

Teaching and Learning Operations Research – Insights and experiences.

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As a student

- Learnt Operations Research, Network Models from faculty from different institutions
 - Anna University, IIT Madras, IIT Kanpur, Lehigh University
 - Fascinated by the assignment problem and its connections to Clustering
-
- Too much emphasis on solutions
 - Role of $C_j - Z_j$ or $Z_j - C_j$
 - Optimality of transportation and assignment algorithms
 - Understanding the simplex table
-
- Score well, interesting, unable to get a hold!

Starting to teach

- Clarity on maximization vs minimization – product mix problem
- Clarity on $C_j - Z_j$ through algebraic form of simplex
- Access to good books – Ravindran, Taha, Hillier
- Learning from Chvatal's book – Algebraic form, dual

- Understanding the importance of the “dual”

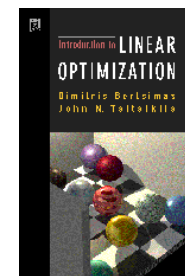
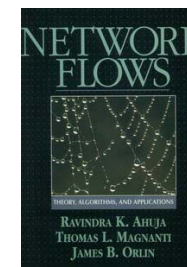
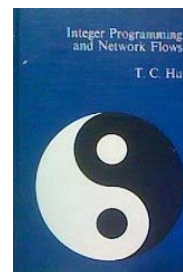
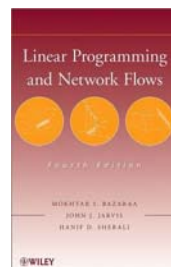
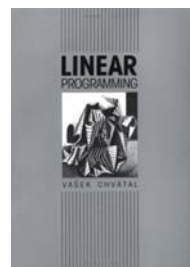
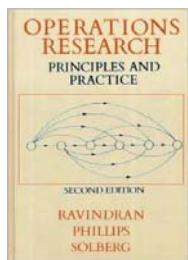
- Introducing an example in formulation where we can relate primal and dual – two person zero-sum game

- Optimality of transportation and assignment problems

- Dynamic Programming

Knowledge from O.R Books

- Linear Programming – Ravindran, Chvatal
- Linear Programming and Network Flows – Bazaara, Jarvis and Sherali
- Integer Programming and Network Flows - T C Hu
- Integer Programming - Garfinkel and Nemhauser
- Introduction to Linear Optimization – Bertsimas and Tsitsiklis
- Network Flows - Ahuja, Magnanti and Orlin
- Graph theory in Operations Research - Boffey



Other Interactions

- **IIT Kanpur** — Prof R K Ahuja
 - **Author copy** of their book sent by Prof J Orlin
- **Lehigh University** — Prof M P Groover, Prof S David Wu
 - **When to write a book?**, Graduate course on Network Models
- **Penn State** — Prof A Ravindran
 - Discussions on Operations Research
- **University of Texas at Austin** — Prof Uttarayan Bagchi
 - The **CTV research** and what not to do when you write a paper..
- **IIT Madras** – Prof K R Parthasarathy, Dr Ram Gopalan
 - **Karmarkar's algorithm, Benders' partitioning**

Theme based Question papers

- Golden jubilee of IITM
- World cup 2011
- Day in the life of a professor
- IPL / Sachin Tendulkar
- The Sharda scam
- Agatha Christie
- Sudoku
- Sri Sathya Sai Baba
- Hostel days
- Birthdays

There are O.R applications everywhere around you

Student names and familiar situations in questions

Book writing

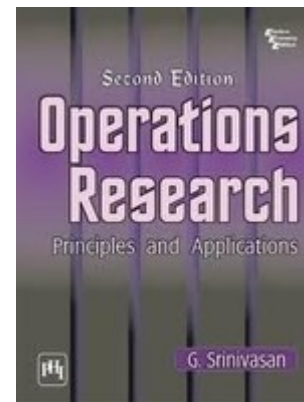
- Wrote a book just as I teach in class (2007)
- Added few topics, cases, solutions (2010)

- Introducing LP through product mix
- Algebraic form of simplex
- Motivation to dual, importance to dual
- Optimality of shortest path

Letter from Dr James G Shanahan, CA
Found a second hand version in Berkeley



2007



2010

Cover page
designed by
Abhishek

Old QPs came
In handy

Student names
In exercises

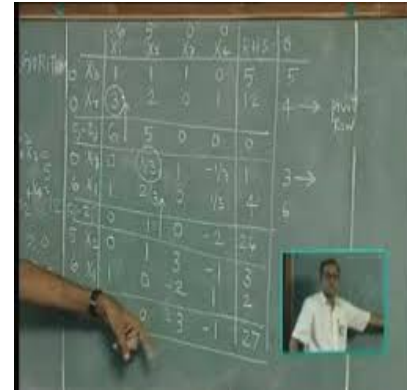
NPTEL videos

Fundamentals of O.R

Advanced O.R

Ops and SCM

Manuf Sys Mgt



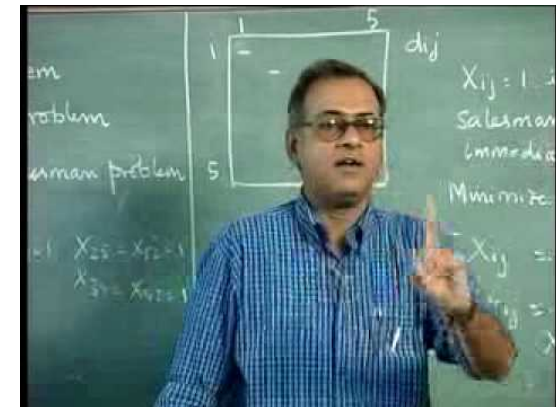
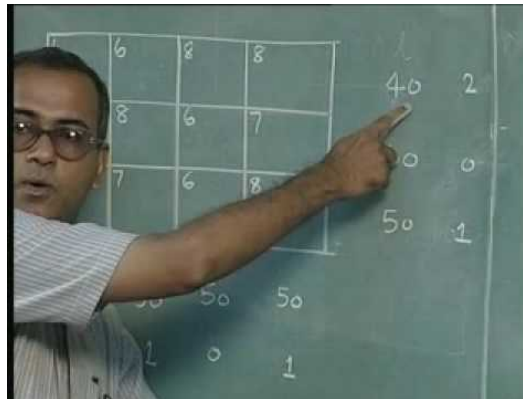
F.O.R

A.O.R

ETC, Ekalavya Channel and NPTEL



Prof.G.Srinivasan
Department of Management Studies



61 O.R lectures have a combined viewership of over **40 lakhs**

Some lectures in different languages, text transcriptions



Operations Research Applications – Linear and Integer Programming (Web)

COURSE OUTLINE

Linear Programming, Transportation problems, Assignment and Allocation problems, Location problems, Packing problems, Flow problems and distribution problems.

We discuss several important formulations and applications under each problem. Each of these are described in a module with additional applications and a case study. Each module is for 4 hours.

The second part discusses four application domains and areas such as **Workforce planning, Health, Education and Airlines**. Each has five applications and each module is for 2 hours.

Applications from research papers
Creating reasonable sized problems simplified from research papers that can be solved and presented

<http://nptel.ac.in/courses/110106059/>

[Introduction to Operations Research](#)

Prof. G. Srinivasan, Department of
Management Studies, IIT Madras

Course Duration: 5th Jan - 27th Feb 2015

Introduction to Operations Research

Exam dates: March 22nd / 29th 2015; 1 PM to 4 PM

Exam Registration URL:

<https://www.digialm.com/EForms/configuredHtml/885/1958/login.html>

Exam registration open till Feb 27th 2015 5 PM.

Certificate will have the test score, which is a combination of your assignment scores and exam score. **Only those who have already enrolled in this course will be able to register for the exam.**

1. Keep the content simple
2. Use PPTs for 20 min short videos
3. Use interactive methods
- Highlighting etc..



NPTEL

NPTEL Online Certification Course

1. LP formulation
2. Graphical and Algebraic
3. Simplex
4. Dual
5. Dual results
6. Transportation
7. Assignment problem
8. Solving using Excel

Each week has 2 hours content
Five videos of 20 minutes each
2 Assignments

Teaching O.R to MBA class

- Emphasis on formulation
 - Extensive use of solver
 - Simplex table?
 - Emphasis on dual
 - Tradeoff between problem solving and cases
-
- Case based
 - Red Brand canners, Auto assembly, Shipping wood to market (extended), project pickings, aiding allies, Staffing a call center, Sportstuff
 - General elections – bin packing
 - Indian victories (based on assigning art)

Great Indian Victories

Tests (at least 4)

1975-WI-Chennai
1984-Eng-Mumbai
2003 – Aus-Adelaide
2013- WI- Mumbai

India (at least one third)

1975-Test-Chennai
1984-Test-Mumbai
2013 –Test-Mumbai
2011- ODI- Mumbai
2014-ODI-Kolkata
2013-T20-Rajkot

Sachin (at least 3)

2013- WI- Mumbai test
2008-ODI-Brisbane
2003-ODI- Centurion

ODI (less than 50%)

1975-EA-Leeds
2003-Pak-Centurian
2006 – Pak-Lahore
2008- Aus- Brisbane
2011-SL-Mumbai
2013-Eng-Birmingham
2014-SL-Kolkata

White clothes (≥ 3)

All 4 tests +
1975- ODI-EA-Leeds

Bowlers (at least 2)

1984- Eng- Mumbai test
1975-ODI- EA- Leeds

T20 (at least 2)

2006-SA-Jo Berg
2007-Eng-Durban
2007 – Pak-Jo Berg
2011- WI- Trinidad
2013 – Aus-Rajkot

Before 2000 (at least 3)

1975-WI-Chennai test
1984-Eng-Mumbai test
1975 – EA- ODI

Pakistan (3 and 4) (1 in Pak)

2003-ODI-Centurian
2006-ODI- Lahore
2007 – T20- Jo Berg

Takeaways and Messages

(only for young faculty and scholars)

- Learn from others all the time but be unique
- Teach the basics well; have your special topics
- Allow students to “ask”. You can answer in the next class
- Read at least 5 books before you teach
- Teach at least for 5 years before you write a book
- Start writing down what you teach
- Try to find an application around you (convoy, minor allocation, workforce...)
- What have I done that will last longer than me?

Thank you

My teachers

My students

My research scholars

