ISTANBUL TECHNICAL UNIVERSITY
Aviation Institute: M.Sc. Air Transport Management
Course: Advanced Information Systems and Business Analytics for Air Transportation
June 1-6, 2015

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YOUR INSTRUCTORS:

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COURSE DESCRIPTION
An airline's ultimate success in creating value depends on how efficiently and effectively it manages its data. This course provides the background on both current and future information systems and business analytics methods from airline management perspective. Specifically, by the end of the course students are expected to:

a) Understand the current strategic IT structure/mechanisms in Turkish Airlines and in modern airlines.
b) Understand the future trends in the IT side of the airline businesses.
c) Understand potential breakthrough technologies (both hardware and software side) that might be a game changer in the airline business
d) Develop a keen understanding of the business analytics and what it can do for them now and in the future (in light of advancing hardware and software technologies)
e) Demonstrate learnt understanding through projects/applied demos.

Website: http://aviation.itu.edu.tr/Icerik.aspx?sid=13177

COURSE MATERIAL

Cases will also be an important component of the course.

SkyJet: this is a comprehensive case that reinforces several important skills in Excel:

- Forecasting: Utilizing a year worth of demand data, students are required to build a forecasting model that captures different levels of seasonality while capturing other unique events in order to decide on protection levels.
- Simulations: Constructing simulation models in Excel is an important skill. This case covers several aspects that are commonly observed in the airline industry such as buy-up and buy-down thereby encompassing formation of normal and binomial distributions.
- Optimization: Developing optimizations model in airlines hub and spoke network, this case guides the students through the importance of Solver in Excel.

There is no main textbook. However some of the analytics lectures will use materials from the following textbooks:

- Saxena and Srinivasan, Business Analytics: A Practitioner's Guide, 2013, Springer
- Kantdarzic, Data Mining: Concepts, Models, Methods and Algorithms, 2011, Wiley

ACADEMIC ASSESSMENT

There will be a 3 hour exam within one month of completing the course. Final exam will form the balance of the student's final grade of 40 percent.

Case Study will account for 10 percent.

There will be a significant project that will also count towards the students' final grade 40 percent.

Class participation will form 10 percent of the final grade.[1]

Tentative Course Schedule:

There are two pillars in this course: IT in the airline industry and data analytics. These will be supported by a third pillar: application through a team project.

Airline IT will introduce students to the broad framework of information systems and how they are adopted by the airline industry with a focus on some key application areas. Trends in the industry will be reviewed along with guidelines for development of IS.

Analytics will cover the following elements:

- Descriptive analytics: data analysis and visualization; clustering
- Predictive analytics: forecasting and statistical techniques, simulations; machine learning, collaborative filtering (beyond Excel)
- Prescriptive analytics: analytical models for decision making, optimization
- Network Flow and Optimization
- Case studies for data analysis in air transportation
- Exposure to advanced data analysis tools

Within groups of 4-5 students, teams are required to develop an IT/Analytics solution. Examples include the following possibilities:

- Using existing data, carry out a complete analysis that can be automated to derive insights for the airline.

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[1] The participation grade is based on the instructors' evaluation of the quality of each student's progress and contribution during the course. Please carefully read all assigned materials, make a serious attempt to complete exercises and answer assigned questions, and be ready and willing to actively engage in the classroom learning experience. Students may be asked to explain concepts in class. The implicit assumption is that we all have something to contribute to the collective learning experience each day, and we all want to benefit from it.

- o Transacted data can informs decision makers on trends
- o Price volatility can reveal information about your competitors, customers
- o Transform textual feedback to valuable insights (for example, using http://www.airlinequality.com/Forum/turkish.htm or http://www.airlineratings.com/passenger-reviews/34/turkish-airlines)
- Developing the framework for a new solution:
  - o An app that will inform passengers of their baggage (in line with IATA Resolution 753)

DATE	PERIOD	Instructors	CLASS TOPICS/Text Chapters	CONTENT / ACTIVITIES
June 1 Monday	AM	Mantin (3)	Introduction to the course Introduction to IS; Types of IS.	Functional areas; review of IS in the context of airlines (RM, maintenance, operations, HR, business processing, finance, etc.)
			Analytics with Excel	Example using DOT data
	PM	Üre (2)	Introduction to Data Analytics	Data Examples from AT
		Koyuncu (1)	Data Analytics in AT I: Trajectory Based Operation case	
June 2 Tuesday	AM	Mantin (2)	IT/IS strategy and outsourcing IS trends in the industry Developing IS	
		Koyuncu (1)	Data Analytics in AT II: Predictive Incident Analysis, FDM Based Performance Analysis	
	PM	Mantin (1+1)	Analytics: forecasting and simulations	*Case Study: SkyJet*
		CIO (1)	Turkish Airlines IS perspective	
June 3 Wednesday	AM	Mantin (1+1)	Focus on RM and GDS Focus on (irregular) operations, M&E MRO:	IS trends and applications in focus area
		Karaman (1)	Optimization: Linear Programming,	
	PM	Karaman (2)	Optimization Interactive Session	

		Mantin (1)	Analytics: optimization	*Case Study: SkyJet*
June 4 Thursday	**AM**	Üre (2)	Analytics: Machine learning	**Project Proposal Due (1 page)** Supervised and unsupervised learning
		Karaman (1)	IT: Social media, text analytics	
	PM	Karaman (1)	Data Visualization Tools	Tableau Tutorial
		Koyuncu (1)	Information Exchange: Secure Multiparty Computation (SMC)	
		Üre (1)	Collaborative Filtering, Product Recommendation Systems	Promotion Packages – Targeted Advertising Amazon, Netflix examples
June 5 Friday	**AM**	Karaman (1)	IT: Big data	Implications of Big Data, Big Data and Decision Making, Impact on Business (MIT Technology Review Article) MapReduce, Hadoop
		Üre (1)	Managing Big Data	
		Koyuncu (1)	Data Analytics in AT III: Delay Propagation in ATM networks	European ATM Network case
	PM	Üre (2)	Analytics: Beyond Excel – other tools for data mining	Business Analytics with R
		Mantin (1)	Large scale econometrics	
June 6 Saturday	**AM**	Karaman (2)	Network flow and optimization, Exposure to Network Modeling, Queuing and Optimization Tools	TBO Wind Update case
		Koyuncu (1)	Sequential Filtering	
	PM	All	Project work feedback	SkyJet Case Study due