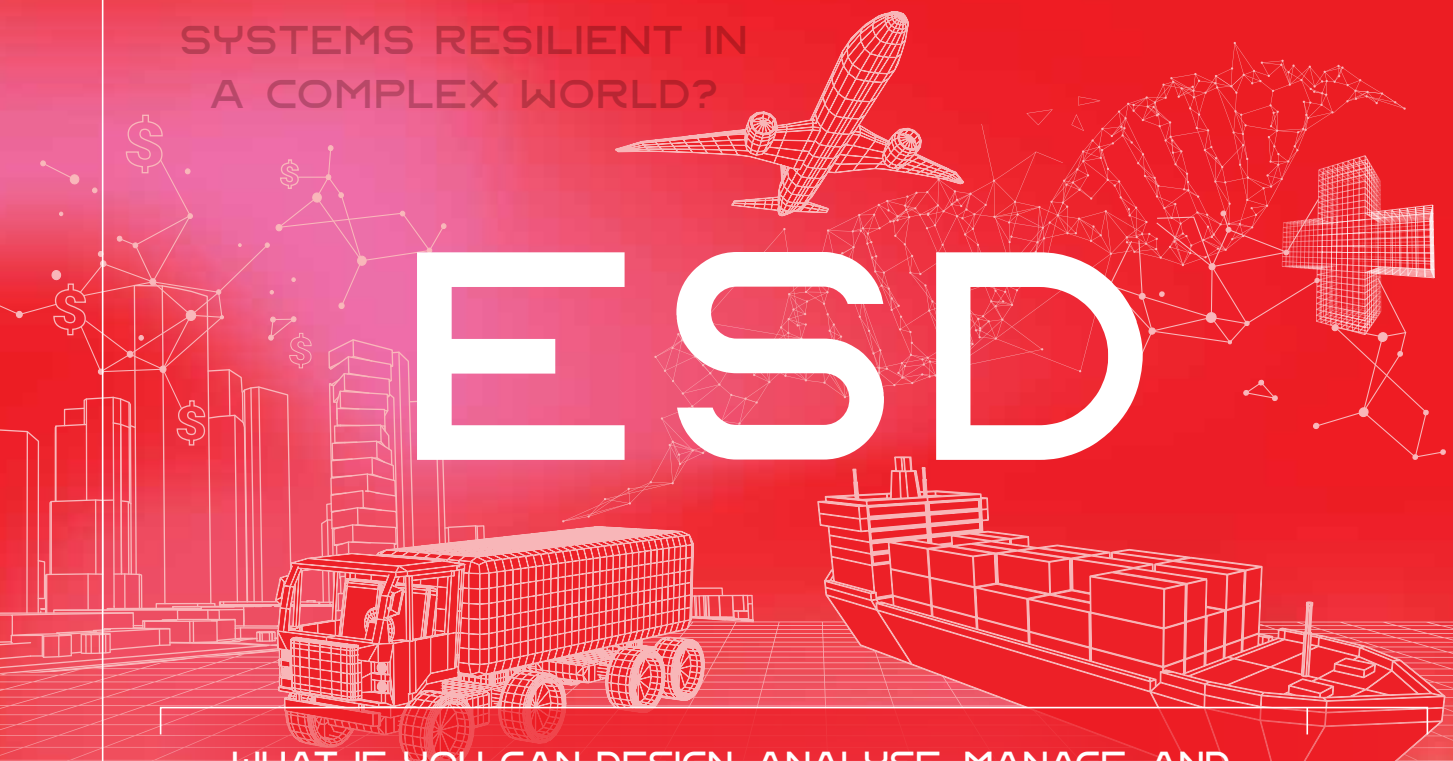
SINGAPORE UNIVERSITY OF TECHNOLOGY AND DESIGN

HOW CAN Design·AI MAKE COMPLEX SYSTEMS SIMPLER FOR HUMANS?

WHAT MAKES CRITICAL SYSTEMS RESILIENT IN A COMPLEX WORLD?

ESD

ENGINEERING SYSTEMS AND DESIGN



WHAT IF YOU CAN DESIGN, ANALYSE, MANAGE, AND OPTIMISE CRITICAL SYSTEMS FOR AN OPTIMAL WORLD?

HOW CAN WE ENGINEER DATA INTELLIGENCE THROUGH ANALYTICS AND AI?

SUTD.EDU.SG/ESD

TRAILBLAZING A BETTER WORLD BY DESIGN.

OTHERS TEACH AI AS A TOOLSET. WE TEACH AI AS A MINDSET.

AI alone is just deep tech. Design·AI at SUTD goes further—a bold integration of AI with a holistic view of design, embracing creativity, ethics, empathy, critical thinking, purposeful action, and a commitment to solve human and societal challenges.

At SUTD, you'll learn when to harness AI, when to refine it, and when to rethink it—guided by human-centred design. Because real innovation isn't just about smarter tech—it's about solutions that really matter.

THE SCIENCE BEHIND DECISION-MAKING

In a world full of complex problems, making the right decisions at the right time with the right resources matters more than ever.

Whether it's:

- **Choosing the right company or project to invest in**
- **Designing warehouses that are both green and efficient**
- **Timing the launch of your next-gen product**

—these are the kinds of tough, system-level questions every organisation faces—and which ESD students are trained to solve.

Graduate with a Bachelor of Engineering in Engineering Systems and Design.

ESD graduates will enter the workforce armed with a formidable combination of AI, design, analysis, management, and optimisation expertise—a powerful repertoire that's needed to tackle complex open-ended challenges. Like their peers in all other majors, ESD graduates won't just be "bilingual" with expert domain knowledge and AI, they will be effectively "trilingual"—using Design·AI**, you don't just solve problems, you'll redesign entire systems for a more optimal world.**

In addition, ESD specifically trains you to provide the core insights that power AI models for greater accuracy. And because you understand both the *inputs* that go into AI models and are adept to *make (better) decisions* that come out of them, you're fluent at both ends of the loop—making you the go-to minds for the AI-driven age.

A CURRICULUM FOR THE NEW WORLD

Over your first three Freshmore terms, you'll build a strong foundation in Science, Mathematics and Technology (SMT), Humanities, Arts and Social Sciences (HASS), and Design·AI through our reimagined Freshmore curriculum. From day one, courses integrate Design with AI to strengthen both technical depth and human-centred skills, giving you the solid foundations and readiness not only for your ESD major but also for life beyond graduation.

New options in key Freshmore courses let you tailor your journey to match your interests: the (E) option for courses with a stronger focus on engineering applications, or the (S) option for courses with a stronger focus on social sciences applications. ESD students should take the (E) option. *(See ESD Curriculum table for details.)*

From day one of the ESD programme, you will be working with corporate clients, leveraging AI to solve real-world problems and improving their operations. In addition to your ESD subjects, you'll continue to take courses in HASS and Design·AI that will prepare you to be a new kind of engineer—one that embraces the cultural and social context of technology in the new world.

Every undergraduate works on at least 20 design projects at SUTD, culminating in a two-term Capstone project in the final year. This allows you to collaborate with students from other majors and apply the skills you've mastered in ESD and Design·AI to either a client-sponsored industry project or your own entrepreneurial venture, tackling real-world challenges. By graduation, you'll have built an extensive portfolio of industry-inspired work, well-prepared for your career journey.

THE FIRST
Design·AI
UNIVERSITY FOR THE NEW WORLD

Design·AI IS IN ALL SUTD PROGRAMMES —SPANNING EDUCATION, RESEARCH, AND ENTERPRISE.

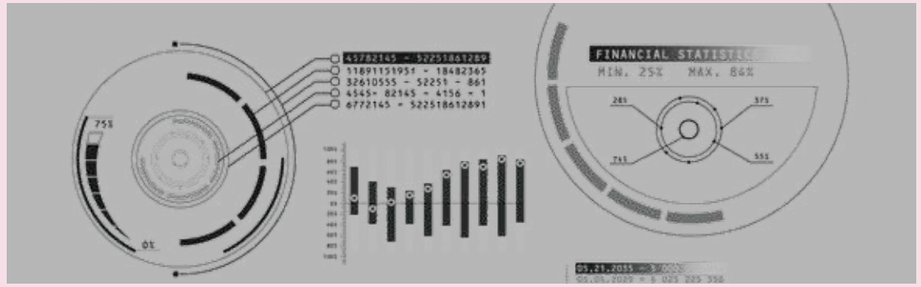
ESD CORE SUBJECTS

- Data & Business Analytics
- Heuristics & Systems Theory
- Manufacturing & Service Operations
- Optimisation
- Probability & Statistics
- Simulation Modelling & Analysis
- The Analytics Edge

The ESD curriculum is very well designed to equip students with not only the technical skills such as systems architecture design, mathematical modelling, and coding but also **data-driven solution delivery, visualisation, and presentation skills.** I learned how to build models and perform data analysis, but more importantly, was given many opportunities to present the results of the analysis to different stakeholders. These opportunities that ESD has provided me—**to meet clients and deliver data-driven solutions that help them make more informed decisions**—are truly valuable.

+++ Pei Jinling
Business Analyst, Standard Chartered Bank, ESD Alumna

LEARNING OUTCOMES OF ESD CORE



TRANSFORM DATA INTO DECISIONS

Be equipped with tools in data manipulation, visualisation and analysis. Gain a competitive edge using advanced optimisation models.

Application examples:
Recommend locations for new stores.
Choose pricing strategy for a new product launch.

UNDERSTAND & MANAGE COMPLEX ENGINEERING SYSTEMS

Learn to use probability, statistics, and optimisation, opening the door to powerful techniques for tackling complex engineering systems.

LEARN COMPUTATIONAL TOOLS & MODELLING SKILLS

Master the four fundamental methods for modelling dynamical systems: system dynamics, agent-based modelling, discrete-event simulation and Markov Chain Monte Carlo.

Application examples:
Predict the evolution of financial option prices.
Devise scheduling rules to relieve airport ground transportation congestion.

DEVELOP CONSULTANCY SKILLS

Become familiar with accounting and finance—the language of business—even as you acquire skills in project management and professional communication.

ESD CURRICULUM

JAN-APR	MAY-AUG	SEP-DEC
Freshmore Subject Core Subject Humanities, Arts and Social Sciences (HASS) Subject Elective Capstone	Y1 Y2 Y3 Y4	**TERM 1** Innovating with Design & AI 1 Introduction to Programming Calculus Sustainability: Science & System Thinking Introduction to Social Sciences/Global Humanities
TERM 2 Innovating with Design & AI 2 Algorithmic Thinking & Object-Oriented Programming Linear Algebra & Multivariable Calculus **(E)** Physics Principles & Applications 1 Introduction to Social Sciences/Global Humanities	**TERM 3** Innovating with Design & AI 3 Introduction to Machine Learning Introduction to Probability & Statistics **(E)** Any Two Electives*	**VACATION**
TERM 4 Data & Business Analytics Optimisation Probability & Statistics HASS	**TERM 5** Manufacturing & Service Operations Heuristics & Systems Theory The Analytics Edge HASS	**VACATION/ INTERNSHIP/ EXCHANGE**
TERM 6 Simulation Modelling & Analysis Elective Elective HASS	**VACATION/ INTERNSHIP/ SUMMER PROGRAMME**	**TERM 7** Capstone Elective Elective HASS
TERM 8 Capstone Elective Elective HASS		

***Term 3 Electives:**
- Designing Sustainable Energy Solutions
- Introduction to Discrete Mathematics
- Introduction to Healthcare Technology
- Physics Principles & Applications 2

Students are guided on electives that match their learning interests, while retaining the flexibility to chart their own path.

- In addition to all subjects in Term 1 being grade-free (Pass/No Record), students can choose up to four more subjects from Terms 2 and 3 to be grade-free.
- Students will declare their choice of major at the end of Term 3.

Information is subject to change. Visit sutd.edu.sg/esd for latest updates.

MINORS

Our range of minors offers you more choices and flexibility in pursuing your broader interests.

- **Minor in Computer Science (CS)**
- **Minor in Design and Artificial Intelligence (DAI)**
- **Minor in Design, Technology and Society (DTS)**
- **Minor in Digital Humanities (DH)**
- **Minor in Healthcare Informatics (HI)**
- **Minor in Human-Centred Design (HCD)**
- **Minor in Psychology and Business Management (PBM)**
- **Minor in Sustainability by Design (SD)**

Students will indicate their choice of minor at the end of Term 3.
Information is subject to change. Visit sutd.edu.sg/minors for latest updates.

DOUBLE YOUR MAJOR, YOUR IMPACT.

To acquire more in-depth human-centred Design·AI expertise, ESD students have the option to pursue the **Human-centred Domain Intelligence (HDI) Second Major**.

REQUIREMENTS

- 2 DAI studios **OR**
  1 DAI studio **+** 1 DAI course
- 2 AI courses (own major)
  + 1 AI course (can be from another major)
- 3 HASS HCD courses

DAI – Design and Artificial Intelligence
HCD – Human-Centred Design
HASS – Humanities, Arts and Social Sciences

SCAN TO FIND OUT MORE

The ESD students are impressive, within 11 weeks they can develop a working prototype with minimal guidance, **provide fresh and out-of-the-box approach** to PDF parsing, **showcasing the innovative thinking and creativity** of the students.

+++ Infineon

The ESD students have demonstrated remarkable independence and proactivity, actively engaging with our healthcare system to deepen their understanding with the data and the work we do. **Their dedication and innovative thinking have allowed International SOS to further enhance our data analytics capabilities, significantly improving our operations and developing new commercial solutions.** Through this collaboration, the students have created advanced wellbeing analytics systems that have transformed the way we use and analyse data, enabling a healthier and more productive workforce for our clients. We truly appreciate the significant contributions made by the ESD students.

+++ International SOS

FUTURE POSSIBILITIES

CAREERS

ESD graduates are equipped with skills that make them suited for a wide range of engineering and management careers. With skills in analytics, management, and design, they have excelled in both the private and public sectors in industries such as consulting, healthcare, banking and finance, manufacturing, supply chain, energy, transportation, telecommunications, retail, entertainment and hospitality.

POSITIONS HELD BY ESD GRADUATES:

- Aviation analyst
- Corporate planner
- Data analyst/scientist
- Financial analyst
- Hospital planner
- Industrial engineer
- Management associate
- Operations analyst
- Project manager
- Supply chain analyst
- Systems engineer
- Technology consultant

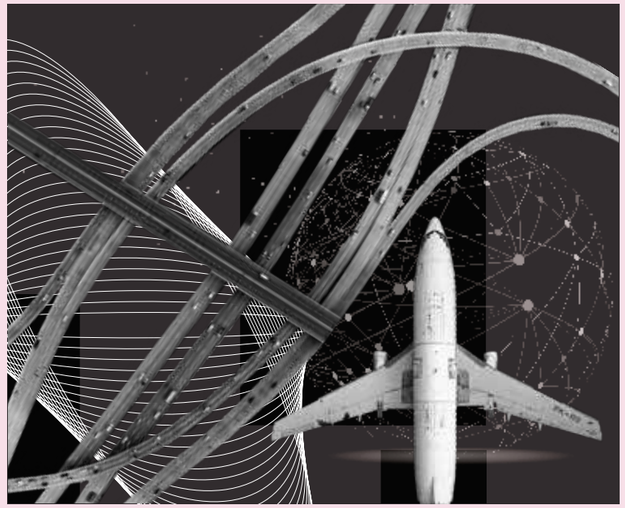
WHERE ESD GRADUATES ARE MAKING AN IMPACT:

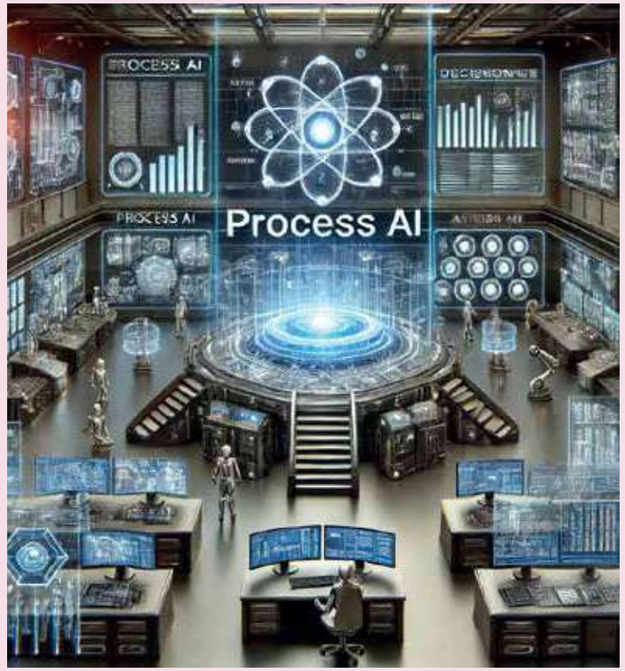
- Accenture
- Boston Consulting Group
- Bloomberg
- Changi Airport Group
- Citibank
- DB Schenker
- DBS Bank
- Defence Science and Technology Agency
- EY
- GovTech
- Infineon Technologies Asia Pacific
- Land Transport Authority
- Monetary Authority of Singapore
- Procter & Gamble
- PwC Singapore
- Shopee
- Singapore Airlines
- SBS Transit
- United Overseas Bank
- Visa



My current role relies heavily on the design-centric approach to produce elegant system features that enhance the multi-faceted user experience. Being able to seamlessly bring together and consolidate different perspectives in producing a holistic and satisfying solution is widely appreciated and embraced in the modern working industry. The **design and analytical thinking** skills I learned at ESD help to tackle the inevitable complexities embedded in all systems regardless of industry.

+++ Chloe Tan
SIA Executive (Ground Experience Development), Singapore Airlines Limited, ESD Alumna





ENTREPRENEURSHIP

Strong engineering and Design·AI skills, coupled with practical applied mathematics knowledge in developing solutions for real-world challenges will put you in good stead to initiate your start-up ventures.

START-UPS BY ESD GRADUATES:

- **Renderspace** provides property agents with virtual staging services using AI. Helping homeowners visualise their future home, giving them the assurance to make the big purchase.

  Co-founded by ESD alumnus, Alexander Koh.

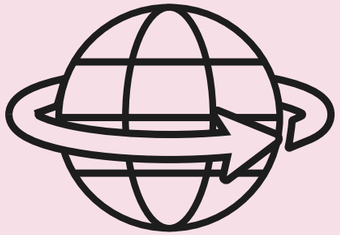
- **SGP Foods**, winner of the Singapore SME 500 Award, is a resource efficiency tech company which uses a multi-pronged approach to combat issues of climate change and food security. Through its carbon crediting, vertical farming via IoT and energy efficiency solutions, it aims to build Singapore's food and climate resilience.

  Founded by ESD alumna, Pek Yun Ning.

GRADUATE SCHOOL

The rigorous technical training from ESD will prepare you for various post-graduate programmes such as industrial and systems engineering, operations research, business, economics and public policy. Our ESD graduates have enrolled at top universities including:

- Carnegie Mellon University
- Cornell University
- Harvard University
- London School of Economics and Political Science
- Massachusetts Institute of Technology
- University of California, Berkeley
- Yale University



PREPARE TO TAKE ON THE WORLD

4 SPECIALISATIONS

AVIATION SYSTEMS

Learn and explore the intricacies of the 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.

Designed for students interested in careers in the aviation industry.

BUSINESS ANALYTICS AND OPERATIONS RESEARCH

Prepares you for a career in the field of data-driven decision-making. You will gain experience in modelling, analysing and solving complex decision-making situations. You will also learn the tools and techniques in both the descriptive domain (statistics and predictive analytics) and the prescriptive domain (optimisation and reinforcement learning).

HAVE THE FLEXIBILITY TO CUSTOMISE YOUR CURRICULUM WITH ONE OR MORE SPECIALISATIONS*. YOUR SPECIALISATION WILL BE REFLECTED ON YOUR TRANSCRIPT SO THAT EMPLOYERS RECOGNISE YOUR ADDITIONAL EXPERTISE.

*Specialisations offered in a given year are subject to change. Choosing a specialisation is optional.

SCAN TO FIND OUT MORE

FINANCIAL SERVICES

Learn about portfolio theory, derivatives valuation and financial risk analysis, complementing the core subjects in stochastic processes, optimisation, simulation and statistics.

Designed for students interested in careers in the securities, banking, financial management and consulting industries; or as quantitative analysts in corporate treasury and finance departments of general manufacturing and service firms.

SUPPLY CHAIN AND LOGISTICS

Covers the design and management of products, information and financial flow related to supply chains in a wide range of industries.

You will learn quantitative methods (built upon statistics, optimisation, and microeconomics) relevant to a variety of supply chain decisions; read and critique industry cases; and also participate in supply chain simulation games that simulate real-world decision-making scenarios.

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