MASTER OF APPLIED CYBERNETICS

2020 APPLICATION PACK

3AINSTITUTE.ORG
The collection of technologies we are currently calling artificial intelligence (AI) heralds the next industrial revolution: IoT turbo-charged by AI, advanced robotics, automated vehicles incorporating sensing data with other datasets, and machine learning driving automated decision-making. Rapid convergence into systems – cyber-physical systems – is having unprecedented impact on humanity through deep economic, social and cultural shifts.

The world needs new ways to enable the safe, ethical and effective design, integration, management and regulation of cyber-physical systems. The 3Ai Institute (3Ai) at the Australian National University (ANU) is forging this path through the creation of a new applied science (as yet unnamed).

ANU has a commitment to intellectual leadership, transformational experiences and building capacity for the 21st Century. 3Ai is a flagship of this commitment.

Located within the ANU College of Engineering and Computer Science, 3Ai brings together an interdisciplinary team led by Distinguished Professor Genevieve Bell, one of the world’s leading technologists and Senior Fellow at Intel.

In 2019, the 3A Institute piloted a postgraduate curriculum as a collaborative experiment to help incubate the intellectual framework of the new applied science. In 2020, we are continuing this mission.

As the technology landscape continues in accelerated flux, we will carry on testing, challenging and creating, with a new cohort of students, the blueprint for a new applied science, and exploring the opportunities for influence and impact where it matters.

The 3Ai Master of Applied Cybernetics is the first graduate program that grapples with the challenge of bringing intelligent cyber-physical systems safely to scale. We are seeking the next cohort of students who will continue to shape this new applied science, through our innovative model of collaborative learning, teaching and researching.

The Master of Applied Cybernetics is being offered by the College of Engineering & Computer Science, via competitive entry. Due to the unique nature of this degree, tuition will be covered for a small number of students who obtain one of these spots.
We are recruiting a small cohort of student participants. Selected participants will undertake a one-and-a-half-year period of study, commencing in February 2020. This includes 1 year full-time immersive in-person on ANU campus (February 2020 – February 2021). The final semester of courses will be delivered in flexible formats that allow off-campus study after February 2021. Depending on your academic and professional experience, you may qualify for credit towards courses run outside of the intensive one-year period, and thereby reduce the final semester load and degree length.

We encourage diversity in background, education, experience, gender, orientation and aspiration.

Admission requirements:
- Have Honours or a Graduate Diploma or Higher Degree (in any discipline) with a minimum GPA of 5/7.
- Have 3+ years of professional experience in an area of relevance to the new applied science.
- Be ready to start in February 2020 and able to commit full-time until February 2021, in person, on the ANU campus.
- Have an interest in participating as a co-investigator throughout the Masters.
- Demonstrated aptitude for sharing expertise with, and learning from, peers, stakeholders and partners.
- All applicants must meet the University’s English Language Admission Requirements for Students.

The following additional elements may be taken into consideration for ranking purposes for admission into the Master of Applied Cybernetics courses but are not mandatory admission requirements:
- A track record of outputs illustrating intellectual leadership in your field, such as (but not limited to):
  - Awards, grants and projects secured
  - Publications, media, policy briefings, outreach activities, guidelines and training delivered
  - IP, products and product concepts created
- A demonstrated ability to communicate complex ideas across disciplines, media and sectors, to a range of audiences.
- A demonstrated ability to operate with a high degree of flexibility and openness to calculated risk-taking. Demonstrated determination and resilience. Aptitude for working in uncertain and fast-changing environments.
- Demonstrated aptitude for interdisciplinary/cross-disciplinary collaboration
- Individual and/or group-based professional / entrepreneurial / community service contributions. Experience in one or multiple of these fields (highly regarded): education, policy, technology, business, the arts, science, engineering, computing, social sciences, and entrepreneurship.
- Ability to operate across disciplinary silos. Ability to think laterally and critically. Collaborative and mission-driven mindset.
The competitive selection process will include a formal application and interview process, to select a small cohort of students who will undertake the 3Ai’s Master of Applied Cybernetics and receive financial support.

Application to the Master of Applied Cybernetics

We will select members of the 2020 cohort through a three-step competitive process running between 19 July and 06 November 2019.

Applicants must be available to participate in phone and face-to-face (Canberra) interviews throughout the selection process. For candidates who are unable to get to travel to Canberra for a face-to-face interview, we will organise to interview you via live video stream.

All dates and times are in Canberra time (AEST).

I. Applications open: 19 July – 11.59pm 25 August 2019
Submit your application in accordance with the 3A Institute’s application process, found on our website.

Your application must include:

- Your up-to-date CV / resumé;
- A cover letter (max 2 A4 pages) addressing admission requirements of the Master of Applied Cybernetics listed in the Student Profile section above;
- One Portfolio Piece that succinctly demonstrates your interest in the new applied science. Your Portfolio Piece must be your own work and can be in any format – e.g. a short piece of writing, an artwork, a video recording, a piece of software, a poem, a blueprint, etc. – we encourage you to be creative! To avoid disappointment, we recommend you contact us early if your portfolio piece is a large file or requires unusual software to be opened. You can email us at 3ainstitute@anu.edu.au
- If your file is larger than 5GB, please contact us at 3ainstitute@anu.edu.au. We will assist you to find an alternative submission process.

We will contact applicants by 5pm on 20 September 2019 and invite shortlisted applicants to the next stage.

II. Phone interviews: 23 September – 04 October
Congratulations on making the shortlist! The selection panel will arrange a 20-minute phone interview with you.

We will contact applicants by 5pm on 08 October and invite further shortlisted applicants to the final stage.

III. Face to face interviews: 09 October – 24 October
The final round of interviews! Meet our selection panel for a 20-minute interview on the ANU campus.

We will extend offers to undertake the 3Ai Master of Applied Cybernetics to the top-ranked candidates by 29 October 2019. Candidates will have until 9am on 06 November 2019 to formally accept the offer.

Successful candidates who have accepted their offer from the Institute will be invited to complete their application formalities by applying for the Master of Applied Cybernetics through the Universities Admission Centre (domestic students), or directly to the university (international students) in line with the ANU’s application process.
**3AI MASTER OF APPLIED CYBERNETICS**

The 3Ai is committed to creating a new applied science to manage the machines, with a focus on cyber-physical systems. Our graduates will have cognitive, technical and creative skills to investigate, analyse and synthesise complex information, problems, concepts and theories and to apply established theories to different bodies of knowledge or practice.

The Master of Cybernetics has an overarching aim: to create pioneers of this new (as yet unnamed) applied science. As the new applied science continues for now in its infant stages, your participation in this program means not just grappling with but also testing the principles we have developed so far.

Participants are expected to dedicate 40 hours per week to the program, for the one-year duration of the on-campus delivery component (subject to the usual university holiday breaks). Around 20 hours per week will be in face-to-face class sessions. The remaining 20 hours per week will be reading, listening, reflecting, viewing, discussing and writing, as well as individual and group projects. The final semester can be completed flexibly around other commitments.

**COURSE STRUCTURE**

The 1-year intensive component of the Master of Applied Cybernetics (running from February 2020 – February 2021) is divided into five courses, totalling 60 units of coursework, which interact and reinforce each other.

<table>
<thead>
<tr>
<th>COURSE</th>
<th>Duration</th>
<th>Hours per week</th>
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<tbody>
<tr>
<td>Fundamentals of a new applied science I</td>
<td>Semester 1 2020</td>
<td>12 units</td>
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<td>This course will start to create pioneers who can critically examine new and emerging technological constellations and the questions they raise for human society. It challenges participants to (a) engage with technological detail and understand the building blocks of the technologies around us, (b) integrate multiple disciplinary perspectives in order to move from a focus on solving problems, to a focus on framing critical questions about cyber-physical systems (CPSs).</td>
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<tr>
<td>Fundamentals of a new applied science II</td>
<td>Semester 2 2020</td>
<td>12 units</td>
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<td>This course uses a case-study approach focusing on emerging CPSs. It is designed to (a) provide participants with an appreciation of the complexity and dynamics of the settings in which CPSs are planned, designed, built, operated and maintained, and (b) give participants a practical grounding in new and existing approaches they could use to analyse and intervene throughout the CPS lifecycle. Building on the critical framework established in Fundamentals I, this course challenges participants to explore the key questions of autonomy, agency and assurance, plus how we decide metrics for success and what the interface looks like, when planning, designing, building, operating and maintaining cyber physical systems.</td>
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<tr>
<td>New applied science: Lab</td>
<td>Semesters 1 &amp; 2 2020</td>
<td>24 units</td>
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<tr>
<td>This course will give participants a hands-on understanding of new and emerging technological constellations and their separate components. Participants will complete a range of lab-based projects to develop an understanding of systems as designed objects which embody values. They will also gain confidence in designing, building and understanding such systems, putting the skills...</td>
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learned in Fundamentals I and II into practice. Through learning-by-doing, participants will complement their existing skillsets and gain the mastery required to build and guide teams developing and understanding new and emerging technologies.

**New applied science: Capstone project**

**Summer session 2021 | 12 units | 40 hours per week**

Within this course, projects and special topics may be offered that vary from year to year. This course will enable students to develop competencies expected of professionals working in business, government academia or the broader community. There may be internship opportunities available for which students can apply. A holistic selection process will be used to select the best applicant for each opportunity. Students can also propose internships or research projects, but these will always be established following negotiations between the ANU and the potential host organisations or project sponsors, before being offered to students along with other opportunities.

A further 12 units of coursework will be delivered through flexible formats outside of the one-year intensive experience.

**Cybernetics and Cyber-physical Systems**

**Semester 1 2021 | 6 units | 20 hours per week**

This course will introduce the history, theoretical frameworks and key concepts of cybernetics and cyber-physical systems. “Cybernetics” as a field was invented in 1948, when American mathematician and philosopher, Norbert Wiener coined the term in his book of the same name. Wiener’s early explorations of the topic brought together anthropologists, psychologists, biologists, philosophers, and early proponents of computing to investigate systems level interactions and feedback loops that encompassed biological, technical and human systems. Today, cyber-physical systems, or CPS, are often viewed as the application of cybernetics. This course will explore CPS in this context.

**Scaling Systems Safely: Assurance, Ethics and Governance**

**Semester 1 2021 | 6 units | 20 hours per week**

Cybernetic or cyber-physical systems (CPS), already surround us, and are increasingly being designed to make decisions that previously required human insight and input. In order to ensure humanity maximally benefits from these new advances in technology, the world will need practitioners who can holistically consider and manage the potential impacts of CPS on humans, each other, and our world. Safely scaling technical systems will take more than just an awareness of ethics; it will also require identifying, predicting, and mitigating risk in complex technical systems, which are additionally complicated by the capacity of CPS to evolve beyond its initial state. This course will explore assurance frameworks that act as the mechanism by which risk involved with CPS is identified and managed in an informed and strategic way.

**Degree Structure Overview:**

**February 2020 – November 2020 | On-campus**

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
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<tbody>
<tr>
<td>Fundamentals I (12 units)</td>
<td>Fundamentals II (12 units)</td>
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<tr>
<td>Lab (24 units)</td>
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**January 2021 – February 2021 | Intensive**

This course will run intensively as either a research-based project or internship.

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<th>Summer</th>
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<td>Capstone Project (12 units)</td>
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**January 2021 – February 2021 | Flexible Teaching**

These courses will run as online courses.

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<th>Semester 1</th>
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<tbody>
<tr>
<td>Cybernetics &amp; Cyber-physical Systems (6 units)</td>
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<tr>
<td>Scaling Systems Safely (6 units)</td>
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**MORE INFORMATION**

You can find more information in the Frequently Asked Questions document available on the 3A Institute website.

If you still have questions, please contact us at 3Ainstitute@anu.edu.au.

**GOOD LUCK!**

To keep in touch with the 3A Institute:
- Join our mailing list via this link
- Follow us on Twitter: @3ainstitute
- Visit our website: 3ainstitute.org

**BENEFITS**

We don’t expect the 3Ai postgraduate courses to be for everyone. Those able to come on the journey can expect a range of benefits…

- **Help develop a new applied science in Australia**
  You will partake in a pioneering course that is world-first in offering postgraduate education that focuses on the implications of bringing artificial intelligence safely to scale.

- **Open new employment opportunities**
  Explore further study or teaching positions at ANU, or internships and employment with our many Australian and international partners.

- **Build a strong community**
  Work closely with 3A Institute faculty and your peers to develop long-lasting relationships, which we will support well beyond the end of the program.

- **Boost your professional networks**
  Collaborate with visiting experts from a wide range of disciplines and sectors in Australia and around the world.

- **Play a role in reimagining tertiary education**
  The 3A Institute is part of a bold project to reimagine the constellation of engineering and computing disciplines, being led by the ANU College of Engineering and Computer Science.

- **Earn a fee-free Masters experience**
  We will cover tuition fees for all students in the cohort, and provide scholarships to offset the cost of taking a year out to help build Australia’s future.