**Australian National University**

**Australian Higher Education Graduation Statement**

The Australian Higher Education Graduation Statement is provided by Australian higher education institutions to graduating students on completion of the requirements for a particular higher education award. It provides a description of the nature, level, context and status of studies that were pursued by the individual named. Its purpose is to assist in both national and international recognition of Australian qualifications and to promote international mobility and professional recognition of graduates.

## 1. the graduate

| | |
|---|---|
| Name | Mukesh Tiwari |
| Student number | 5935541 |

## 2. the award

**Name of award**

### Doctor of Philosophy

**Detail**

"The Doctor of Philosophy, PhD, is an AQF level 10 Doctoral Degree (Research) which normally takes between three and four years of full-time study or part-time equivalent and is conducted in English. This award is made principally on the basis of a research thesis comprising original written work, normally of up to 100,000 words, that is independently assessed by no fewer than two examiners. At least one examiner is external to the University. A collection of published research papers may be assessed as an alternative to a written thesis in exceptional cases. Admission to a Doctor of Philosophy program is normally granted to applicants holding a Master by research degree or a Bachelor degree with First Class Honours or Second Class Honours Division A. Admission can be granted to applicants who demonstrate a background equivalent to these qualifications."

**Features**

The Doctor of Philosophy program at ANU consists primarily of research which is supervised by a panel of researchers. The program contains a number of key research milestones including a research proposal, annual reports, an oral presentation and research integrity training in addition to the main thesis. Professional development courses and industry internships may also be part of this program. Doctor of Philosophy students may be given the opportunity to attend or present at relevant national/international conferences or to publish articles based on their research. They may also be offered teaching opportunities such as tutoring, demonstrating, and/or lecturing.

## 3. awarding institution

The Australian National University is a research intensive education institute established by an Act of the Australian Parliament on 1 August 1946.

For more information about The Australian National University visit www.anu.edu.au

## certification

**date 16 April 2021**

**Ariel Edge**
**Registrar, Student Administration & Academic Services**

## 4. graduate's academic achievements

**Doctor of Philosophy awarded 16 April 2021**

| Course Code | Course Title | Units | Mark | Grade |
|---|---|---|---|---|
| **2016**<br>COMP 9000F | **QUARTER 2**<br>Doctor of Philosophy (Computer Science) | 2 | RC | RC |
| **2016**<br>COMP 9000F | **SECOND SEMESTER**<br>Doctor of Philosophy (Computer Science) | 24 | RC | RC |
| **2017**<br>COMP 9000F | **FIRST SEMESTER**<br>Doctor of Philosophy (Computer Science) | 24 | RC | RC |
| **2017**<br>COMP 9000F | **SECOND SEMESTER**<br>Doctor of Philosophy (Computer Science) | 24 | RC | RC |
| **2018**<br>COMP 9000F | **FIRST SEMESTER**<br>Doctor of Philosophy (Computer Science) | 24 | RC | RC |
| **2018**<br>COMP 9000F | **SECOND SEMESTER**<br>Doctor of Philosophy (Computer Science) | 24 | RC | RC |
| **2019**<br>COMP 9000F | **FIRST SEMESTER**<br>Doctor of Philosophy (Computer Science) | 24 | RC | RC |
| **2019**<br>COMP 9000F | **SECOND SEMESTER**<br>Doctor of Philosophy (Computer Science) | 24 | RC | RC |
| **2020**<br>COMP 9000F | **FIRST SEMESTER**<br>Doctor of Philosophy (Computer Science) | 3 | CRS | CRS |

**Thesis**

Formally Verified Verifiable Electronic Voting Scheme

Since the introduction of secret ballots in Victoria, Australia in 1855, paper (ballots) are widely used around the world to record the preferences of eligible voters. Paper ballots provide three important ingredients: correctness, privacy, and verifiability. However, the paper ballot election brings various other challenges, e.g. it is slow for large democracies like India, error prone for complex voting method like single transferable vote, and poses operational challenges for large countries like Australia. In order to solve these problems and various others, many countries are adopting electronic voting. However, electronic voting has a whole new set of problems. In most cases, the software programs used to conduct the election have numerous problems, including, but not limited to, counting bugs, ballot identification, etc. Moreover, these software programs are treated as commercial in confidence and
are not allowed to be inspected by members of the public. As a consequence, the result produced by these software programs can not be substantiated.

In this thesis, we address the three main concerns posed by electronic voting, i.e. correctness, privacy, and verifiability. We address the correctness concern by using theorem prover to implement the vote counting algorithm,

privacy concern by using cryptography, and verifiability concern by generating a independently checkable scrutiny sheet (certificate). Our work has been carried out in the Coq theorem prover.

**Special achievements, recognition and prizes**

**Scholarships**
HDR Fee Remission Merit Scholarship
ANU PhD Scholarship (International) Full-Time (737/2018)

# 5. description of the **australian higher education system**

### Introduction
The Australian higher education system consists of self-governing public and private universities and higher education institutions that award higher education qualifications.

### The Australian Qualifications Framework
The Australian Qualifications Framework (AQF) is a single national, comprehensive system of qualifications offered by higher education institutions (including universities), vocational education and training institutions and secondary schools.

The AQF has 10 levels, each with defined criteria based on a taxonomy of learning outcomes. Higher education qualifications are placed between level 5 (the Diploma) and level 10 (the Doctoral Degree). The Bachelor Degree is at level 7. Each AQF qualification has a set of descriptors which define the type and complexity of knowledge, skills and application of the knowledge and skills that a graduate who has been awarded that qualification has attained, and the typical volume of learning associated with that qualification type. The full set of levels criteria and qualification type descriptors can be found by visiting www.aqf.edu.au.

The main AQF qualifications awarded by higher education institutions are Bachelor Degrees, Masters Degrees and Doctoral Degrees. There are also three qualifications at the sub-degree level: the Diploma, the Advanced Diploma and the Associate Degree. At the graduate level but below the Masters Degree are the Graduate Certificate and Graduate Diploma. The Undergraduate Certificate, which was added to the AQF in 2020, is a higher education qualification that is not allocated to a single AQF level, but recognises completion of a short course, equivalent to half a year's study (0.5 Equivalent Full Time Study Load) toward an existing qualification at AQF level 5, 6 or 7.

| Level | Qualification Type | Summary |
|---|---|---|
| - | Senior Secondary Certificate of Education | Graduates with this qualification will have knowledge, skills and values for diverse pathways to further learning, work and effective participation in civic life |
| Level 1 | Certificate I | Graduates at this level will have knowledge and skills for initial work, community involvement and/or further learning |
| Level 2 | Certificate II | Graduates at this level will have knowledge and skills for work in a defined context and/or further learning |
| Level 3 | Certificate III | Graduates at this level will have theoretical and practical knowledge and skills for work and/or further learning |
| Level 4 | Certificate IV | Graduates at this level will have theoretical and practical knowledge and skills for specialised and/or skilled work and/or further learning |
| Level 5 | Diploma | Graduates at this level will have specialised knowledge and skills for skilled and/or paraprofessional work and/or further learning |
| Level 6 | Advanced Diploma Associate Degree | Graduates at this level will have broad knowledge and skills for paraprofessional/highly skilled work and/or further learning |
| Level 7 | Bachelor Degree | Graduates at this level will have broad and coherent knowledge and skills for professional work and/or further learning |
| Level 5-7 | Undergraduate Certificate | Graduates with this qualification will have foundational knowledge and skills for further study, professional upskilling, work and participation in lifelong learning |
| Level 8 | Bachelor Honours Degree Graduate Certificate Graduate Diploma | Graduates at this level will have advanced knowledge and skills for professional highly skilled work and/or further learning |
| Level 9 | Masters Degree | Graduates at this level will have specialised knowledge and skills for research, and/or professional practice and/or further learning |
| Level 10 | Doctoral Degree | Graduates at this level will have systematic and critical understanding of a complex field of learning and specialised research skills for the advancement of learning and/or for professional practice |

* As at the publication of this document, the Undergraduate Certificate qualification type must not be issued after 31 December 2021. Undergraduate Certificates that have been issued prior to this date will continue to be recognised as valid AQF qualifications.

## Admission

Requirements for admission to particular awards are set by higher education institutions and provide a range of routes for entry and only admit those students considered to have potential to complete an award successfully. Admission of school leavers to undergraduate awards is typically on the basis of the level of achievement in Year 12 secondary education, although some institutions and awards also use interviews, portfolios or demonstrated interest or aptitude. Most institutions also provide alternative entry provisions via bridging or foundation programs for mature age students or other special provisions, such as recognition of prior learning from previous study. Admission to post-graduate awards is generally based on the level of achievement in previous higher education studies and in most cases, admission to PhD awards is based on high achievement in a research Masters Degree or in a Bachelor Degree with first class honours or second class honours division A.

## Quality

Quality assurance and stringent approval requirements for higher education institutions ensure that Australia has an international reputation for high quality education.

The Tertiary Education Quality and Standards Agency (TEQSA) was established on 30 July 2011 as a new national regulator and quality assurance agency for higher education. TEQSA is an independent body with the powers to regulate university and non-university higher education providers and monitor quality against standards.

From 29 January 2012 TEQSA assumed responsibility for registering and re-registering providers and accrediting and re-accrediting awards for higher education providers that do not have authority to accredit their own awards. At the time of registration, re-registration, accreditation and/or re-accreditation, TEQSA evaluates the performance of a higher education provider against the Higher Education Standards Framework. The Standards Framework comprises: Provider Registration, Category and Course Accreditation Standards and Qualification Standards (based on the AQF). The Higher Education Standards Panel, which is independent from TEQSA, is responsible for developing and monitoring the Standards Framework.

TEQSA also undertakes quality assessments of individual providers or reviews issues within the sector across a cohort (thematic reviews). These reviews help to identify sectoral good practice, guide sectoral quality enhancement and inform policy and research.

TEQSA's primary aim is to ensure that students receive a high quality education at any of Australia's higher education institutions.

All higher education institutions receiving Australian Government financial support must meet quality and accountability requirements that are set out in the Higher Education Support Act 2003. The Australian Government also uses a range of tools to measure and monitor the quality of outcomes, while the interests of international students are protected by the Education Services for Overseas Students Act 2000 and the Commonwealth Register of Institutions and Courses for Overseas Students (CRICOS), providing tuition assurance and ensuring that institutions listed on CRICOS meet defined minimum standards.

# The Australian National University   Australian Higher Education Graduation Statement

## Explanation of grades and codes

| Key to grades and codes | | | | | |
|---|---|---|---|---|---|
| HD | High Distinction | 80 - 100 | H1 | First Class Honours | 80 - 100 |
| D | Distinction | 70 - 79 | H2A | Second Class Honours Division A | 70 - 79 |
| CR | Credit | 60 - 69 | H2B | Second Class Honours Division B | 60 - 69 |
| P | Pass | 50 - 59 | H3 | Third Class Honours | 50 - 59 |
| CRS | Course Requirements Satisfied | ungraded pass | IP | In progress (continuing course) | |
| PS | Pass at supplementary exam | 50 | KU | Continuing course | |
| HLP | Higher Level Performance | higher ungraded pass | EE | Enrolled elsewhere | |
| N | Fail | 0 - 49 | EXE | Exemption external (no unit value) | |
| NCN | Not complete/Fail | not graded | EXI | Exemption internal (no unit value) | |
| WD | Withdrawn without failure | not graded | RC | Research continuing | |
| WN | Withdrawn with failure | not graded | STE | Status external (external credit)* | |
| WL | Withdrawn late without failure | not graded | STI | Status internal (internal credit)* | |

This explanation is current at 1 July 2011. Subsequent amendments and further details of assessment notations are available at **drss.anu.edu.au**

*Results for internal status credited to the specified award are not recorded on this Graduation Statement. Please see the graduate's Transcript of Academic Record for these results. Results for any external status credited cannot be provided by ANU.

## Unit values and equivalencies

The majority of courses offered at ANU are valued at 6 units. The normal maximum load in a semester or half-year is 24 units (normally 4 courses). Undertaking 18-24 units per semester is considered a full-time study load.

ANU considers 30 European Credit Transfer System (ECTS) credits as equivalent to 24 ANU units.

## Course information

Details of the syllabus for individual courses listed on this Australian Higher Education Graduation Statement may be found in the relevant University Handbook for the year indicated. Alternatively, course information may be obtained from the relevant academic area.

## Semesters and sessions

| Coursework programs | | Research programs | |
|---|---|---|---|
| First Semester | February - June | First Semester | 1 January - 30 June |
| Second Semester | July - November | Second Semester | 1 July - 31 December |
| Summer Session | January - March | Quarter 1 | January - March |
| Autumn Session | April - June | Quarter 2 | April - June |
| Winter Session | July - September | Quarter 3 | July - September |
| Spring Session | October - December | Quarter 4 | October - December |

## Transcript of Academic Record

The information contained within this Australian Higher Education Graduation Statement pertains to the specified award only. For a complete history of academic results achieved at ANU, or results for courses granted as internal status, please see the graduate's Transcript of Academic Record.

## Glossary of terms

| Terminology | Explanation |
|---|---|
| Award | A certificate, diploma, degree, associate degree, graduate certificate or graduate diploma, conferred by the University to a person upon the completion of an academic program leading to an award, for example a Bachelor of Arts. The award is represented by a testamur and is presented to a graduate upon graduating. |
| Course | A discrete entity of study in a subject, normally of one semester or session in duration, identified by an alpha-numeric code. For example, 'ENGN3224 Energy Systems Engineering' is one course. Three or four courses per semester or half-year normally constitutes full-time enrolment. |
| Grade | A classification of achievement based on the final mark. For example a grade of High Distinction (HD) indicates a final mark between 80 and 100. |
| Mark | A number indicating a student's performance in an assessment activity or a course. Raw marks, which may be scaled, become final marks after approval by the Delegated Authority. Marks range from 0 to 100. |
| Program | A structured sequence of study, undertaken in one or more Colleges of the University, normally leading to an award. Programs are controlled by one or, in the case of combined programs, two academic authorities. |
| Status | Students admitted to a program at the University, or transferring between programs at the University, may be granted status (credit) in the new program on the basis of previous tertiary studies. |
| Unit | This is an indicator of the value of a course within the total program. Most courses are valued at 6 units. |

## Document security

This document is printed using a number of special security features including watermarked paper, microtext printing and University hologram. To confirm this document is an original, hold the paper up to a light source to view a wavy line image throughout the paper. Additionally, the University hologram appears on each page of this document, is multicoloured, multilayered and includes the University crest. The absence of any of these security features may indicate that this document is not an original and should not be accepted as an official University document. Any questions regarding this document should be made to the Division of Registrar and Student Services at **drss.anu.edu.au**