



CDE WORKSHOPS

PRE-UNIVERSITY STUDENTS

THEME: THE FUTURE OF DESIGN & ARCHITECTURE

- HeriTech - The future of the past
- Visual Communication

THEME: TECHNOLOGY

- Reaction to Reactors - Chemistry vs Chemical Engineering
- Journey to Space
- Wearable Technology

THEME: BUILT ENVIRONMENT

- 5G Digital Technology for Buildings
- Building Singapore's First Floating Park Connector
- Design and Make your Optical Fiber Sensor for Structural and Water Level Monitoring
- From Dirty to Clean: How Technology Purifies Water

THEME: SYSTEM ANALYSIS

- Analytics for Social Good
- Net Zero Emissions Systems Analysis
- Introduction to Simulation Analytics

THEME: MAKERSPACE

- Arduino as a prototyping tool
- Create a circuit on a prototyping board using soft soldering
- Creating hand-held sized electronic systems using Expressif (ESP) design platform
- 3D printing for prototyping
- 2D design using a Cricut maker
- How to use laboratory equipment for prototyping
- 2D design using a laser cutter
- How to use Unity for virtual reality development
- Introduction to embroidery machine for making e-textiles

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HERITECH: THE FUTURE OF THE PAST

Duration:	2 - 4 hours
Course Outline:	This course will first introduce the concept of Net Zero and sustainable (historic) buildings. It will then introduce technologies, such as terrestrial LiDAR scanning, 3D modelling and printing, and Digital Twin for managing heritage buildings in Singapore.
Learning objectives	• Students will be able to understand the concept of sustainable development of the built environment. • Students will be able to understand and apply 3D technology and Digital Twin application to a real-world scenario. • Tour of NUS Architectural Conservation Laboratory (ArClab) located at 141 Neil Rd, Singapore 088870 • Hands on - 3D Scanning
Maximum number of students per class	45 pax
Price:	S\$20 - \$40 per student excluding GST (Depending on the duration of workshop)

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VISUAL COMMUNICATION

Duration:	2 hours
Course Outline:	Learning basic fundamentals of Visual Communication. a. Visual Hierarchy b. Gestalt Theory c. Colour Semantics and balance d. Typography e. Intro to branding Through these concepts, participants will learn its application to various existing companies, public/education spaces and houses. There will be hands-on experience with digital design tools to create their own logomarks/logotypes, edit images to personalise projects
Learning objectives	We strive to imbue participants with 3 main goals : Identify , Analyse and Application. It is through learning about design fundamentals and hands on application with a design software. Participants will be informed on the importance of design and the positive impact it has to our daily lives.
Maximum number of students per class	40 pax
Price:	S\$10 per student excluding GST



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REACTIONS TO REACTORS

Duration:	3 hours
Course Outline:	Have you ever wondered how these reactions are scaled up for large-scale production? What are the devices in which reactions are carried out? How are the operating conditions (like temperature and pressure) determined for optimal conversion of the reactants? This is one of the main facets of the chemical engineering discipline. This course will extend the idea of chemical reactions to reactors by means of simple simulations using chemical process simulation software. Participants will get to appreciate how chemical reactions are scaled up and the effect of operating conditions on conversion and yield.
Learning objectives	• Appreciate the difference between chemistry and chemical engineering. • Understand the basics of reaction kinetics and conversion. • Understand the effect of operating conditions on reactor performance. • Get a preview into how chemical engineers solve real problems by using simulation tools.
Maximum number of students per class	30 pax
Price:	S\$30 per student excluding GST

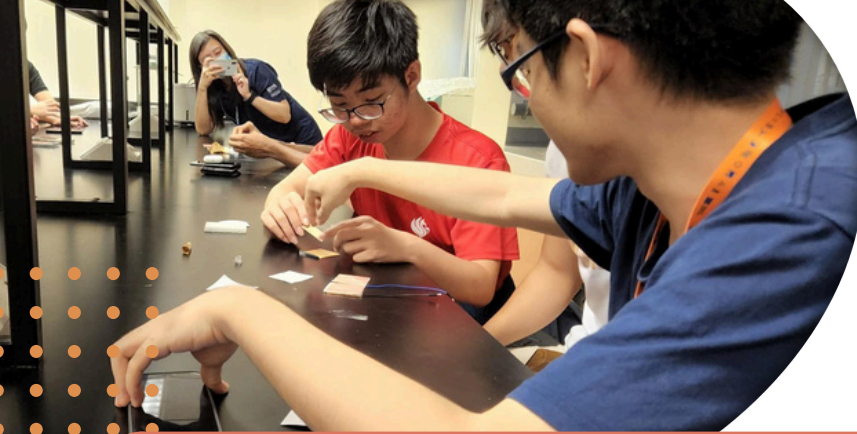




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JOURNEY TO SPACE

Duration:	2 hours
Course Outline:	In this workshop, you have the opportunity to visit the state-of-the-art Satellite Technology And Research (STAR) centre in NUS. STAR is setup as a joint laboratory between NUS and DSO National Laboratories. The vision of STAR is to be a world class research centre for distributed space system using multiple satellites flying in formation, constellation and swarm. The centre is building a number of small satellites with several of them planned to be launched in 2023. Besides the visit, the participants will learn how a satellite being built, what is inside the satellite, how the satellite being tested on earth before its launch into the orbit, as well as the challenges operating a satellite in the space environment. In addition to lecture materials, there will be real satellite in the centre and informative videos for the participants to have a fruitful learning.
Learning objectives	• Learn about the space environment • What a satellite can do • What is inside a satellite • The process of satellite assembly, integration and testing • The environmental test process • Launching of a satellite • Real-time operation of a satellite
Maximum number of students per class	20 pax
Price:	S\$20 per student excluding GST



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WEARABLE TECHNOLOGY

Duration:	2 hours
Course Outline:	• Introduction of wearable technology • Applications of wearable electronic and energy devices • Typical types of wearable devices • Significance of materials in wearable development • Introduction to relevant Material Science Engineering tools and hands-on experiment
Learning objectives	• Understand why wearable technology is attractive • Understand what is wearable electronics • Learn the applications of wearable devices • Understand why materials are important • Hands-on experience on making an biomechanical energy harvester
Maximum number of students per class	30 pax
Price:	S\$20 per student excluding GST

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5G DIGITAL TECHNOLOGY

Duration:	5 hours (inclusive of 1 hour lunch)
Course Outline:	The course involves hands on Experiential Learning of 5G-enabled Digital Building Technologies such as the systems and robotics used in the maintenance of buildings for increased efficiency and sustainability.
Learning objectives	Learners will know the basics of 5G Connectivity, Digital Twins, Robotics, AI, Video Analytics, AR, VR, and ways they can be applied to Smart Facilities Management applications by the end of the workshop. Presentation on information of 5G-enabled Digital Building Technologies and case studies on their applications Hands on learning on the robotics such as AGVs, UAVs, Cleaning Robot, Disinfect Robots, Inspection Robot, Surveillance Robots, Drones
Maximum number of students per class	30 pax
Price:	S\$30 per student excluding GST

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BUILDING A FLOATING PARK CONNECTOR

Duration:	2 - 4 hours
Course Outline:	This course aims to introduce students to the challenges of Civil Engineering. Students will learn the basic principles of Structures and Hydraulics. They will then apply these engineering principles in a design project where they will build a scaled model of their design and test it to failure. Workshop video: https://youtu.be/i4koTSi3juU?si=qRI6Csq5bzyPRgjC
Learning objectives	Students will • Understand the challenges faced by civil engineers. • Learn the basic principles of statics and hydraulics. • Design a solution to address a real-life problem. • Test their solution and evaluate its effectiveness.
Maximum number of students per class	60 pax
Price:	\$S\$50 per student excluding GST

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DESIGN AND MAKE OPTICAL FIBER SENSOR FOR STRUCTURAL AND WATER LEVEL MONITORING

Duration:	3 hours
Course Outline:	Participants will be guided to create the sensor from scratch using plastic optical fibers for two experiments. 1) Bending sensor 2) Water level detection sensor Participants will also be exposed to the data acquisition system, and wireless transmission possible with the sensor system introduced in this workshop. No experienced required. Basic introduction to optical fiber sensors will be provided by the instructor.
Learning objectives	a. Students will be able to acquire practical experience in designing and constructing an optical fiber sensor to measure the bending of a long structure. b. Students will be able to gain hands-on experience in creating an optical fiber sensor for detecting flood or drought conditions. c. Students will gain a foundation understanding the working principles of optical
Maximum number of students per class	20 pax
Price:	S\$30 per student excluding GST



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FROM DIRTY TO CLEAN: HOW TECHNOLOGY PURIFIES WATER

Duration:	3 hours
Course Outline:	Singapore has strategically positioned itself as a global hydrohub, leveraging advanced water management technologies and sustainable practices. By integrating innovative solutions like desalination, water recycling through NEWater, and effective rainwater harvesting, Singapore addresses its limited natural freshwater resources. These efforts not only ensure a reliable water supply for the people but also demonstrate a commitment to environmental sustainability.
Learning objectives	In this workshop, students will get an overview of the domestication of the water cycle in the Singapore context and will get their hands on the latest technologies used to treat water.
Maximum number of students per class	20 pax
Price:	S\$50 per student excluding GST

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ANALYTICS FOR SOCIAL GOOD

Duration:	3 hours
Course Outline:	This workshop introduces how machine learning and optimization techniques can inform real-world decision-making for social good. Students will explore applications in areas such as sustainable infrastructure planning, healthcare operations, and housing allocation, where data-driven methods have been used to create tangible real-world impact. Students will then work with real-world datasets drawn from these contexts and use Python to explore and apply machine learning techniques to practical decision-making problems.
Learning objectives	1. Appreciate the value of machine learning and optimization in addressing real-world problems. 2. Understand the unique challenges that often arise in social good applications. 3. Gain hands-on experience applying machine learning techniques to real-world datasets using Python.
Maximum number of students per class	50 pax
Price:	S\$10 per student excluding GST



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NET ZERO EMISSIONS SYSTEMS ANALYSIS

Duration:	3 hours
Course Outline:	This workshop introduces students to Industrial and Systems Engineering (ISE) through the lens of sustainability analytics. Students will apply quantitative tools and systems thinking skills to one of the most pressing challenges of our time: transitioning a country's energy system to net zero emissions. Using Singapore as an illustrative example, students will explore how engineers and policymakers make complex decisions under real-world constraints. The workshop centres on two progressive games. In the first game, an energy resource allocation challenge, students act as energy planners tasked with selecting a mix of power generation sources to meet Singapore's electricity demand at the lowest possible cost. The second game builds on this foundation by introducing an additional constraint: an emissions reduction target. Through a card game, students will select from a basket of climate mitigation strategies to achieve net zero.
Learning objectives	• Understand the concepts of climate change, net zero targets and the role of energy systems in these issues • Understand some of the quantitative skillsets that an ISEM student will graduate with and how it is relevant to real world problems in sustainability analytics and energy resource allocation problems • Gain exposure to the range of complexities surrounding climate mitigation and how systems engineering tools can be utilised to analyse and address some of these complexities
Maximum number of students per class	30 pax
Price:	S\$10 per student excluding GST



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INTRODUCTION TO SIMULATION ANALYTICS

Duration:	3 hours
Course Outline:	How can we evaluate a decision before implementing it in the real world? This short course introduces students to simulation analytics, the use of computational models and data to understand complex systems and support decision-making under uncertainty. The workshop consists of two parts. The first introduces the fundamental concepts, steps, and principles of simulation modelling and analysis through engaging examples from different industries. The second provides students with initial exposure to simulation software through instructor-led demonstrations. A simple queueing-system example and practical case studies will be used to illustrate how simulation models are developed, analysed, and applied to support real-world decision-making.
Learning objectives	• Understand the fundamentals of simulation and why it is useful for decision making • Recognise the effects of uncertainty, queues, and resource constraints • Appreciate how simulation analytics is applied in healthcare, transportation, manufacturing, and service operations, etc.
Maximum number of students per class	40 pax
Price:	S\$10 per student excluding GST

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ARDUINO AS A PROTOTYPING TOOL

Duration:	3 hours
Course Outline:	This is a basic workshop for Arduino training for beginners. The workshop will teach basic coding using Arduino programming. This workshop also covers basic electronics circuits built using Arduino platform. This is a practical workshop with lots of hand-on activities. This workshop is designed for a beginner who wants to learn the basic techniques programming using Arduino hardware and software for prototyping.
Learning objectives	• What is the Arduino? • Exploring basic electronics concepts and components • Installing Arduino IDE • Using digital input/output • Using analog input/output and pulse-width modulation • Implementing serial communication • Building a closed system with integration to electronic sensors and actuators
Maximum number of students per class	20 pax
Price:	S\$30 per student excluding GST

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SOFT SOLDERING

Duration:	3 hours
Course Outline:	Soft soldering is a useful prototyping skill to fabricate electronic circuits, but also a skill that allows an artist to express his or her creativity by constructing beautiful and robust wire models. This workshop is designed for a beginner who wants to learn the basic techniques and requirements of soldering on a circuit board, and creating wire models.
Learning objectives	In this workshop, you will learn the correct usage of the soldering iron, select the correct solder type and iron tip, types of solder joints and their requirements. Also, you will learn about the safety aspects of using tin/lead solder. You will have the opportunity to create a working circuit on a prototyping board during this workshop.
Maximum number of students per class	20 pax
Price:	S\$30 per student excluding GST

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CREATING HAND-HELD SIZED ELECTRONIC SYSTEMS USING EXPRESSIF (ESP) DESIGN PLATFORM

Duration:	3 hours
Course Outline:	If you've been wanting to learn to code using ESP32 but don't know where to start, this workshop is perfect for you. In this workshop, you will learn about programming concepts in the ESP environment. This workshop introduces you to coding using the ESP development platform through a hands-on approach. This workshop is designed for students who are interested to learn about coding in the ESP32 platform, with some prior knowledge on programming.
Learning objectives	This workshop covers the fundamental concepts and techniques of coding in the ESP32 platform. To give the learner a realistic learning experience, lots of hands on activities will be conducted.
Maximum number of students per class	20 pax
Price:	S\$30 per student excluding GST

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3D PRINTING FOR PROTOTYPING

Duration:	3 hours
Course Outline:	3D printing or additive manufacturing is a process of making three-dimensional solid objects from a digital file. Being able to come up with a 3D printed prototype is an important step in the design process. This workshop is designed for students who are interested to learn about prototyping in the 3D space. Students with little or some prior knowledge on computer aided drawing will have an advantage on picking up the practical skills.
Learning objectives	• Basics of CAD concepts and tools • Overview of manufacturing methods • Design considerations for 3D printing • Practical considerations and constraints for prototyping and manufacturing
Maximum number of students per class	20 pax
Price:	S\$30 per student excluding GST

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2D DESIGN USING CRICUT MAKER

Duration:	3 hours
Course Outline:	The Cricut system is a smart and versatile cutting equipment that work with an easy-to-use app to help you design and personalise almost anything, i.e. custom cards, unique apparel, everyday items, and so much more. Students who want to get a head-start in prototyping and have little or no experience in using computer-aided drawing software should attend this workshop.
Learning objectives	Participants will learn the different features in the Cricut system and create their own designs using the Cricut machine.
Maximum number of students per class	20 pax
Price:	S\$30 per student excluding GST

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HOW TO USE LABORATORY EQUIPMENT FOR PROTOTYPING

Duration:	3 hours
Course Outline:	This workshop has been custom designed to provide pertinent hands-on experience on using common laboratory equipment, like the multimeter, oscilloscope and other available laboratory equipment. This experience will be important for students to know how to conduct their design and experimental work in studio and laboratory settings. Students who have little or no experience in using common and dedicated laboratory equipment for experimental and prototyping work could attend this workshop.
Learning objectives	This hands-on experience helps students gain a good understanding of the technologies and applications of our suite of laboratory equipment that can be used for experiments.
Maximum number of students per class	20 pax
Price:	S\$30 per student excluding GST

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2D DESIGN USING A LASER CUTTER

Duration:	3 hours
Course Outline:	Laser cutting machines provide a wide range of opportunities and possibilities. The versatility, speed, and precision of laser cutters enable makers, hobbyists, and entrepreneurs to produce everything from a simple machine concept to packaging to trophies & awards. Students who want to get a head-start in prototyping and have some experience in using computer-aided drawing software should attend this workshop.
Learning objectives	Participants will gain basic knowledge of laser cutting systems in terms of their functions, capabilities, benefits and limitations. After going through the workshop, participants will be able to articulate the simple process to perform laser cutting as well as apply the knowledge.
Maximum number of students per class	20 pax
Price:	S\$30 per student excluding GST

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HOW TO USE UNITY FOR VIRTUAL REALITY DEVELOPMENT

Duration:	3 hours
Course Outline:	This workshop provides an overview on designing apps in virtual reality (VR). This workshop takes a hands-on approach to learning Unity. This workshop is suitable for students who are interested to design apps in VR
Maximum number of students per class	20 pax
Price:	S\$20 per student excluding GST



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EMBROIDERY MACHINE FOR MAKING E-TEXTILES

Duration:	3 hours
Course Outline:	This workshop provides an overview of the field, the current state of the art in e-textiles, and the possibilities and difficulties that arise from merging electronics with flexible materials. Students who are interested to prototype using e-textiles should attend this workshop. The workshop materials will also be easy to pick-up for students who have some basic circuit making and hand sewing skills.
Learning objectives	In this workshop, students will learn how to create active and responsive textiles embedded with microcontrollers, handmade textile sensors, muscle wire, pneumatics, and/or electronics.
Maximum number of students per class	15 pax
Price:	S\$20 per student excluding GST