IS421 - Enterprise Analytics for Decision Support
AY2016/17, Term 2
COURSE OUTLINE

Instructor: Professor LAU Hoong Chuin, Tel: 6828-0229, hclau@smu.edu.sg
Office Hours: by appointment, SIS Room 5030

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Class Time: Thursday 12noon -3:15pm
Class Venue: SOL Classroom B1.09

Course Description:

In the era of Big Data, IT systems contain a lot of data that provide management with good managerial insights about business operations and customers. How can such data and insights turn into actionable decisions? More precisely, how may existing policies, plans and schedules be constantly updated to accommodate new requests and events under severe time constraints? Such requirements are becoming increasingly common in the service industry (transport and logistics, health-care, hospitality, to name a few).

In this course, we discuss the inner working of such analytics engines embedded in enterprise systems that provide optimized managerial decision making and decision support. Students will acquire skills for thinking about, understanding, modeling and solving such decision problems. This course complements data analytics courses which are concerned with understanding data. Data + Decisions form a holistic picture for coping with planning and operational problems in business.

This is not a programming course, but a problem-solving course. And unlike a traditional course on Optimization and Algorithm Design, this course will offer a real-world problem-centric rather than algorithm-centric approach.

Prerequisites:

1. **IS102 (Computer as an Analysis Tool)**
2. **IS103 (Computational Thinking)**

Course Objectives:

Upon completion, the student will:

1. Master the process to think about resource management problems arising in enterprises (both government and industry), and frame these problems as optimization problems.
2. Formulate **mathematical models** for these optimization problems, building on what has been briefly covered in CAT (IS102).
3. Apply **computationally efficient methods** to design and implement solutions for such problems, building on what has been covered in Computational Thinking (IS103).
4. As an SMU-X course, use the learnt skills to solve a problem sponsored by a real company.

Course Material:

Main text: (available in SMU BookLink and Amazon)
[KL] Steven Kimbrough and Hoong Chuin Lau. *Business Analytics for Decision Making*, **CRC Press, 2016.** https://www.crcpress.com/Business-Analytics-for-Decision-Making/Kimbrough-Lau/9781482221763

Selected Chapters from Additional Texts (downloadable from SMU Springerlink):
(1) **[S]** Steven Skiena, *The Algorithm Design Manual* (2nd edition), Springer 2008
   - available for download through this SMU Springerlink (Chapters 5-7)
   - 1 copy of the book is in SMU Library Course Reserve QA76.9.A43 S55
   - website http://www.algorist.com/
(2) **[P]** M. Pinedo, *Planning and Scheduling in Manufacturing and Services* (2nd edition), Springer, 2009.
   - available for download through this SMU Springerlink) (Chapters 3,9,13)

Slides and handouts will be downloadable from eLearn.

Grading:

(1) Class Participation (15%)
(2) 2 Written Assignments (30%) - 15% each
(3) 1 Mid-Term Test (25%)
(4) 1 Team Programming Project (30%)
   – 10% technical achievements, 10% report, 5% presentation, 5% X factor

Class Schedule (subject to minor change, depending on class progress):

Wk	Date	Topic	Reference	Events
1	5 Jan	Course Introduction Constrained Optimization Models and Concepts	[KL] Chap 1	
2	12 Jan	Linear and Integer Programming Part 1 Tutorial and Lab on OPL	[KL] Chap 2	Introduction to projects
3	19 Jan	Linear and Integer Programming Part 1I Tutorial and Lab on OPL	[KL] Chap 3	Release Assignment 1
4	26 Jan	Knapsack Problems Post Solution Analysis	[KL] Chap 4	Finalize project team and topic+mentor
5	2 Feb	Assignment Problems Metaheuristics: Local Search and Evolutionary Algorithms	[KL] Chap 5, 11-12	Due: Assignment 1
6	9 Feb	Graph and Network Analytics	[S] Chap 5-6	
7	16 Feb	Project Proposal Discussion Mid-term Review		Return Assignment 1
8	23 Feb	Recess Break		
9	2 Mar	Mid-term Exam (open book)		
10	9 Mar	Transportation, Logistics, and Travel Planning	[KL] Chap 6,7 [S] Chap 7	Release Assignment 2
11	16 Mar	Resource-Constrained Scheduling and Timetabling	[KL] Chap 8 [P] Ch 3,9,13	Return Mid-Term
12	23 Mar	**Guest Lectures**	To be determined	Due: Assignment 2
13	30 Mar	No class (Project Consultation)		
14	6 Apr	Student Project Presentations		Due: Poster and System Return Assignment 2
15	13 Apr	No Final Exam		Due: Project Report

Note:
- All assignments, project slides and reports are to be uploaded to the course eLearn dropbox by their respective due dates.
- To facilitate grading, assignments are also to be submitted in hardcopy in class.
- Further details of submission will be given at a later day.

Academic Integrity

All acts of academic dishonesty (including, but not limited to, plagiarism, cheating, fabrication, facilitation of acts of academic dishonesty by others, unauthorized possession of exam questions, or tampering with the academic work of other students) are serious offences. All work (whether oral or written) submitted for purposes of assessment must be the student's own work. Penalties for violation of the policy range from zero marks for the component assessment to expulsion, depending on the nature of the offense. When in doubt, students should consult the instructors of the course.

Details on the SMU Code of Academic Integrity may be accessed at http://smuscd.org/wp-content/uploads/2014/12/code_of_academic_integrity.pdf