EIS Summer Scholarship Projects 2022			
Title of Research Project 1:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Nano-Physics and Thin Film Technologies	Thin film technologies, surface and interfacial sciences, nano- technologies, hybrid structures (magnetism, superconductivity, semiconductors), novel phenomena at interfaces explored by neutrons, high density magnetic storage systems, spintronics (spin-electronics) and novel devices, these are just a few key words highlighting what is explored within this project tailored individually for every interested student with the help of the state of the art ultra high vacuum and low temperature experimental facilities and theory.	Prof Alexey V Pan	10 weeks
Title of Research Project 2:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Superconductivity and Superconducting Materials	Absence of resistance, revolution in energy handling and generation, new superconducting electronics, single photon and single proton detection for space and medicine, quantum supremacy, quantum vortices, high energy particles probing superconducting quantum states, magneto-optical imaging, these are just a few key words highlighting what is explored within this project tailored individually for every interested student with the help of the state of the art equipment and theory.	Prof Alexey V Pan	10 weeks
Title of Research Project 3:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Uptake of sustainable technologies in alternative housing communities	There is a small, but active niche of alternative housing communities in Australia, with residents/members trying to create housing responding to a need (e.g. environmental or social) that isn't being met by the current housing system. Examples include ecovillages, deliberative developments and cohousing. Evidence suggests that these communities can achieve significant reductions in environmental impact. This project will map out the existing and forming communities around Australia, and assess the key sustainability technologies and initiatives being undertaken. Research will involve reviewing publicly available information, and collecting data from communities (e.g. survey).	Dr Matthew Daly	8 weeks
Title of Research Project 4:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Weld Process Trials for Advanced WAAM Applications	Our research group has developed an advanced non-planar slicer for a Wire Arc Additive Manufacturing (WAAM) system in our manufacturing laboratory. We require a student to test this software system by developing a stable welding process that can reliably fabricate a set of sample components. The student will be provided the opportunity to operate a Yaskawa/Lincoln robotic welding system in our lab, and will be tasked with: A) Studying and understanding the Lincoln STT welding process and how it can be tuned for our advanced welding application, and B) Performing physical welding trials to additively manufacture two sample components we have developed.	Dr Joseph Polden	10 weeks
Title of Research Project 5:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Validation of experimental structural measurements of the 3D Digital Correlation System	The School of CMEA has recently acquired the 3D Digital Image Correlation (DIC) System for non-contact optical measurements of response of structural elements such as beams, columns, connections etc. The 3D DIC system can be used with many tests including tensile, torsion, bending and combined loading for both static and dynamic applications. This project aims to validate the measurements obtained using the 3D DIC system on simple structures to compare the experimental results with the theoretical results of stresses, strains and displacements. Simple structural elements like beams will be tested under 3- or 4-point bending tests and the experimental results from the 3D DIC system will be recorded and then compared with the theoretical calculations for the beams.	Prof Alex Remennikov	8 weeks
Title of Research Project 6:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Optimised Harmonic Management Processes In Renewable Energy Zones	The management of power system harmonic distortion has increased in complexity due to the ongoing rate of connection of large-scale renewable energy generators. Existing methodologies in the allocation and mitigation of harmonic distortion results in the vast majority of renewable generators requiring the installation of harmonic filters, capable of significantly increasing capital expenditure. Preliminary studies have shown that this may not be the optimal approach. This project aims to investigate revised processes in the design and location of harmonic filters to ensure the system does not exceed planning levels and does not drastically increase costs to connecting proponents.	Dr Jason David	10 weeks
Title of Research Project 7:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Enhancing the radar footprint of a stealthy craft	Many military powers in the world resort to composite material and sharp object angles to deflect radar signals to project a very low radar footprint to conceal their modern crafts. However, with the emergence of deep learning, it would be interesting to see whether combining a radar footprint with larger wake on ocean surfaces could predict the possibility of a larger craft even when a small radar footprint is detected. This project will lay the groundwork for a future PhD project.	Dr Prashan Premaratne	10 weeks
Title of Research Project 8:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**

Towards Indigenous Community Masterplanning: Benchmarking tool development for existing Indigenous housing stock	The provision and maintenance of culturally appropriate social and affordable housing stock is a key goal of Indigenous communities and government. However, research indicates that such appropriate housing is currently lacking. This project involves a scoping study of indigenous housing sites across the NSW South Coast (Yuin Nation), considering the appropriateness of existing housing stock. A prioritisation and benchmarking tool will be prepared, which may consider factors including community health and wellbeing, housing standard, disaster/climate change resilience, community engagement, community capability and capacity and use of sustainable technologies. This research will build a locally-focused understanding of indigenous housing; critical in the development of community master plans.	Dr Matthew Daly	8 weeks
Title of Research Project 9:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Development of Dynamic Load Models for Power System Planning, Operation and Control	Load Modelling is off key importance to power system operators. The current static load models used by the Australian Energy Market Operator (AEMO) is unable to accurately model the complex network behaviour due to the significant change in the end-user composition of load and increase in the number of PV inverters in the network. This project, in collaboration with AEMO, aims to carry out extensive experimental testing of modern loads when subject to various voltage, frequency, and phase disturbances. The results obtained from the tests will be utilized to model the dynamic behaviour of common household loads in future power systems.	Dr Obaidur Rahman	10 weeks
Title of Research Project 10:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Evaluation of the Impact of DER on Electricity Supply Networks	This project involves assisting the Australian Power Quality and Reliability Centre to assess the impact of Distributed Energy Resources (DER) on the operation of electricity supply networks. The project will involve review of literature, theoretical studies along with laboratory testing of a number of DER devices.	A/Prof Duane Robinson	10 weeks
Title of Research Project 11:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Energy Storage to improve Infrastructure Resilience: Commissioning and Field Measurements	This project involves working with the Australian Power Quality and Reliability Centre in conjunction with Shoalhaven Water to deploy energy storage technologies designed to improve the resilience of Shoalhaven Water pumping sites. The successful student will assist with commissioning of the systems and ongoing performance assessment through deployment of field measurements systems and analysis of collected data. The student can expect to be undertaking work in both the Shoalhaven region as well as at the Sustainable Buildings Research Centre at the University in Wollongong.	A/Prof Duane Robinson	12 weeks
Title of Research Project 12:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Energy Storage to improve Infrastructure Resilience: Modelling and Analysis	This project involves working with the Australian Power Quality and Reliability Centre in conjunction with Shoalhaven Water to deploy energy storage technologies designed to improve the resilience of Shoalhaven Water pumping sites. The successful student will assist with modelling and analysis of the energy storage systems including investigation of the potential for operation as a virtual power plant. The student can expect to be undertaking work in both the Shoalhaven region as well as at the Sustainable Buildings Research Centre at the University in Wollongong.	A/Prof Duane Robinson	12 weeks
Title of Research Project 13:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Energy Storage to improve Infrastructure Resilience: Hardware Development	This project involves working with the Australian Power Quality and Reliability Centre in conjunction with Shoalhaven Water to deploy energy storage technologies designed to improve the resilience of Shoalhaven Water pumping sites. The successful student will assist with hardware design, construction, deployment and commissioning and can expect to be undertaking work in both the Shoalhaven region as well as at the Sustainable Buildings Research Centre at the University in Wollongong.	A/Prof Duane Robinson	12 weeks
Title of Research Project 14:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Waste auditing of prefabricated housing/building construction waste	Prefabrication, or offsite construction, has been identified as a more sustainable method of building construction, with one of the key features always being that it creates less waste. However, there is currently insufficient data available to support and justify these claims. This project will involve visiting construction sites, as well as prefabrication factories, to understand waste auditing and gather data on how much waste is being generated and how it is managed. This research will contribute to understanding the impact that prefabrication can have on reducing waste.	Dr Leela Kempton	10 weeks
Title of Research Project 15:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Augmented Reality and digital twins of sustainable buildings	This project will use state of the art photogrammetry software, Reality Capture, combined with VR and AR games engines to produce digital twins of Desert Rose House and Illawarra Flame House to demonstrate the potential of AR in explaining the sustainability features of these houses. The Scholar should have good experience with Revit and be willing to learn software such as Reality Capture, Epic Games Unreal Engine and/or Unity. The project will use Microsoft Hololens AR headset and Adobe Aero AR tool on Ipad.	Prof Tim McCarthy	10 weeks
Title of Research Project 16:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**

Deep Learning for Object Detection and Classification with Satellite and Drone Imaging	This project aims to develop deep learning algorithms and tools for locating and recognising objects with satellite and drone imaging. These tools have important applications in space surveillance, environment monitoring, precision agriculture, infrastructure management, and many other areas. The project tasks will include image acquisition, data annotation, algorithm development, system implementation and evaluation. This project seeks a student (in computer engineering, computer science, or a related major) with experience in Python/MATLAB programming and a strong interest in a postgraduate research study on machine learning and AI.	Prof Son Lam Phung	10 weeks
Title of Research Project 17:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Wearable Sensor development for the OSH improvement of construction workers	Australia's construction industry generates over $360 billion in revenue, producing around 9% of its Gross Domestic Product. Unfortunately, the construction industry is also one of the largest sources of work-related injuries, in 2012-13 alone the cost of injury to the economy was $61.8 Billion or 4.1% of GDP. Alarmingly, 77% of work-related injury and disease costs are borne by workers and 18% by the community. This project aims to develop wearable devices that will reduce injury to workers by detecting and warning the user of potential injury risks while reducing associated costs to businesses. The project aims to use artificial intelligence to correlate a detailed laboratory movement recording system to a more portable and wearable device. The project requires advanced knowledge in Machine learning.	Dr Aziz Ahmed	8 weeks
Title of Research Project 18:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Engineered Bamboo for Sustainable Construction	Currently, there is a significant timber shortage in the construction industry and in general an over-reliance on natural wood products that take many years to mature. On the other hand, bamboo is fast growing grass that can be engineered into structural products. However, the application of Engineered Bamboo in construction is very limited at this time. To change the perception about Engineered bamboo, this project aims to assess the suitability of engineered bamboo beams for structural applications. The project will involve experiments on Engineered Bamboo based structural connections commonly found in the construction of residential buildings.	Dr Aziz Ahmed	8 weeks
Title of Research Project 19:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Neuromusculoskeletal analysis and dynamic simulation of eccentric cycling	Neuromusculoskeletal models help simulate the complex processes related to the neural and muscular control of human movements. This topic (part of a UOW 2022 Aegis Connect project), is aimed at achieving a better understanding of eccentric cycling (backward pedalling while applying forces) in the context of sports and clinical rehabilitation. A special focus will be on quantifying the changes that our movement apparatus undergoes at a neuromuscular level as a consequence of this exercise regime. Students should have strong aptitude for computer based- methods, modelling and MATLAB experience, and be familiar with fundamentals of human physiology.	Dr Manish Sreenivasa	10 weeks
Title of Research Project 20:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
3D printed Low Carbon Concrete with Accelerated Buildability	This project will be part of an ongoing project on 3D printed Low Carbon Concrete. The main aims of the project are as below: 1. To develop several mix designs for low-carbon concrete by partially replacing cement with blast furnace slag. 2. To develop simplified test equipment to assess the suitability of concrete 3D printing. This project will involve laboratory experiments. The student will get first hand experience in the exciting field of 3D printing of concrete.	Dr Aziz Ahmed	8 weeks
Title of Research Project 21:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Development and experimental setup for recording dynamics of eccentric cycling	Eccentric cycling (ECC) involves a backward pedalling motion in which participants apply a force against the pedals during the muscle lengthening phase. ECC has been shown to place lower cardiorespiratory demand on the participants (relative to traditional cycling), with improved neuromuscular outcomes. This topic (part of a UOW 2022 Aegis Connect project), will focus on developing and fine-tuning an experimental setup to record the kinematics and dynamics of ECC. Students should have strong aptitude for experimental work, signal processing and good MATLAB programming experience. Knowledge of physiology would be beneficial but not critical.	Dr Manish Sreenivasa	10 weeks
Title of Research Project 22:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Design of prosthetic socket pressure sensors	Socket fit is rated as the most important aspect of lower-limb amputee satisfaction with their prosthetic socket. Excess pressure in the socket can cause wounds, pain and gait alterations. This project will involve the design iteration, fabrication and benchtop testing of a portable in-socket pressure measurement system for use in prosthetic legs. Students will be asked to design and manufacture software and hardware for the system and will participate in benchtop testing of the system in the laboratory.	Dr Lucy Armitage	10 weeks
Title of Research Project 23 :	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**

Human-to-Robot Skill Transfer via Teleoperated Robotic Hand	This project aims to develop a new teleoperated robotic hand that can easily adapt to different industrial tasks by acquiring new skills from human workers to improve the flexibility and productivity of manufacturing processes. With the real-haptic sensation-based human-to- robot skill transfer technique and the intrinsically safe actuation technology, the proposed teleoperated robotic hand can i) safely work alongside humans in open factory environments, ii) perform more delicate tasks than existing robotic systems, and iii) be rapidly reconfigured for different tasks by human workers who will not have to be trained in robotics and programming.	Dr Emre Sariyildiz	8 weeks
Title of Research Project 24:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Secure blockchain protocols based on Hyperledger Fabric	Blockchain is an emerging topic, with a business value reaching $176 billion by 2025, as predicted by Gartner. Hyperledger Fabric is an enterprise-grade permissioned blockchain framework that offers modularity and versatility for developing secure blockchain-based solutions and applications. This summer scholarship will train students in blockchain fundamentals and programming in Hyperledger Fabric. The outcome of this project will design fair and secure blockchain applications based on Hyperledger Fabric.	Dr Yannan Li	10 weeks
Title of Research Project 25:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Geothermal energy recovery from energy screw pile foundations – Experimental development	Integrating heat pump technology, geo-structures can be transformed into energy-structures harnessing geothermal energy. For example, screw piles typically composed of hollow pipe sections can be utilised as an energy pile by installing a fluid circulation system. However, evaluating the capacity of screw piles subjected to thermal loads is essential in establishing confidence in the proposed technology. The project expects to develop an energy-pile physical model by modifying the existing screw pile test apparatus in the geotechnical engineering laboratory to investigate the axial capacity of the energy pile. Interest in experimental work and on-campus attendance is essential for this project.	Dr Pabasara Wanniarachchige	10 weeks
Title of Research Project 26:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Geothermal energy recovery from energy screw pile foundations – Numerical modelling	Due to the rising cost and severe environmental consequences of conventional fuels, the world is looking for alternative energy sources. Geothermal near-surface systems based on heat pumps have already proved feasible for heating and cooling buildings with low CO_2 footprints. This concept-level project will evaluate the potential of harnessing geothermal energy through screw-pile foundation systems integrated with a heat exchanger comprising fluid circulation pipes. The expected outputs include a finite element model to simulate fluid flow and heat transfer through the energy pile. Prior experience or interest in numerical simulations is essential for this project.	Dr Pabasara Wanniarachchige	10 weeks
Title of Research Project 27:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Investigating liquid surfaces and bulk by terahertz time-domain spectroscopy	In most spectrometers, the beam is horizontal. This means it is not possible to measure a liquid directly – first it needs to be placed in a suitable container (cuvette). However, this then complicates the measurement, by adding additional absorption, reflection or scattering. By using moveable terahertz emitters and detectors, the project will attempt to measure the liquid directly, not through the walls of a container. Better data should result from this approach. This project will use the commercial terahertz time-domain spectrometer (Terapulse, by Teraview) located in the School of Physics, using remote emitter/detector heads.	Prof Roger Lewis	8 weeks
Title of Research Project 28:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
November 15-24 beamtime experiments at the Australian Synchrotron terahertz beamline	This project requires the student to travel to Melbourne to undertake experiments on the far-infrared/terahertz beamline of the Australian Synchrotron during the period 15-24 November (note partial clash with examination period). Travel and accommodation will be provided as these are included with the allocation of beamtime already granted by the Australian Synchrotron. The materials to be tested include plastics with a view to improving recycling yields and novel magnetic materials. After the two intensive weeks spent collecting the data, the remainder of the project time will be spent in analysing, interpreting and writing up the results.	Prof Roger Lewis	8 weeks
Title of Research Project 29:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Optically pumped, terahertz probed spectroscopy of semiconductors	The School of Physics has already constructed a terahertz time-domain spectrometer. The project here involves extending the operation to allow optical pumping of materials. The information obtained from optical pumping gives insight into the dynamics of charge carriers, such as electrons, in the material. The current spectrometer splits a very short (<15 fs) laser pulse into synchronised excitation and detection beams. To now add optical pumping requires the pulse to be split again, to provide a third beam synchronised with the other two beams. The project will add the optical components to allow optical pumping to be achieved.	Prof Roger Lewis	8 weeks
Title of Research Project 30:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**

Development of Monte Carlo simulation tools for bio-medical physics	Geant4 is a Monte Carlo simulation code extensively used in bio-medical physics. The Centre For Medical and Radiation Physics (CMRP), University of Wollongong, contributes significantly from many years to the development of Geant4 tools for medical applications, which are then used internationally by the Geant4 bio-medical community. The project will have two parts: 1) Develop a Geant4 application to support Geant4 users to use the Geant4 Atomic De-excitation Package, 2) Extend an existing Geant4 test, developed at CMRP, to validate Geant4 for carbon ion therapy. The research takes place within vibrant collaborations, involving ANU, IN2P3 and CERN.	A/Prof Susanna Guatelli	10 weeks
Title of Research Project 31:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
A new magnetorheological isolator with low vibration bandgaps	Vibration isolation plays an important role in protecting machines or systems from external excitations. The project aims to develop a new metamaterial magnetorheological elastomer (MRE) isolator, which is capable of isolating vibrations with tunable bandgaps for engineering applications. This project consists of two major tasks: (a) design and analysis of bandgaps of the new isolator; and (b) experimental evaluation of dynamic performance of the isolator.	Prof Weihua Li	10 weeks
Title of Research Project 32:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Microbeam Radiation Therapy R&D	Treatment of some cancers (e.g. glioblastoma multiforme) is very challenging. Radiosurgery with submillimetre X-ray beams, or Microbeam Radiation Therapy (MRT), is a novel emerging treatment approach. This translational R&D program incorporates several potential projects, matched to compliment individual student interests, and include: • MRT radiation detector design, simulation, development and testing, • Electronic readout hardware, firmware and software design development and testing, • MRT treatment simulation, planning and validation • MRT image guidance and treatment enhancement using nanoparticles • MRT related in vitro and in vivo preclinical experiments Projects may involve active participation in experiments at CMRP, National scientific accelerator facilities and clinical radiation oncology centres.	Prof Mike Lerch	8 weeks
Title of Research Project 33:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Intelligent robotic workspace	The key to unlocking more potential for industrial robotics is to make them smarter. Traditionally, robots follow a pre-programmed path where any variation to the path or sequence of events must be pre-determined. However, with the addition of sensors and high computational power, it is expected that robots will eventually be able to respond to dynamic changes in the robot's workspace. This project will explore using sensors to detect the workspace environment and assess the effectiveness of using AI to identify changes in the environment.	Dr Philip Commins	10 weeks
Title of Research Project 34:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Immersive Digital Twins	This project will explore immersive digital twins. As part of the Industry 4.0 revolution, digital twins of manufacturing equipment and processes are becoming more popular. Many of these digital twins are either virtual or connected twins, where the data of the twins are not easily accessible by personnel on the factory floor. Therefore, more immersive digital twins using mixed reality digital technology are desirable to increase their effectiveness.	Dr Philip Commins	10 weeks
Title of Research Project 35:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Next Generation of Programming Industrial Robots with Augmented Reality	This project will further the work on understanding how augmented reality solutions can be used for more intuitive robotic programming. This project will involve using holographic technology, such as the Microsoft HoloLens, to visualise robotic workspace, motions and path planning.	Dr Philip Commins	10 weeks
Title of Research Project 36:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Monitoring indoor conditions of houses in ACT	The student will assist in the development of the monitoring methodology for 25 houses in ACT, with a possibility to also assist in the auditing and surveying of the houses. This is part of an existing project the Sustainable Buildings Research Centre has with CSIRO to collect energy and indoor thermal comfort data from houses in ACT. The student will become familiar with the sensors used for monitoring the energy performance of buildings and the parameters used in thermal comfort assessments.	A/Prof Georgios Kokogiannakis	10 weeks
Title of Research Project 37:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Efficient and privacy-preserving subgraph query in the cloud	Graphs are widely used to model the complex relationships among different entities. As a fundamental task, subgraph queries, such as influential community query and direct k-core query, are generally recognized as a promising approach for finding cohesive groups. However, as the size of graphs grows, the service provider tends to outsource the services to the cloud for flexible and reliable computational resources. While due to the properties of cloud services, privacy is a big concern. In this project, we aim to develop efficient and privacy- preserving subgraph query approach to meet the requirement in real applications.	Dr Chen Chen	10 weeks
Title of Research Project 38:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**

Development and evaluation of soft pneumatic sensors for neuromechanics applications	Measuring the interaction forces between human body and interface devices, is vital to gain a full understanding of the neuromechanics of movement. In previous research, the use of 3D printed pneumatic sensors has proven to be an effective way to design customized force transducers. This topic will expand on this pilot work by specifically developing and evaluating pneumatic chambers that could be embedded within shoes, or under clothing, to record interaction forces during movements. Students should have strong aptitude for experimental work, computer based- methods and interest in 3D printing. Knowledge of physiology would be beneficial but not critical.	Dr Manish Sreenivasa	10 weeks
Title of Research Project 39:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Quantum-safe Distributed Storage: Password Protected	A password-protected distributed storage allows a user to store shares of data on a set of L servers, and use a single password to authenticate itself to any subset of k(<L) servers at a later time to access the shares and reconstruct the data. In this project, we aim to construct a password-protected quantum-safe system from lattices.	Dr Partha Sarathi Roy	10 weeks

Title of Research Project 40:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
The Design and Implementation of Broadcast Encryption Scheme on Lattices	Broadcast encryption (BE) allows transmitting an encrypted message over a public channel to multiple receivers and only authorized users can obtain the plaintext. Compared with repeatedly invoking point-to-point encryption, BE saves computation and communication costs. A few directions are derived from BE. In identity-based broadcast encryption (IBBE), the ciphertext is appended with intended recipients' identities, thus the computation and communication cost hinder its application in large-scale resource-limited wireless networks such as IoT. In addition, anonymity is valued more with the increase in the public's privacy awareness. This project will start by reviewing lattice-based BE schemes and simulating existing schemes using crypto libraries such as NTL, then progress to seek solutions to high-performance BE construction and implementations on Lattices.	Dr Xueqiao Liu	10 weeks

Title of Research Project 41:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Commissioning a major laboratory test facility for sustainable buildings research	The SBRC is commissioning the $2.1 M Building Insights Facility (BIF) which will be a major test facility for the Faculty of Engineering and Information Sciences with 5 major test capabilities enabling large scale experimental measurement of building facades, indoor environments and air conditioning equipment (https://www.uow.edu.au/sbrc/facilities-and- equipment/). This chamber is in the final stages of commissioning, and will be entering a shakedown process – which you can contribute to. This is a unique opportunity for you to participate in a variety of practical and theoretical work to help bring this facility online.	Dr Craig McLauchlan	10 weeks

Title of Research Project 42:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Machine learning for perceptive wireless network signal processing	Wireless networks are evolving from networks with only communication services to perceptive wireless networks with advanced sensing capabilities. Perceptive wireless networks synergize communications and sensing, making the networks intelligent and enabling innovative applications such as smart transportation and smart city. In this project, you will investigate the use of machine learning techniques to address some challenging signal processing issues for joint communications and sensing in perceptive wireless networks.	A/Prof Qinghua Guo	10 weeks

Title of Research Project 43:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Modelling Modern Distribution Systems using DIgSILENT PowerFactory	Distributed and renewable energy resources are integral part of modern distribution systems. Also, there are conventional network components such as low voltage and medium voltage feeders, transformers, voltage regulators and capacitor banks embedded within a distribution system. The main aim of this project is to undertake modern distribution system modelling studies in DIgSILENT PowerFactory. As a first step, thorough literature review related to the topic is required to be conducted. Also, to begin with, it is envisaged that the standard IEEE test systems will be used to build a representative distribution system. Student should be able to apply various DIgSILENT modules effectively for analysing the network data and generating meaningful results. A draft research paper needs to be developed highlighting outcomes of the research work by the end of the project. [Note: The supervisor will be away on an annual leave during the summer break. In such case, the student should be able to undertake the research work independently]	A/Prof Ashish Agalgaonkar	10 weeks

Title of Research Project 44:	**Description of Project:**	**Primary Academic Supervising:**	**Duration:**
Development of a hardware-in-the-loop platform for two degree-of-freedom electromagnetic seat suspension.	In recent years, electromagnetic damper has drawn growing attention due to its advantages like fast response time, low maintenance and design flexibility. The aim of this project is to develop a test platform for seat suspension that incorporate real-world devices and simulations simultaneously. The hardware includes a direct-current (DC) motor which acts as an electromagnetic damper and a servo motor that generates excitation. A two degree-of-freedom seat suspension model is built and implemented in a Field-programmable gate array (FPGA) device named myRIO-1900. This project involves hardware implementation, data collection, and programming, it will also be a part of full-vehicle system we plan to implement. This project is open to undergraduate students with related majors at the University of Wollongong. It is suitable for motivated students with an electrical/mechatronic background, programming experience (either MATLAB, Labview), and an interest in pursuing a further research study.	Prof Haiping Du	10 weeks