CIVIL, CONSTRUCTION AND ARCHITECTURAL ENGINEERING

PROFESSOR HUSSEIN DIA

CHAIR, DEPARTMENT OF CIVIL AND CONSTRUCTION ENGINEERING

SWINBURNE UNIVERSITY OF TECHNOLOGY

Civil Engineering

Shaping the future of a sustainable world

What is Civil Engineering?

- Why choose a Civil Engineering profession?
- Career opportunities in a post Coronavirus world

Civil Engineering at Swinburne

- Our learning and teaching approach

Why study at Swinburne?

Image Credit: AdobeStock

What is Civil Engineering?

Civil engineering reflects the dreams of visionary people

The engineers who plan, design, build, operate and maintain the infrastructure for a sustainable planet

What we do:

- Structural Engineering
- Construction Engineering
- Geotechnical Engineering
- Transportation Engineering
- Water Engineering
- Architectural Engineering
- Facades Engineering

Powered by imagination and a desire to change the world, Civil Engineers celebrate the ingenuity behind infrastructure marvels

Viaduc de Millau, France

Civil Engineers push the limits of innovation in a beautiful interplay between humans and technology

Bringing People Together: The Falkirk Wheel

A rotating boat lift in Scotland, connecting the Forth and Clyde Canal with the Union Canal

Why Choose Civil Engineering? Why we do it?

Improve the quality of life for communities through safer and more resilient infrastructure

Better access to places, jobs, education, economic opportunity and services

The Future

Career opportunities in a post coronavirus world

Cities

Infrastructure

Connectivity

Image Credit: Adobe Stock

Tomorrow’s cities: Magnets of economy, engines of globalisation

Just 100 cities account for 30% of the world’s economy

London and New York, together, represent 40% of the global market capitalisation

In 2025, 600 cities are projected to generate 58% of the global GDP

But … mega challenges

2 . 54 . 75 . 80

30% of city residents around the world are living in slums

33% have no proper wastewater collection

92% breath in unsafe levels of polluted air – 7 million deaths per year

1.2 million deaths due to traffic crashes

Image Credit: Adobe Stock

FUTURE DEMAND FOR INFRASTRUCTURE AND CIVIL ENGINEERS

IN THE NEXT 30 YEARS, THE WORLD WILL CONSTRUCT THE SAME AMOUNT OF INFRASTRUCTURE AS IT HAS IN THE PAST 150 YEARS – INCREASED URBANISATION, AGEING INFRASTRUCTURE AND POPULATION GROWTH, ALL CONTRIBUTE TO THE **RISING DEMAND FOR INFRASTRUCTURE SERVICES**.

Global Infrastructure Basel

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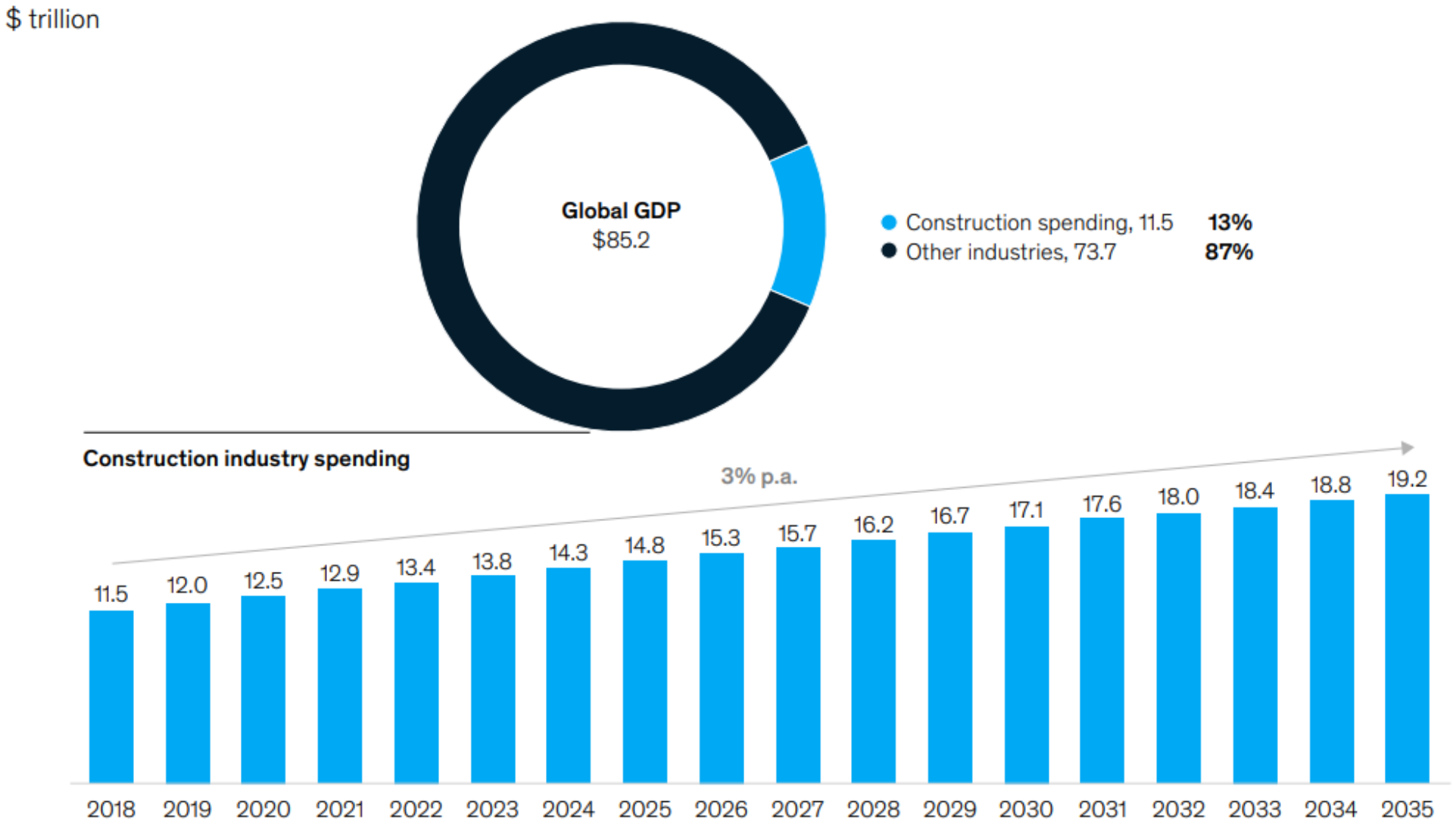
CONSTRUCTION SPENDING: 13 PERCENT OF GLOBAL GDP



Note: Due to COVID-19, the amount of spending in 2020 and subsequent years is likely to change.

Source: IHS Global Insight; ISSA – Infrastructure Stock & Spend Analyzer; World Bank; McKinsey Global Institute analysis

Today, Construction spending accounts for 13 percent of global GDP ($11.5 trillion).

It is expected to grow to 19 percent of GDP by 2035

Growth expected to accelerate in Coronavirus recovery phase

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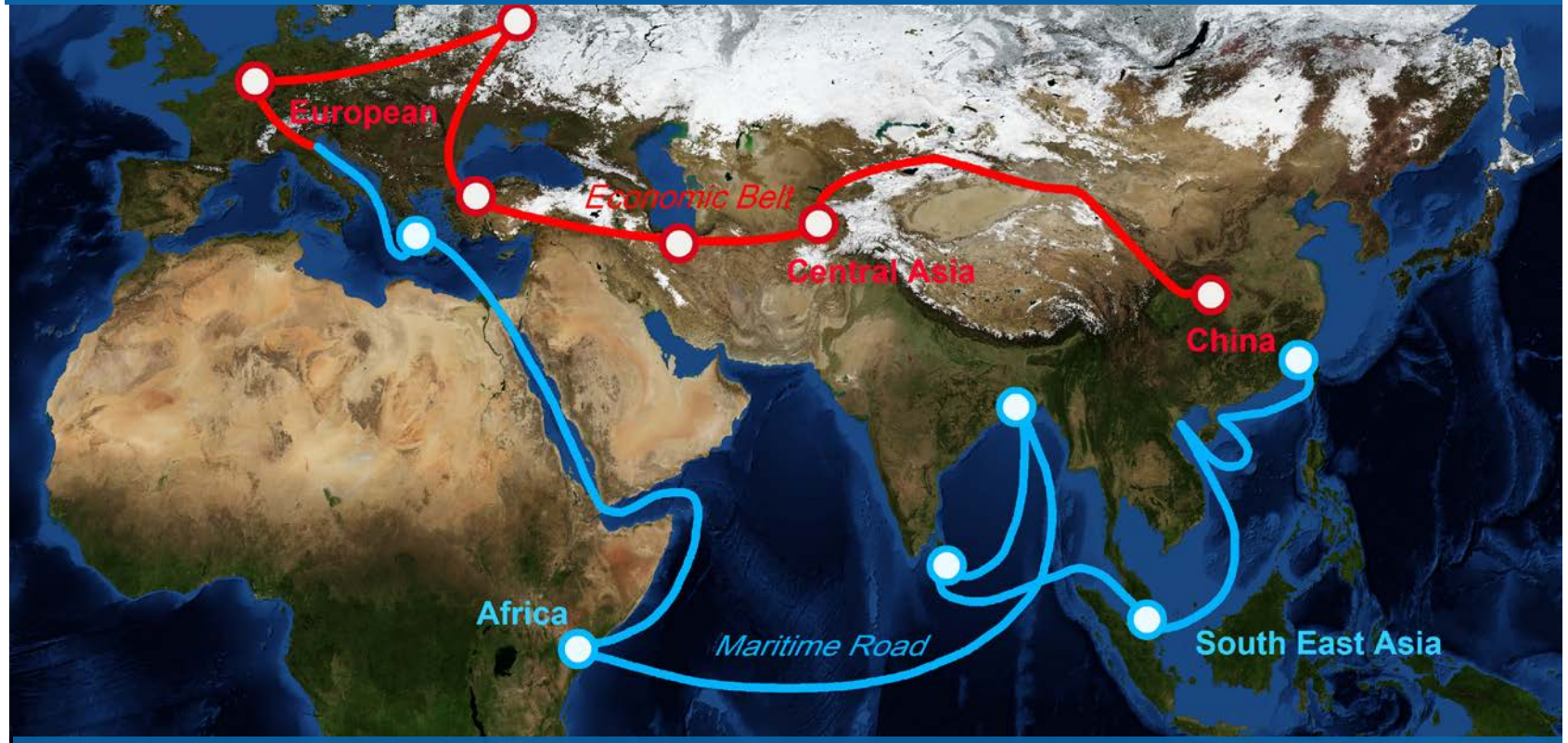
OVERCOMING THE CHALLENGES FACING CITIES

75% of the infrastructure that will be in place by 2050 doesn't exist today. Most of that infrastructure will be transformative. Building tomorrow's infrastructure and smart cities requires a new breed of Civil Engineers.

Trillion dollar Belt and Road infrastructure agenda



Well-integrated metropolises are already emerging along the route

One of the most ambitious geopolitical projects

Aims to spend $1.3 trillion in loans by 2027

Around ten times what the US spent on the Marshall Plan in the aftermath of World War II

New Silk Road project serves as a highway for 'smart cities'

Infrastructure gap estimates between 2013-2030

[1] McKinsey: 2013
[2] American Society of Civil Engineering: 2013
[3] Chatham House: 2014
[4] Ruiz-Nuñez, Wei: 2015

Today, governments spend around $11.5 trillion a year on infrastructure. To meet the U.N. Sustainable Development Goals by 2040, the world economy needs an injection of $97.5 trillion in infrastructure.

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Civil Engineering Professionals

SKILL IN DEMAND

ANZSCO ID 2332

Civil Engineering Professionals design, plan, organise and oversee the construction of civil engineering projects such as dams, bridges, pipelines, gas and water supply schemes, sewerage systems, roads, airports and other structures; analyse the likely behaviour of soil and rock when placed under pressure by proposed structures and design structural foundations; analyse the statical properties of all types of structures and test the behaviour and durability of materials used in their construction; plan and develop transportation systems; and estimate and monitor the construction costs of projects.

Civil Engineering Professionals

Weekly Pay **$1,962**
Future Growth **Strong**
Skill Level **Very high skill**

Includes these jobs:

Civil Engineers | Geotechnical Engineers | Quantity Surveyors | Structural Engineers | Transport Engineers

Construction Managers

Weekly Pay **$3,450**
Future Growth **Strong**
Skill Level **Very high skill**

Includes these jobs:

Construction Project Managers | Project Builders

All Civil Engineering Professionals

$1,962 Weekly Pay
Strong Future Growth
Lower unemployment Unemployment
53,300 workers Employment Size
Very high skill Skill level rating
90% Full-Time Full-Time Share
46 hours Average full-time
36 years Average age
12% female Gender Share

CIVIL ENGINEERING AT SWINBURNE

- **Ranked Top 100 in the world in Civil Engineering**

  Ranked 76th globally according to World Ranking of Academic Subjects, 2019
  Ranked 42nd globally according to U.S. News World Education Report, 2019

- **Practical curriculum developed in partnership with industry**
- **World standard smart structures and advanced geotechnical laboratory, and virtual transport modelling facility**
- **Work integrated learning with leading longstanding employers through industry placement**
- **A wide range of specialisations available through unique units of study offered by expert staff**
- **High employability rate upon graduation**

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UNDERGRADUATE DEGREES AVAILABLE

Single Degrees

- Bachelor of Engineering (Honours) (Professional)
  With a major in Civil, Construction or Architectural – includes a 12-month paid professional placement
- Bachelor of Engineering (Honours)
  With a major in Civil, Construction or Architectural

Double Degrees

- Bachelor of Engineering (Honours)/Bachelor of Business
- Bachelor of Engineering (Honours)/Bachelor of Computer Science
- Bachelor of Engineering (Honours)/Bachelor of Science
- Bachelor of Laws /Bachelor of Engineering (Honours)

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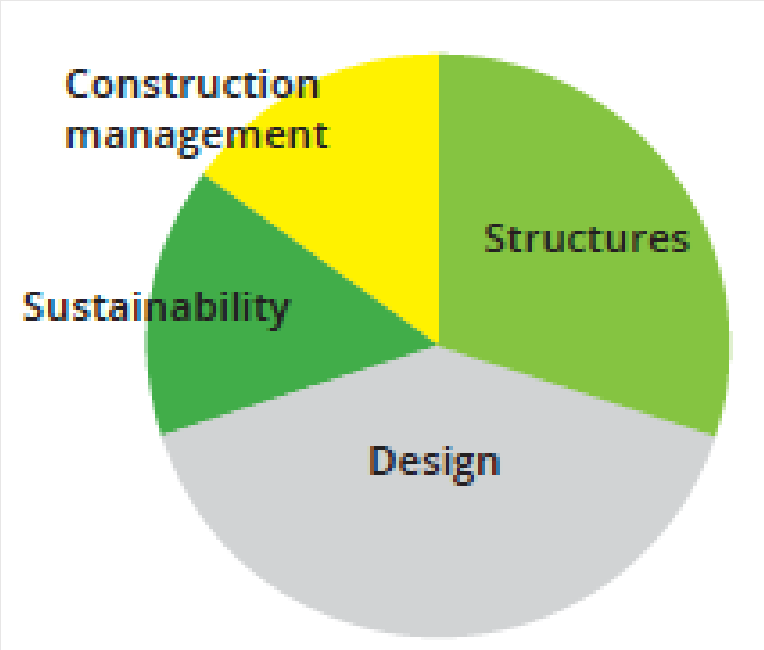
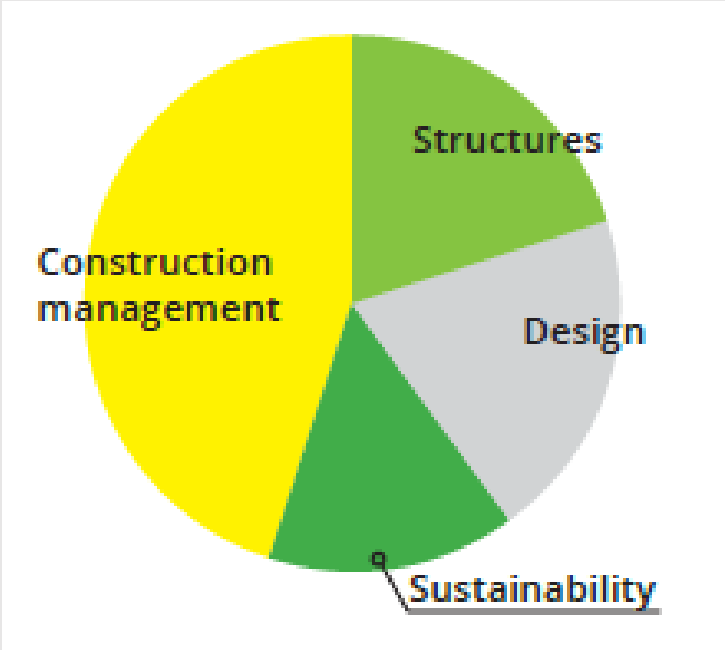
CIVIL, CONSTRUCTION AND ARCHITECTURAL MAJORS

COMMON FIRST YEAR

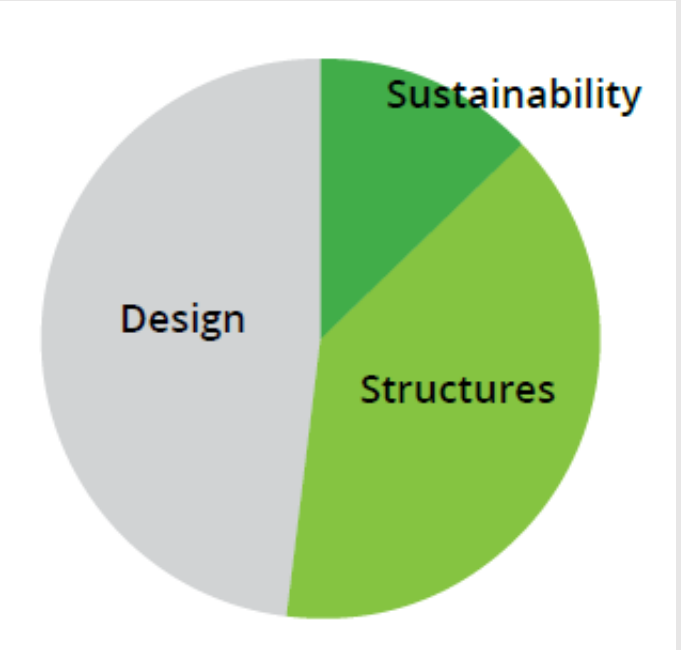
CIVIL



CONSTRUCTION



ARCHITECTURAL



GRADUATE CERTIFICATES AND DIPLOMAS

Associate Degree of Engineering
Diploma of Engineering (UniLink) (12 months)
Diploma of Engineering (UniLink) (8 months)
Advanced Diploma of Engineering Technology (Specialising in Civil)
Graduate Certificate in Risk Management
Graduate Certificate of Engineering (Civil)
Graduate Certificate of Engineering (Civil Structures)
Graduate Diploma of Engineering (Civil)
Graduate Diploma of Engineering (Civil Structures)

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MASTER OF ENGINEERING DEGREES

Master of Engineering (Civil)
Master of Engineering (Civil) / Master of Construction Management
Master of Engineering (Civil) / Master of Entrepreneurship and Innovation
Master of Engineering (Civil Structures)
Master of Engineering Science (Civil)
Master of Engineering Science (Civil Structures)
Master of Professional Engineering

HIGHER DEGREE RESEARCH

Master of Engineering (Research)
Doctor of Philosophy

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OUR LEARNING AND TEACHING APPROACH

Our students learn technical and management skills required to plan, design, build and maintain infrastructure.

Our teaching program combines engineering theory with industry needs and provides students with access to a range of opportunities such as:

- Work Integrated Learning
- State-of-the-art engineering laboratories
- Learning from highly-regarded academics

"Acciona Geotech wholeheartedly supports Swinburne's Work Integrated Learning program and acknowledges the quality of Swinburne's civil engineering programs as being both practical and relevant to industry.

While we offer student placements in a variety of disciplines, the vast majority of our students come from the civil engineering stream. And, thanks to the diversity and robustness of Swinburne's courses, students quickly find their feet and are able to undertake real work and add value in a very short period of time.

For our self-performing construction engineering businesses, the students' soft skills in a site engineering role are just as important as their technical skills, and we've found the balance taught at Swinburne to be right. With such investment in infrastructure, opportunities for civil engineers to fast-track their careers are plentiful. While nothing can replace real-world experience, we've found Swinburne's engineering programs provide their students and graduates a competitive advantage in being job-ready."

acciona GEOTECH

Dene Macleod
Business Improvement Manager, ACCIONA Geotech

OUR LEARNING AND TEACHING APPROACH

Year One

Your First Semester		Your Second Semester	
ENG10001 Engineering, Design and Innovation	+12.5	ENG10004 Digital and Data Systems	+12.5
ENG10002 Engineering Materials	+12.5	PHY10004 Electronics and Electromagnetism	+12.5
PHY10001 Energy and Motion	+12.5	ENG10003 Mechanics of Structures	+12.5
MTH10012 Calculus and Applications	+12.5	MTH10013 Linear Algebra and Applications	+12.5

Year Two

Semester One		Semester Two	
MTH20010 Engineering Maths 3	+12.5	CVE20003 Design of Concrete Structures	+12.5
MEE20004 Structural Mechanics	+12.5	CVE20005 Road Engineering	+12.5
CVE20001 Topographical Engineering	+12.5	CVE20004 Geomechanics	+12.5
CVE20002 Computer Aided Engineering	+12.5	MEE20003 Fluid Mechanics 1	+12.5

Year Three

Semester One		Semester Two	
MME30001 Engineering Management 1	+12.5	CVE40001 Geotechnical Engineering	+12.5
CVE30001 Urban Water Resources	+12.5	CVE40004 Water and Enviromental Engineering	+12.5
CVE30002 Design of Steel Structures	+12.5	CVE30004 Cost Engineering	+12.5
CVE30003 Transport Engineering	+12.5	MME40001 Engineering Management 2	+12.5
EAT20008 Professional Experience in Engineering	+0		

Year Four

Semester One		Semester Two	
ENG40001 Final Year Research Project 1	+12.5	ENG40002 Final Year Research Project 2	+12.5
CVE40002 Structural Design of Low Rise Buildings	+12.5	CVE40006 Infrastructure Design Project	+12.5
Component unit	+12.5	Component unit	+12.5
Component unit	+12.5	Component unit	+12.5

COMMON FIRST YEAR

Course 400 Credit Points

Core units
150 Credit points

A set of compulsory units you **MUST** complete as part of your Course.

First Major units
200 Credit points

A structured set of 16 units or 200 credit points in a field of study specific to your course.

Component Units
50 credit points

Can be completed from a combination of the following:

MINOR
A structured set of 4 units or 50 credit points from a field of study which you can choose in addition to a first major.

ELECTIVES
A standalone unit from any study area.

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STUDENT ENGINEERING EXPERIENCE AT SWINBURNE

Engineering degrees at Swinburne ranked the highest level of overall graduate satisfaction in Victoria and is above the national average (2019)

- 79.6% of students are satisfied with their Swinburne experience
- 83.5% of graduates were satisfied with their Swinburne Experience
- 71.6% of graduates were in full-time employment 4 months after graduation

Median salary for Swinburne engineering graduates is $60K

National Student Experience Survey Results				
	2016	2017	2018	2019
Quality of Teaching	77%	86%	75%	79%

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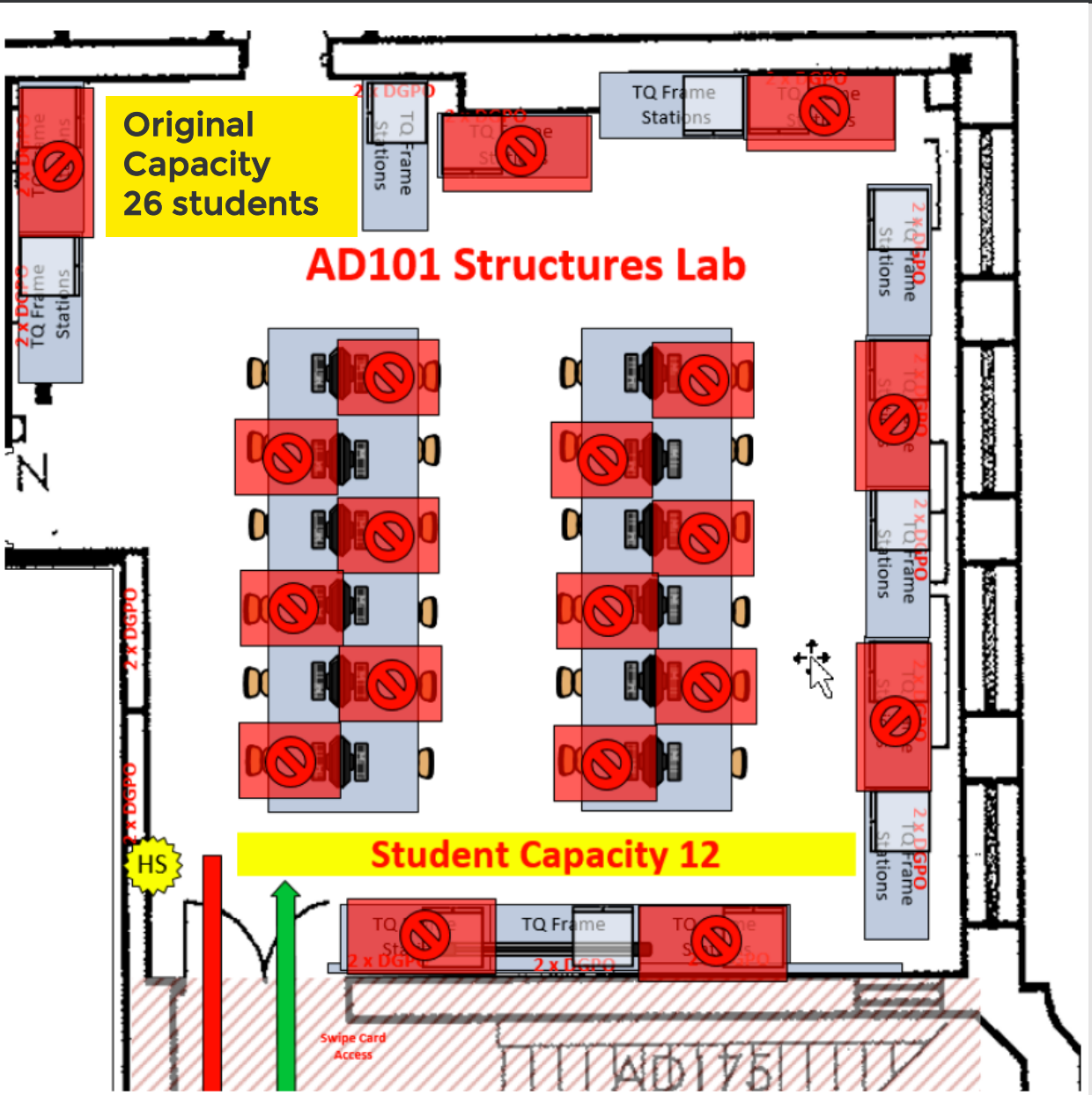
APPROACH TO LEARNING DURING COVID-19 PHYSICAL DISTANCING RESTRICTIONS

March – June 2020

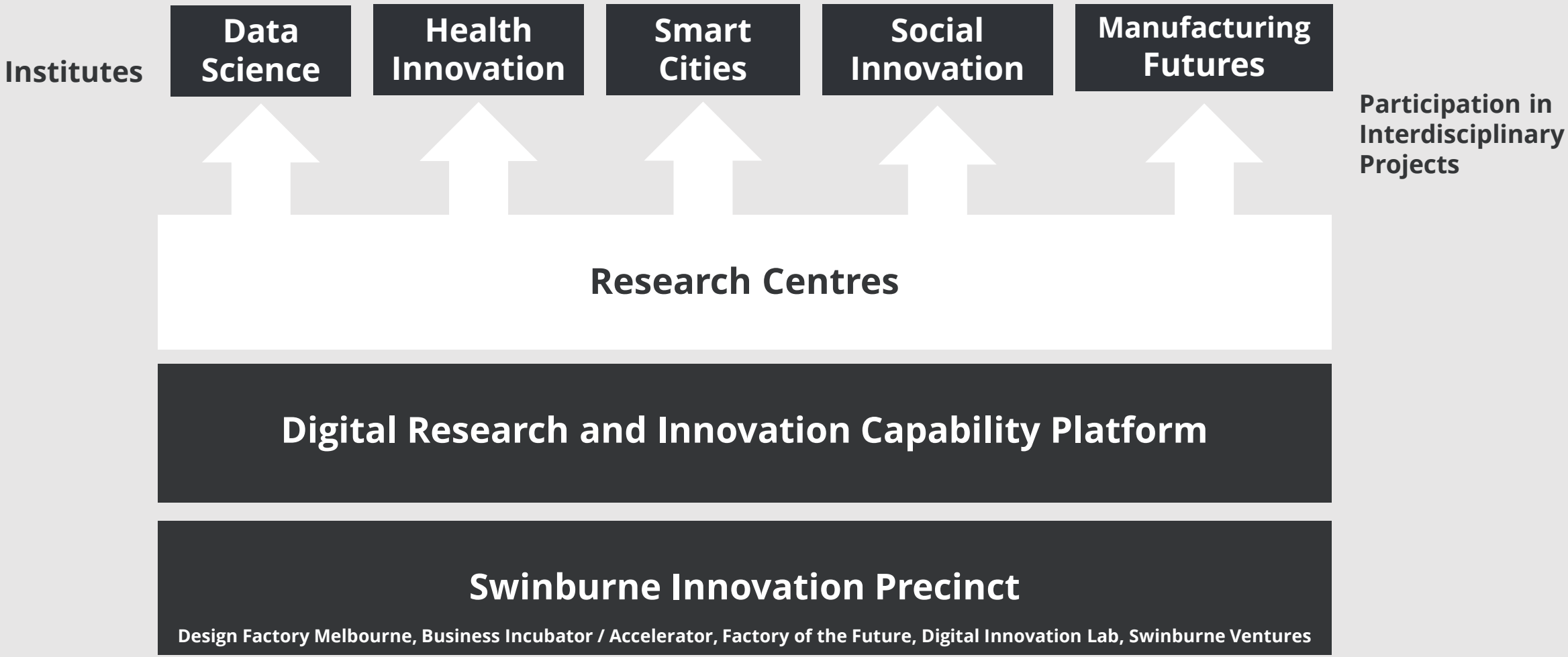
Online delivery using the Canvas Learning Management System, including collaborative tools for lectures, tutorial and practicals.

August – November 2020

All lectures online
All tutorial sessions online
Essential practical sessions on-campus



THE SWINBURNE RESEARCH ECOSYSTEM



CIVIL ENGINEERING RESEARCH FACILITIES

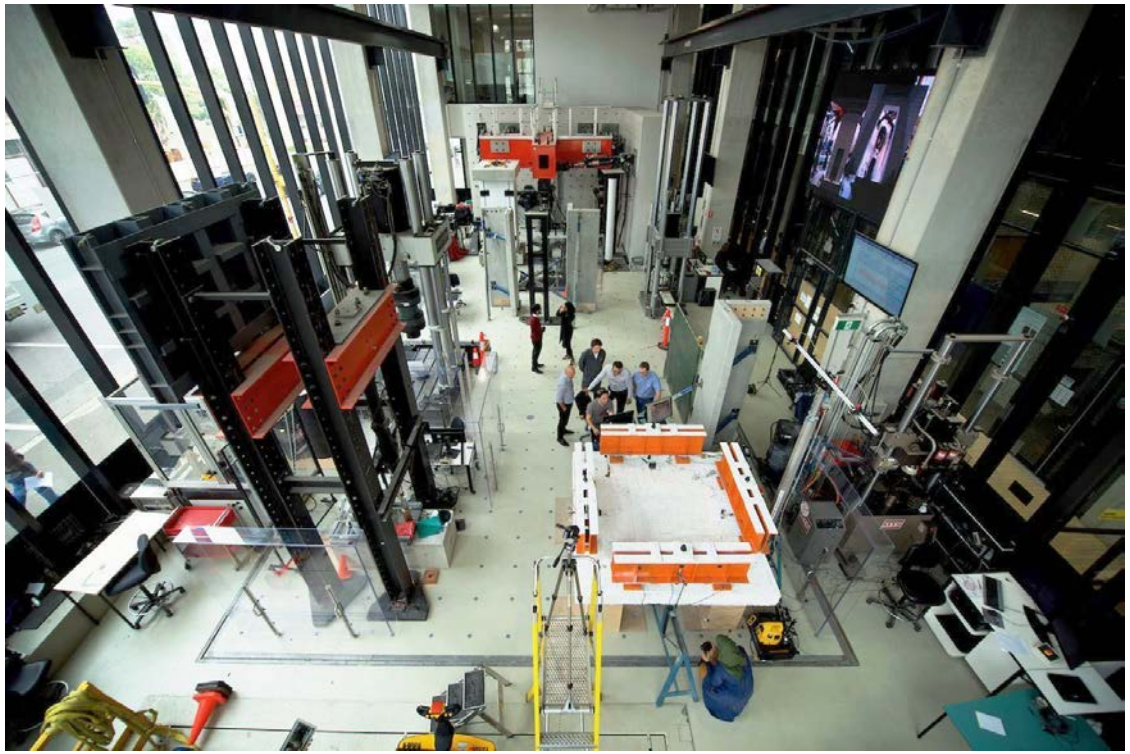
Research and innovation

Cutting-edge research feeding into teaching

Smart Structures Laboratory
Digital Construction Laboratory
Advanced Geotechnical Laboratory
Surveying Laboratory
Virtual Transport Modelling Facility

CIVIL ENGINEERING RESEARCH FACILITIES

Smart Structures Laboratory



CIVIL ENGINEERING RESEARCH FACILITIES

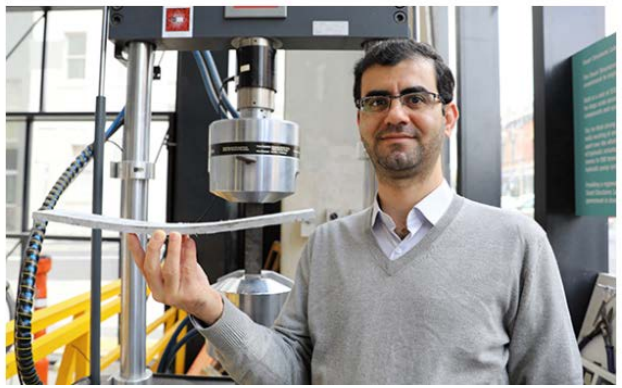
Digital Construction Laboratory – 3D Concrete Printing

We need to talk about cement

Concrete is essential to modern life, but it's no friend to the planet. The rush is on to find a way to make concrete without CO2

Bendable, safe, long-lasting and green cement-free concrete developed at Swinburne

Tuesday 3 March 2020



IN SUMMARY

- A new type of concrete made out of waste materials has been developed and patented by researchers at Swinburne
- The material can bend under load making it suited for construction in earthquake zones
- It uses industrial waste products instead of cement, making the product more sustainable than traditional

CIVIL ENGINEERING RESEARCH FACILITIES

Construction Innovation Virtual Research Facility

Coming soon: Trimble Digital Engineering Lab (2021)

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WHY SWINBURNE?

The Swinburne Advantage

Work Integrated Learning: Turning knowing into know-how

Your options	Duration	Compulsory	Paid	Degree credit
Professional degrees	12 months	Yes	Yes	Yes
Professional placements	6 or 12 months	No	Yes	Yes
Professional internships	1 semester	No	No	Yes
Accreditation placements	Varies	Yes	No	Varies
Industry study tours	15–30 days	No	No	Yes
Industry-linked projects	1–2 semesters	Yes	No	Yes
Create your own experience	Varies	No	No	No

37 international students obtained professional placements between 2017-2019

High graduate employment rates

Hands on learning using excellent facilities

Leading the way with new courses and approaches

Comprehensive range of double degrees

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INTERNATIONAL STUDY OPPORTUNITIES

Swinburne provides students opportunities to study part of their degree overseas.

- Gain credit for subjects completed overseas, to stay on track with their course
- Scholarships, travel grants and funding available
- Over 100+ program options available in 20+ countries
- Gain intercultural skills, learn a new language, meet friends from all over the globe, explore the world and become a global citizen

Programs include:

- Semester Abroad
- Faculty-Led Study Tours
- Short-Term Programs
- Overseas Internships

SWINBURNE UNIVERSITY OF TECHNOLOGY


DREAM BIG!
If you imagine it, you can engineer it!