems.

At this workshop, we present a systematic way of analyzing the problems and applying appropriate technique chosen among several classic algorithm design techniques in order to develop solutions to numerous problems that arise in many different domains. On many occasions, the solution to a problem in one domain may be used for the solutions to a seemingly different problem in another domain. It also presents several problems for which 'optimal' solutions are beyond reach of even the most powerful computers and 'good-enough' solutions are sought.

#### Workshop objectives

The overall objectives of the workshop are to teach methods and techniques of: (a) analyzing the problem; (b) modeling the problem; (c) evaluating and choosing the appropriate algorithm design technique suited to the problem solution; (d) developing and analyzing the solution; (e) presenting the solution.

#### Workshop activities

This workshop is hands-on and the participants will be actively engaged in applying algorithmic techniques to the solutions of several interesting and practical problems. The problems will be drawn from many different domains, such as Engineering, Computing, Transportation, Manufacturing, Management, Social sciences, etc. Each of the problems is analyzed and the most appropriate algorithm design technique is chosen for its solution. Then, the solution is developed and analyzed for its correctness and complexity. The participants will work in groups and compete to develop the most efficient solution, and present their approaches to the solutions and results to the whole class. For some of the problems, specially designed wooden gadgets are used to get a better understanding of the problem and the complexity of its solution.



# PHYSICS

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The workshops have been presented to students and faculty in several colleges.

## Workshop outcomes

The workshop outcomes are: (a) good analytical, problem-solving, and critical thinking skills; (b) understanding of algorithm design techniques; (c) ability to apply algorithms for systematic solution development; (d) ability to evaluate the solutions for correctness and efficiency; (e) experience in working as part of a group; (f) fun.

## Workshop duration

It may be conducted as (i) 2-day workshop (8+8 hours), (ii) full-day workshop (8 hours), (iii) half-day workshop (4 hours), or (iv) lightning workshop (2 hours).

## Audience and prerequisites

Students of Engineering, Science, Management, Computer Science, and Information Technology. Also, anyone with some background in science and mathematics, a desire to learn, and an open mind can benefit from this workshop.

## SR Subramanya - Brief Bio

S.R. Subramanya received his Ph.D. in Computer Science from George Washington University, Washington, D.C. He has been the recipient of several awards including the Richard Merwin memorial award at George Washington University, the Grant-In-Aid of Research award from Sigma-Xi Scientific Society, and Professoriate award and Distinguished Scholarship award from National University.

Dr. Subramanya is currently a faculty member in the School of Engineering and Technology at National University in San Diego, California. He was formerly a faculty member at the University of Missouri-Rolla, teaching courses and conducting research in Multimedia Systems. He has also previously worked at ASEA AB in Sweden, NOKIA in Finland, and at LG Electronics in San Diego, California. He is the author/co-author of over 100 technical papers in refereed conferences and journals. He has served as a reviewer, program committee member, and session chair of several International Conferences. He has also served as a reviewer for several journals, and research grant proposals. He has presented technical tutorials at numerous conferences. He is a senior member of the IEEE. His current research interests are in algorithm design, novel services for digital content, mobile applications, and Computer Science education.

