

# ENGINEERING SYSTEMS AND DESIGN (ESD)

## MISSION STATEMENT

ESD advances a new generation of analysts, engineers, and researchers who can holistically design, analyse and optimise for a better world.

## OVERVIEW

ESD is one of the five majors at SUTD. ESD focuses on modelling, design, optimisation, and management of large, complex engineering systems that have helped to seamlessly enhance our every day for an enriched tomorrow. Examples include aviation, supply chain and logistics, financial services, urban infrastructure systems, healthcare delivery systems, transportation systems, security and defense systems, energy production and distribution systems, and many more.

## CORE SUBJECTS

- Data and Business Analytics
- Probability and Statistics
- Optimisation

- Manufacturing and Service Operations
- Engineering Systems Architecture
- The Analytics Edge

- Simulation Modelling and Analysis

## FOCUS TRACKS



### AVIATION

An airport is one of the most complex engineering systems in existence. It must simultaneously achieve ultra-high levels of safety and security while providing high throughput of passengers and cargo on a daily basis. If you can appreciate the multiple dimensions of design and operation of an airport system, you are well-prepared to tackle many other ‘system of systems’ challenges. In this focus track, you will understand airport systems from both a ‘landside’ and an ‘airside’ perspective, acquire modelling skills to evaluate alternative operational designs, and consider integration issues with land transportation systems.

**Track subjects include:**

- Airport Systems Planning and Design
- Airport Systems Modelling and Simulation
- Urban Transportation

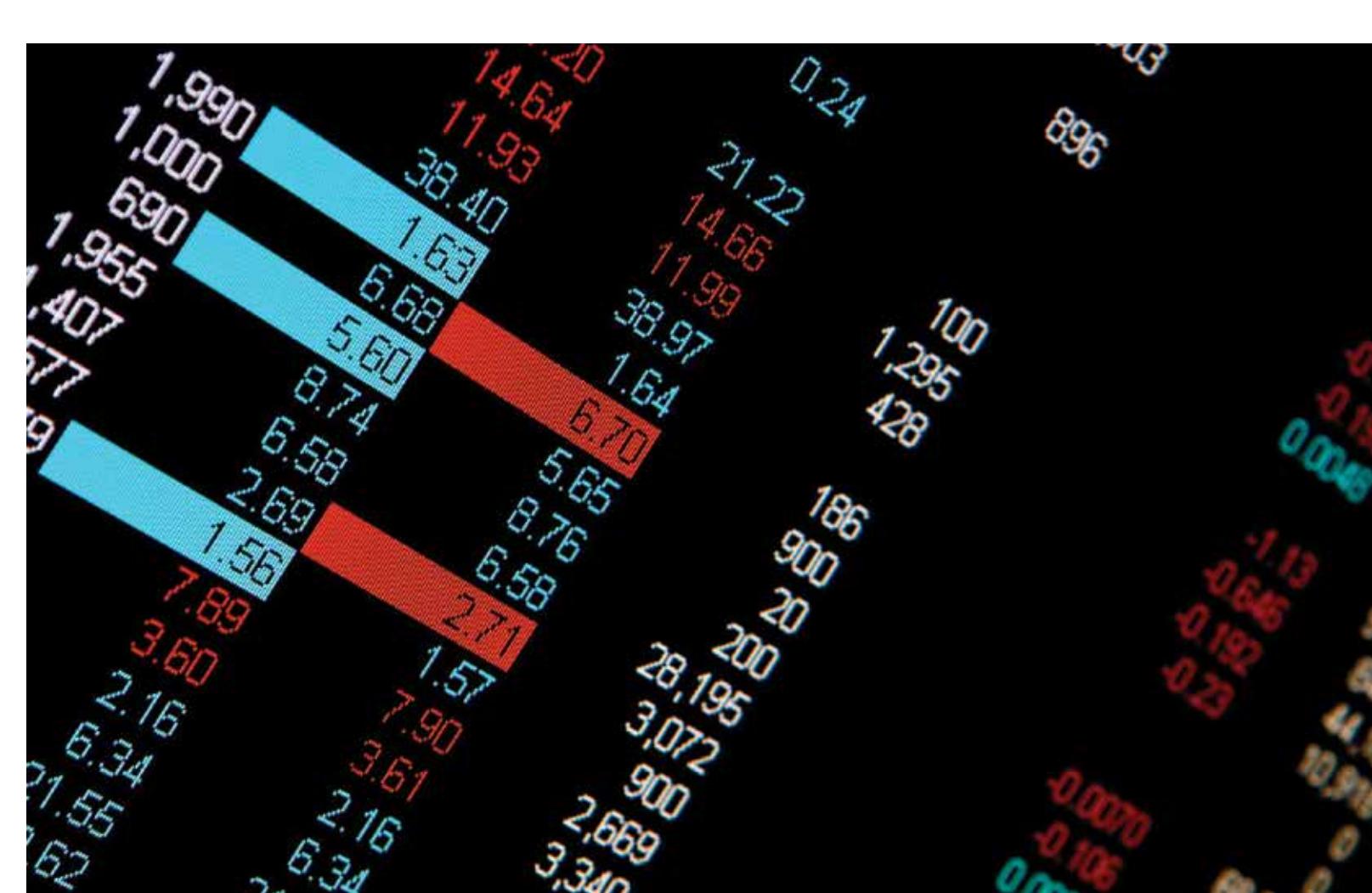


### BUSINESS ANALYTICS AND OPERATIONS RESEARCH

This track is designed for students to gain experience in modelling, analysing, and solving complex decision-making situations. The track is suitable for careers in the emerging field of data-driven decision making, using tools and techniques in both the descriptive domain (statistics and predictive analytics) and the prescriptive domain (optimisation and reinforcement learning). Understanding multi-player behaviours (social network evolution and game theory) is also valuable when developing applications such as energy pricing systems, trading platforms, and resource-sharing systems.

**Track subjects include:**

- Statistical and Machine Learning
- Advanced Topics in Optimisation
- Advanced Topics in Stochastic Modelling
- Networked Life
- Game Theory



### FINANCIAL SERVICES

This track is designed for students who are interested in careers in the securities, banking, financial management, and consulting industries, or as quantitative analyst in corporate treasury and finance departments of general manufacturing and service firms. The track-specific subjects will cover portfolio theory, derivatives valuation, and core subjects in stochastic processes, optimisation, simulation and statistics.

**Track subjects include:**

- Investment Science
- Derivative Pricing and Risk Management
- Equity Valuation
- Financial Systems Design



### SUPPLY CHAIN AND LOGISTICS

This track is concerned with the movement of raw materials into an organisation, the internal processing of materials into finished goods, and the distribution of finished goods to the end consumer. The track will cover the design and management of products, information, and financial flows that are associated with supply chains in a wide range of industries.

**Track subjects include:**

- Supply Chain Management
- Supply Chain Digitalisation and Design
- Advanced Topics in Optimisation
- Advanced Topics in Stochastic Modelling
- Statistical and Machine Learning
- Game Theory



### URBAN INFRASTRUCTURE SYSTEMS

This track uses the tools of systems engineering and operations research to understand how technology, policy, and management shape the urban environment. You will learn how to design, control, and manage infrastructure systems to contribute to sustainable urban development. This track is excellent preparation for careers in industries such as water and power utilities, telecommunications, air-land-sea transportation, and waste management.

**Track subjects include:**

- Airport Systems Planning and Design
- Urban Transportation
- Water Resources Management
- Energy Systems and Management
- Sustainable Engineering
- Game Theory