New Academic Award / Augmentation
Expression of Interest / Proposal
(Coursework)

Award name: Master of Applied Data Analytics
Augmentation (if any): e.g. “Time Travel”

Summary
- Provide an executive summary of this proposal for University Education Committee and Academic Board (100 words or fewer).

The Australian Public Service faces a current and future challenge in recruiting, developing and retaining workforce with skills in data analytics as applied to high-quality, data-informed decision-making. This reflects a wider challenge to Australian business, government and community in terms of the effective use of public data for decision-making. The rapid expansion of a digitally enabled environment has broadened both the threat and the opportunity in data-driven innovation. We propose a multi-disciplinary Masters program comprising of computer science, applied statistics, and social science courses for graduate-level reskilling and upskilling in the area of applied analytics which can be applied across a host of settings from health to national security.

How to use this form

Overview

Part 1 – Priority approval criteria
In Part 1, Colleges to self-assess new programs/plans against priority approval criteria (see Policy: Academic Programs and Courses Accreditation). This will determine which other Parts need to be completed.

Always complete Part 1.

Part 2 – Expression of interest
In Part 2, Colleges give basic program, plan and Award details, a rationale for creation and information about program/plan governance.

Colleges must first submit to CEC and UEC an Expression of Interest for a new program/plan which does not meet any priority approval criteria in Part 1 (see Procedure: Academic Programs and Courses Accreditation). This Expression of Interest is comprised of Part 2.

Always complete Part 2.

Part 3 – New plan proposal
In Part 3, Colleges provide complete Orders (requirements), evidence of ANU and external consultation, and full details for publication and Government registration. Together with Part 1 and Part 2, this forms the full proposal for consideration by CEC, UEC and Academic Board.

Complete Part 3 if:
New Academic Plan Expression of Interest / Proposal

To fill out this Microsoft Word Form, click underlined italicised grey text, e.g. Click here to enter a date, then make a selection or enter text.

To edit the program title and code in the document header, first double click in the header area. Once edited, the header will be updated on all pages.

Long-answer text fields allow the use of standard formatting features, such as bullet points, and will span pages if necessary.

Expected turn-around times (after College Education Committee endorsement)

<table>
<thead>
<tr>
<th>Expression of Interest</th>
<th>Three months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full proposal requiring no revision or further information</td>
<td>Six months / one semester</td>
</tr>
<tr>
<td>Full proposal requiring some revision or further information</td>
<td>Nine months</td>
</tr>
<tr>
<td>Full proposal requiring some revision or further information, and further consultation</td>
<td>Twelve months</td>
</tr>
</tbody>
</table>

Please note that turnaround times are for ANU accreditation. CRICOS registration for advertising and admission of international full fee paying students may be in addition to these times.

If you would like to provide feedback on this form, please email policy.regs@anu.edu.au. Attachments with comments and/or tracked changes are welcome.

Part 1 – Priority approval criteria

Check all relevant criteria that this Award meets.

- Provide justification for each checked criterion in the ‘Rationale’ section in Part 2 below.

☐ Will attract, challenge and retain students of outstanding talent.

☐ Will be included in a double degree with at least one graduate Award (e.g. Vertical Double Degree or Double Masters Degree).

☐ Will respond to or anticipates changing national or global workforce needs.

☐ Will utilise learning technologies and teaching approaches to extend the University’s educational reach on a national or global level.

☐ Will promote executive education pathways, especially in the area of public policy and other disciplines of national significance.

☐ Will be offered in partnership with one or more university of outstanding reputation.

☐ Will provide pathways of demonstrated efficacy for underrepresented cohorts, in line with the University’s access and equity strategies.
If this new plan **does not** satisfy any of the University’s priority approval criteria, complete **only** Part 2 – Expression of interest.

If this new plan satisfies any of the University’s priority approval criteria, complete both Part 2 – Expression of interest and Part 3 – New plan proposal.

**Part 2 – Expression of interest**

**New plan details**

| Australian Qualifications Framework level and type | Level 9 - Masters Degree (Coursework) |
| Nomenclature type (Graduate Coursework only) | Broad Field Named Award (e.g. Master of Science) |
| Admission pathway (e.g. exit only) | Direct admission |
| External accreditation body (if any) | N/A. |
| Full-time duration in years (Single degree or vertical double degree) | 1.5 |
| Units required for completion | 72 |

**Available for enrolment from:** Autumn (1 April) 2016

**Linked qualifications**

- If this is a pathway (i.e. required for admission) or an early exit, list all relevant Awards.

  *Graduate Certificate of Applied Data Analytics (proposed); Graduate Diploma of Applied Data Analytics (proposed)*

**Double degrees**

- Is this Award to be part of a double degree?
  - [ ] Flexible Double Degree (Arts, Social Sciences, Sciences and Business 4 Year)
  - [ ] Flexible Double Degree (Arts, Social Sciences, Sciences and Business 5 Year)
  - [ ] Flexible Double Degree (Law, Engineering and Advanced Computing 6 Year)
  - [ ] Flexible Double Degree (Law)
  - [ ] Flexible Double Degree (Engineering and Advanced Computing)
  - [ ] Vertical Double Degree
  - [ ] Double Masters Degree

**Governance**

| Responsible College | ANU College of Engineering & Computer Science |
| Who is the convener of the plan? | Associate Professor Peter Christen |

Does this Award have a dedicated governance committee or advisory board (other than College Education Committee)? If so, detail membership and frequency of meetings.

No.

**Rationale**
Academic merit and strategic alignment

- Give details of how this Award aligns with University and College strategy (see ANU by 2020) and contributes to the standing of the discipline or interdisciplinary area nationally and (if relevant) internationally (200 words or fewer).

*From 'ANU by 2020': “Central to the outreach role of ANU is engagement with government, and building a critical mass of research and education excellence in public policy which will act as a resource for the nation and our region.” With the challenge of the Australian Public Service to recruit, develop and retain a workforce with skills in data analytics as applied to high-quality, data-informed decision-making, this proposed Masters program will be crucial to overcoming this challenge and contribute to the national standing of the ANU in emerging fields of data analytics and data science.*

Research Led Education

- Identify the initiatives in this Award that contribute to the University’s goal of offering research-led education and how sustained scholarship will inform teaching and learning. (200 words or fewer)

*Underlying all courses of this proposed Masters program will be the common theme of practical hands-on projects using real data (as provided by participating government agencies) tackling real-world research questions as relevant to the APS. Courses will also cover current industry and research developments in data analytics as relevant to the APS.*

Market competition

- Identify a minimum of two competing Awards in the sector nationally or internationally.
- Highlight the ways in which this ANU Award is superior to competitors (200 words or fewer).

Most Data Analytics Masters programs in Australia are either computing / IT, or business focused. Below are two examples. In contrast, the proposed Master program is strongly multi-disciplinary, with a specific focus for the needs of the Australian Public Service with regard to the effective use of public data for decision-making.

Monash University Master of Data Science – includes computing courses only.  

University of Sydney Master of Data Science – includes computing and statistics courses only.  

Other Data Analytics Masters degree are business focused, such as the University of Melbourne (Melbourne Business School) Master of Business Analytics:  
https://mbs.edu/programs/master-of-business-analytics/program

Estimated enrolment

- Provided an estimate of enrolment numbers in EFTSL.
- Provide evidence for estimated enrolment numbers (200 words or fewer).

*The Master of Applied Data Analytics is a new program with specific minimum enrollment number guaranteed by the APS. Anticipated FTE is at least 40 per year, with significantly larger numbers to be expected if additional Government Departments will join this initiative. The currently most relevant computing course is COMP8400 (Algorithms and Techniques for Data Mining) which in the past five years had enrollment numbers between 36 and 57.*

Joint award responsibilities
• If this Award is offered in conjunction with another institution, describe how responsibilities for course
delivery, fees, pre-enrolment engagement of students, student services and care and student visa
requirements are shared (200 words or fewer).

• These details may be provided to TEQSA.

N/A.

Monitoring of performance and quality

• Provide targets for the following indicators: enrolment, student retention, student experience
(including SELS), student outcomes and pathway to further study (200 words or less).

We expect a student enrolment of at least 40 students per year in the Master of Applied Data
Analytics with a completion rate of at least 65%, plus 30% of students selecting an early exit via either
the Grad Cert of Applied Data Analytics or Grad Dip of Applied Data Analytics.

We also expect an agreement rate of <60% in SELS surveys undertaken for the courses within this
degree.

• Provide details of how performance will be monitored against the above targets, including timeframes
(200 words or less).

Monitoring of all of the above will be provided by ISIS, CECS (RSCS), CBE (RSFAS), and CASS
(RSSS and AusCen) examination results through the program Convenor and the College Education
Committees, SELS responses rate and Unistats on a bi-annual basis.

ANU Graduate Coursework model (Graduate Coursework only)

☐ This Award is consistent with the University’s Graduate Coursework Model

✓ This Award requires approval as an exception to the ANU Graduate Coursework model.

• For Graduate Certificates and Graduate Diplomas, provide a strategic case for the creation of this
Award and attach all available evidence.

• For Masters Degrees requiring more or less than 96 units, or with admission requirements than a
non-cognate Bachelor Degree, provide significant justification for creation of this Award (e.g.
professional accreditation or international standards) and attach all available evidence.

This Masters program requires either:
- A completed AQF8 degree or equivalent; or
- A completed AQF7 degree in addition to 3 years of work experiences in the APS.

Either of the above is considered to be equivalent to a Graduate Certificate in terms of learning
outcomes, which is the rationale for reducing the Master program requirements from 96 units to 72
units.

Consultation

Academic consultation

• Includes ANU and external consultation about academic merit and strategic alignment, contribution to
teaching, cross-College disciplines, and cross-College pathway degrees

• Include evidence of consultation, such as meeting dates, links to published minutes, etc.
This program was developed across CECS, CASS and CBE, and involved discussions with senior management of several Government Departments, over a four month period from July to October 2015. Key people involved include from CECS: Prof Elanor Huntington (Dean), Prof Alistair Rendell (Director RSCS), Assoc Prof Peter Christen (RSCS), Dr Jochen Trumpf (Associate Dean (CECS)); from CBE: Prof Steven Roberts (Director RSFAS), Assoc Prof Stephen Sault (Deputy Director and Director of Education RSFAS); and from CASS: Prof Matthew Gray (Director AusCen, CSRM / RSSS).

Consultation with Division of Student Administration
- Includes degree structures, nomenclature, AQF and legislative compliance, Commonwealth support, CRICOS eligibility
- Include evidence of consultation, such as meeting dates, links to published minutes, etc.

The College has liaised with ASQO (Jake Francis) via telephone and email between 26/10/2015 and 29/10/2015 to ensure the degree structure and nomenclature is compliant with AQF and legislative standards.
It is anticipated that there may be some impact on DSA once these programs are implemented; however, discussions with these areas will occur in due course.

Consultation with Division of Student Services
- Includes support for specific cohorts, international students under the age of 18
- Include evidence of consultation, such as meeting dates, links to published minutes, etc.

Minimal impact is anticipated for the Division of Student Life. Limited support is expected to be required for these students.

Consultation with Division of International Operations and Student Recruitment
- Includes admissions, student recruitment, international agreements, international experiences, University publications
- Include evidence of consultation, such as meeting dates, links to published minutes, etc.

Recruitment – Minimal/ no impact; all students will be domestic and will be recruited directly from the APS.
Admission – The College will engage the Domestic Admissions team within DIOSR in due course to discuss processes for receiving applications.

Consultation with Information Technology Services
- Includes support for specific software and infrastructure needs
- Include evidence of consultation, such as meeting dates, links to published minutes, etc.

Not required. Use of external computer labs is subject to further discussions and negotiations with APS (due to security requirements of APS data).

Consultation with ANU Library
- Includes access to specific online and physical collections, specialist information literacy training
- Include evidence of consultation, such as meeting dates, links to published minutes, etc.

Not required.
Note that insufficient consultation may preclude or delay approval or implementation.

**College Education Committee (Expressions of interest only)**

<table>
<thead>
<tr>
<th>Date reviewed by College Education Committee (CEC)</th>
<th>Thursday 29 October 2015</th>
</tr>
</thead>
</table>

CEC recommendation to UEC
- ☑ Proceed with new plan proposal
- ☑ Proceed with new plan proposal with conditions (specified below)
- ☑ Do not proceed with new plan proposal

*Please note: The Research School of Computer Science and the College Executive have endorsed this proposal and it will also be included in the upcoming College Education Committee agenda (7/2015 – 27/11/2015) for noting.*

As approved by the Dean or delegated authority
Professor Elanor Huntington on Thursday 29 October 2015

**University Education Committee (Expressions of interest only)**

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</table>

Document Number
- Click here to enter a date
- e.g. "231/2010"

UEC recommendation to Academic Board
- ☑ Proceed with new plan proposal
- ☑ Proceed with new plan proposal with conditions (specified below)
- ☑ Do not proceed with new plan proposal

*Click here to enter text*

**Part 3 – New plan proposal**

**Description and study requirements**

Marketing and publication description
- This section is published on the 'Programs and Courses' website to an external audience and is used primarily for marketing.
- Describe the plan including any key features, its research led elements and any external accreditation of the plan (100 words or fewer).

*The Master of Applied Data Analytics is a 1.5 year full-time (or equivalent part-time) degree that provides students from the Australian Public Service with:*
* - Exposure to best practice in data analytics.
* - Cutting edge courses in areas of relevance to data analytics practitioners.
* - An opportunity to specialise in one of the three areas of computation, statistics, or social science.
* - Professional development for practicing data analytics professionals.
* - The opportunity to undertake research of professional relevance.

*The program will be thought in intensive blended mode with students expected to be enrolled part-time.*

**Single degree study requirements and Orders**
- Provide requirements for the completion of this Award as a single degree.
- New courses must be approved before being entered into requirements.
- Orders will be drafted by the Academic Standards and Quality Office for confirmation of the appropriate ANU College Associate Dean to then be made by the Deputy Vice-Chancellor (Academic) (see Undergraduate Awards Rules and Graduate Awards Rules).
- This section is published on the ‘Programs and Courses’ website to an external audience.

The Master of Applied Data Analytics requires the completion of 72 units, of which:

60 units from the following compulsory courses:

- COMP7230 Introduction to Programming for Data Scientists
- COMP7240 Introduction to Database Concepts
- COMP8410 Data Mining
- COMP8430 Data Wrangling
- SOCR8201 Introduction to social science methods and types of data
- SOCR8202 Using data to answer policy questions and evaluate policy
- STAT7055 Introductory Statistics for Business and Finance
- STAT7001 Applied Statistics
- STAT6039 Introductory Mathematical Statistics
- STAT7026 Graphical Data Analysis

24u of one of the following specialisations of which 12u comes from the compulsory courses above:

**Computing**
- COMP8410 Data Mining
- COMP8430 Data Wrangling
  - Plus 12u from:
    - COMP8600 Statistical Machine Learning
    - COMP6464 High Performance Scientific Computing
    - COMP6490 Document Analysis
    - COMP6320 Artificial Intelligence

**Social Sciences**
- SOCR8201 Introduction to social science methods and types of data
- SOCR8202 Using data to answer policy questions and evaluate policy
- SOCR8203 Advanced techniques in the creation of social science data
- SOCR8204 Advanced social science approaches to inform policy development and service delivery

**Statistics**
- STAT6039 Introductory Mathematical Statistics
- STAT7026 Graphical Data Analysis
- STAT7040 Statistical Learning
  - Plus 6u from:
    - STAT7016 Introduction to Bayesian Data Analysis
    - STAT7017 Big Data Statistics

Double degree study requirements and Orders

- Provide requirements for the completion of this Award as a double degree (if applicable).
- For Flexible Double Degrees, provide only the Global Requirements (e.g. maximum of 1000-level courses) and any additional requirements specific to Flexible Double Degrees.
- For Vertical Double Degree undergraduate plans and Double Masters Degree plans, provide full requirements for the double degree (i.e. both Awards’ components).
- New courses must be approved before being entered into requirements.
Orders will be drafted by the Academic Standards and Quality Office for confirmation of the appropriate ANU College Associate Dean to then be made by the Deputy Vice-Chancellor (Academic) (see Undergraduate Awards Rules and Graduate Awards Rules).

This section is published on the ‘Programs and Courses’ website to an external audience.

Learning outcomes

- Learning outcomes are high-level statements of the skills and knowledge which ANU certifies that all graduates of the plan possess.
- If this plan is within a Vertical Double Degree or Double Masters Degree, provide full learning outcomes for both degrees.
- This section is published on the ‘Programs and Courses’ website to an external audience.

Upon successful completion, students will have the skills and knowledge to:

1. A solid grounding in the fundamentals of data analytics methods and techniques, including program development, databases and data management, data mining, statistical analysis, data visualisation, quantitative social science methods, .. (need more from stats and social sciences)
2. Broad technical knowledge in a selection of contemporary and advanced data analytics topics, with an understanding of research issues in those topics.
3. Excellent communication skills, both written and verbal, in the technical data analytics context.
4. An understanding of data analytics methodologies, including data processing, management, analysis and visualisation.
5. Experience in applying the above knowledge and skills in a substantial data analytics project.
6. Comprehensive and in-depth technical knowledge and skills in the designated specialisation.

Assessment alignment (Bachelor Honours Degrees only)

- Provide an explanation of how the structure of assessment will determine whether the Honours learning outcomes have been met.

Timing of Honours assessment (Bachelor Honours Degrees only)

- Provide an explanation of how either: a minimum of 25% of the assessment which contributes to the final honours grade or; 15% of the assessment which contributes to the final Honours mark and formalised monitoring of progress by staff other than each student’s supervisor or Honours convener is completed in the first half (in terms of duration) of Honours study.

Honours research training availability (Bachelor Honours Degrees only)

- If Honours research training courses are to be available to students only once per calendar year, describe the strategies to be used to ensure that students who commence Honours in the Period in which these courses are not taught will not be disadvantaged.
New Academic Plan Expression of Interest / Proposal

Research component (Masters Degrees only)

- Provide an explanation of and list of courses for how the AQF Level 9 Masters Degree (Coursework) requirement that graduates must be able to “plan and execute a substantial research-based project, capstone experience and/or piece of scholarship” is demonstrated.

**TODO – which courses? Nothing in the APS document is about having a capstone project course with a large research component? Do we need to have specific new research courses for stage 3? Or can ‘research’ be in any of the courses?**

Admission requirements

Undergraduate

- ATAR, QLD Band and International Baccalaureate score.
- Include any other requirements, such as current ‘Working with Vulnerable People’ check, successful medical check, etc.
- Include secondary schooling prerequisites
- This section is published on the ‘Programs and Courses’ website to an external audience.

Honours Awards (without specialisations)

- Complete the template below.
- Delete text in brackets if not required.
- Delete numbered items if not required. Note: Item 1 is not required if the degree name is specified.
- Choose only one option from a, b or c.
- A maximum of 12 courses may be specified.
- Final admission requirements will be drafted by the Academic Standards and Quality Office for confirmation of the appropriate ANU College Associate Dean.
- This section is published on the ‘Programs and Courses’ website to an external audience.

Honours Awards (with specialisations)

- Complete the template below.
- Delete text in brackets if not required.
- Delete Item 1 if the degree name is specified.
- Final admission requirements will be drafted by the Academic Standards and Quality Office for confirmation of the appropriate ANU College Associate Dean.
- This section is published on the ‘Programs and Courses’ website to an external audience.

N/A.
Direct-entry Graduate Coursework

- Complete the template below.
- Final admission requirements will be drafted by the Academic Standards and Quality Office for confirmation of the appropriate ANU College Associate Dean.
- This section is published on the ‘Programs and Courses’ website to an external audience.

- A completed AQF8 degree or equivalent in any discipline from a recognised university; OR
- A completed AQF7 degree + 3 years of work experience in the APS.
- Applications need to be nominated by the Australian Public Service to be considered.
- Applicants who have completed a degree in a cognate discipline may be eligible to receive up to 24 units of credit towards their Master of Applied Data Analytics degree.

Cognate disciplines (Bachelor Honours and direct-entry Graduate Coursework only)

- List each discipline considered to be ‘cognate’ for the purposes of admission and/or credit.
- This section is published on the ‘Programs and Courses’ website to an external audience.

Maths
Statistics
Computer Science
Information Technology
sociology
political science
psychology
epidemiology/public health
anthropology
demography/population studies

Delivery

Delivery mode(s): Select delivery mode

- Off campus – this plan is to be administered and completed externally to the Acton campus.
- Intensive – this plan is to be completed by undertaking accelerated courses in a full-time block.

   Intensive plan duration in weeks (from commencement to submission of final assessment): e.g. "24"

- There is a compulsory work-based training of Enter hours hours per week for Enter weeks weeks.

List all teaching periods in which students may commence study.

- i.e. Summer, First Semester, Autumn, Winter, Second Semester and/or Spring
- Note that international student visa holders must be able to complete within the normal duration of study without the need to ‘underload’ or take leave.

   All: Summer, First Semester, Autumn, Winter, Second Semester and/or Spring

- To be registered on CRICOS for student visa eligibility.
International student visa holders are able to complete within the normal duration of study without the need to 'underload' or take leave when commencing in all listed teaching periods.

## Typical full-time pattern of study

Provide typical full-time patterns of study for each teaching period in which students may commence study.

- Each study pattern should demonstrate completion of the Orders given above in the full-time plan duration.
- Give the course type, level and unit value in each cell (see Examples below).
- Cells should be merged for courses of 12 or more units.
- Copy and paste rows as needed

### Examples:

<table>
<thead>
<tr>
<th>Year</th>
<th>Course</th>
<th>Level</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>COMP1234</td>
<td>6 units</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Turkish Major 2000-level</td>
<td>6 units</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Science Minor 2 1000-level</td>
<td>6 units</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Elective</td>
<td>6 units</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reading course 6000-level</td>
<td>6 units</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Financial Institution Internship</td>
<td>18 units</td>
<td></td>
</tr>
</tbody>
</table>

### Year 1

<table>
<thead>
<tr>
<th>Course</th>
<th>Level</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Click to enter course, level and units</td>
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<td>Click to enter course, level and units</td>
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<td>Click to enter course, level and units</td>
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</tr>
</tbody>
</table>

### Fees

Fee places available: **Select fee places**

- For Awards with ISF places, identify an existing Award with the same indicative international student fee (see the **annual fee schedule**).

  To be consistent with the final agreement.

- Provide details of additional costs, such as compulsory fieldwork expenses (excludes SA Fee).

  **N/A.**

### Division of Student Administration use only

- Consistent with **Australian Qualifications Framework**, including Level 9 research component where relevant

  If not consistent, give details:

  **Click here to enter text**
| Consistent with **National Code 2007** | If not consistent, give details: | Click here to enter text |
| Consistent with policy: **Academic Programs and Courses Accreditation** | If not consistent, give details: | Click here to enter text |
| Consistent with policy: Nomenclature | If not consistent, give details: | Click here to enter text |
| Consistent with policy: Structure and Wording of Coursework Award Requirements, including Registrar approval | If not consistent, give details: | Click here to enter text |
| Consistent with other relevant University policies and standards (e.g. Admission requirements template) | If not consistent, give details: | Click here to enter text |

**Formal Award name**
e.g. “Master of Science”

**Formal Award post nominal**
e.g. “MSA”

**Augmentation name (Use for Print on Diploma and Print on Transcript)**
e.g. “Conflict and Development”

**Career**
Click to select career

**Does this new plan require a new program?**
Click to select an option

**Program code(s) (4 digits each)**
e.g. “4123”

**Single degree program type (if new)**
Click to select qualification level and type

**Duration / units per year**
e.g. “2 years / 48 units per year”

**Plan code**
e.g. “BLLBA”

**Detailed Field of Education code**
e.g. “010915 - Zoology”

**First available term**
e.g. “2520 – Summer 2015”

**Indicative annual international student fee from first term available, above.**
e.g. “$54,321”

**CRICOS study duration**
46 weeks for 1st year and 52 weeks per year thereafter

**CRICOS full cost of student from year of registration, i.e. the current year.**
Use ISF rate and index + SA fee indexed at 3%

**Detail of Plan - Australian Higher Education Graduation Statement (AHEGS)**
Click here to enter text

**Plan Features - Australian Higher Education Graduation Statement (AHEGS)**
Click here to enter text
### College Education Committee

| Date considered by College Education Committee (CEC) | Thursday 29 October 2015 |
| CEC recommendation to UEC | |
| | ☐ Endorse with no conditions |
| | ☐ Endorse with conditions (specified below) |
| | ☐ Do not endorse |

*Please note: The Research School of Computer Science and the College Executive have endorsed this proposal and it will also be included in the upcoming College Education Committee agenda (7/2015 – 27/11/2015) for noting.*

As approved by the Dean or delegated authority

**Professor Elanor Huntington on Thursday 29 October 2015**

### University Education Committee

| Date considered by University Education Committee (UEC) | Click here to enter a date |
| Document Number | e.g. 132/2012 |
| UEC recommendation to Academic Board | |
| | ☐ Accredit with no conditions |
| | ☐ Accredit with conditions (specified below) |
| | ☐ Do not accredit |

### Academic Board

| Date considered by Academic Board | Click here to enter a date |
| Document Number | e.g. “132/2012” |
| Academic Board | |
| | ☐ Accredits with no conditions from Click here to enter a date |
| | ☐ Accredits with conditions (specified below) from Click here to enter a date |
| | ☐ Does not accredit |
Master of Applied Data Analytics (MADA) - Courses

Computer Science

C1: Introduction to Programming for Data Scientists (COMP7230)  new
Based on existing course material from Programming for Scientists (COMP1730/6730) and Craft of Computing (COMP1040)
This course teaches introductory programming within a problem solving framework applicable to data science. The course emphasizes technical programming, data processing, and data manipulation. There is an emphasis on designing and writing correct code. Testing and debugging are seen as integral to the programming enterprise. The course will also teach how to effectively use computational tools for data analysis. It will provide skills for tackling the ‘messiness’ of real-world computer systems, programming languages, and data. The course will be taught using one or more programming languages which are widely applicable to data analytics work.

C2: Introduction to Database Concepts  (COMP7240)  new
Mostly following the current course Relational Databases (COMP2400/6240).
This course is an introduction to database concepts and the general skills for designing and using databases. The topics include the relational data model, SQL, entity-relationship model, functional dependencies, (de-)normalisation, relational algebra, query processing and optimisation, database transactions and security. To deepen the understanding of relational databases, the current industry development of database systems such as NoSQL databases will be introduced at the end of this course.

C3: Data Mining  (COMP8410)  new
Most of content of the current course Algorithms and Techniques for Data Mining (COMP8400).
Large amounts of data are increasingly being collected by public and private organisations, and research projects. Additionally, the Internet provides a very large source of information about almost every aspect of human life and society. This course provided a practical focus on the technology and research in the area of data mining. It focuses on the algorithms and techniques and less on the mathematical and statistical foundations.
Topics covered: Basic algorithms and techniques, unsupervised and supervised learning, measurements, applications of data mining on text, Web, graphs and networks, data streams, and outlier detection.
Following text book: Han, Kamber and Pei: Data Mining – Concepts and techniques, 3rd Edition

C4: Data Wrangling  (COMP8430)  new
Real-world data are commonly messy, distributed, and heterogeneous. This course introduces core concepts of data cleaning, standardisation, integration, and discusses data quality, management, and storage issues as relevant to data analytics. Topics covered also include data warehousing and advanced database systems such as NoSQL and graph databases.

C5/C6: Select two from:

Statistical Machine Learning  (COMP8600)  existing
This course provides a broad but thorough introduction to the methods and practice of statistical machine learning. Topics covered will include Bayesian inference and maximum likelihood modelling; regression, classification, density estimation, clustering, principal and independent component analysis; parametric, semi-parametric, and non-parametric models; basis functions, neural networks, kernel methods, and graphical models; deterministic and stochastic optimisation; overfitting, regularisation, and validation.
High Performance Scientific Computing (COMP6464) existing
This course provides an introduction to High Performance Computing with an orientation towards applications in science and engineering. Aspects of numerical computing and the design and construction of sophisticated scientific software will be considered. The focus will be on the C and C++ programming languages, although reflecting the reality of modern scientific computation this course will also touch on other languages such as Python, Java and FORTRAN95. The course will study high performance computer architectures, including modern parallel processors, and will describe how an algorithm interacts with these architectures. It will also look at practical methods of estimating and measuring algorithm/architecture performance.

Document Analysis (COMP6490) existing
Processing of semi-structured documents such as Internet pages, RSS feeds and their accompanying news items, and PDF brochures is considered from the perspective of interpreting the content. This course considers the 'document' and its various genres as a fundamental object for business, government and community. For this, the course covers four broad areas: (A) information retrieval, (B) natural language processing, (C) machine learning for documents, and (D) relevant tools for the Web. Basic tasks here are covered including content collection and extraction, formal and informal natural language processing, information extraction, information retrieval, classification and analysis. Fundamental probabilistic techniques for performing these tasks, and some common software systems will be covered, though no area will be covered in any depth.

Artificial Intelligence (COMP6320) existing
Artificial intelligence is the science that studies and develops methods of making computers more 'intelligent'. The focus of this course is on core AI techniques for knowledge representation, search, reasoning, learning and designing intelligent agents. The course also aims to give an overview of other topics within AI, such as for example robotics, and of the historical, philosophical, and logical foundations of AI.

Social Sciences:

SS1: Introduction to social science methods and types of data (SOCR8201)
This course provides an introduction to the main empirical social science methods, types of data, and techniques for collecting social science data. Content will cover: overview of main social and behavioural theories (rational choice; nudge and behavioural insights; complexity theory), introduction to research design (observational designs; intervention and experimental designs and action research), techniques for collecting data (quantitative surveys; qualitative interviews; behavioural and experience methods), measurement issues, participatory approaches to research, vulnerable populations, and ethics and privacy considerations.

SS2: Using data to answer policy questions and evaluate policy (SOCR8202)
This course will provide students with a range of analytical techniques that can be used to answer policy and service delivery questions and how to measure the impact of policy. Content will cover quantitative social science empirical approaches (descriptive approaches, regression analysis), qualitative social science empirical approaches, process tracing, mixed methods approaches, combining different forms of evidence (research, expert evidence), administrative data (e.g., finding it, sampling it, coverage issues, infelicities, measurement properties, linking administrative and survey data) and introduction to evaluation methods.

SS3: Advanced techniques in the creation of social science data (SOCR8203)
This course will provide students with a detailed understanding of the main techniques for the
collection of policy relevant social science data. Students will be well placed to design and undertake their own research and to commission others to undertake design, fieldwork and analysis. Content will cover quantitative surveys (questionnaire design, fieldwork techniques (CATI, online, f2f), cognitive testing) and qualitative methods (e.g., in-depth interviews, focus groups, observational techniques), sampling, weighting and assessing representativeness of data, total survey error, creation of data sets for analysis using administrative data, cross-sectional versus longitudinal data.

**SS4: Advanced social science approaches to inform policy development and service delivery (SOCR8204)**
Course will provide a more advanced treatment of how social science approaches can be used to inform policy development and service deliver approaches. Content includes panel data analysis, evaluation methods, use of machine learning in social sciences, prediction, use of administrative data, text as data, rapid review and meta-analysis and cost-benefit analysis.

**Statistics:**

**STAT1: Introductory Statistics for Business and Finance (STAT7055) existing**
(course assumes no statistics background)
This course would introduce students to basic statistical methods, with a focus on applying these methods to the business world. Topics covered would include: Chance and probability, data gathering basics, basic types of data and data presentation, measures of central tendency and spread, central limit theorem, hypothesis testing, and simple regression.

**STAT2: Applied Statistics (course would assume knowledge of C1) (STAT7001) existing**
This course builds on Statistics C1 (STAT7055) and provides an introduction to common applied techniques for carrying out statistical analysis. Topics covered would include regression modelling with emphasis on model formulation, understanding the implication of model assumptions, diagnostic methods for model checking and interpretation, logistic regression for binary variables and binomial counts, log-linear regression for Poisson counts, exploratory tools for summarising multivariate responses, and resampling methods.

**STAT3: Introductory Mathematical Statistics (STAT6039) existing**
This course builds on Statistics C1 (STAT7055) and C2 (STAT7001) and provides an introduction to mathematical statistics with applications. Topics covered include probability, random variables, moment generating functions and correlation, sampling distributions, estimation of parameters by the methods of moments and maximum likelihood, hypothesis testing, the central limit theorem, and simple linear regression.

**STAT4: Graphical Data Analysis (STAT7026) existing**
This course introduces the principles of data representation, summarisation and presentation with particular emphasis on the use of graphics. Topics to be discussed include: Data representation; examples of good and bad graphics; principles of graphic construction; some pitfalls to be avoided; presentation graphics. Graphics environments; interactive graphics; windows; linked windows; graphics objects. Statistical graphics; stem and leaf plots, box plots, histograms; smoothing histograms; quantile-quantile plots; representing multivariate data; scatterplots; clustering; stars and faces; dynamic graphics including data rotation and brushing. Relationships between variables; smoothing scatterplots; simple regression; modelling and diagnostic plots; exploring surfaces; contour plots and perspective plots; multiple regression; relationships in time and space; time series modelling and diagnostic plots.
STAT5: Statistical Learning (STAT7040)  new in 2015
This course provides an introduction to statistical learning and aims to develop skills in modern statistical data analysis. This course will cover a range of topics in statistical learning including linear regression, classification techniques, resampling methods such as the bootstrap, regularisation methods, tree based methods and unsupervised learning techniques such as clustering. As much modern data analysis requires the use of statistical software, there will be a strong computing component in this course.

STAT6 select one of:

Introduction to Bayesian Data Analysis (STAT7016)  new in 2015
The aim of this course is to equip students with the skills to perform and interpret Bayesian statistical analyses. The first part of the course is devoted to describing the fundamentals of Bayesian inference by examining some simple Bayesian models. More complicated models will then be explored, including linear regression and hierarchical models in a Bayesian framework. Bayesian computational methods, especially Markov Chain Monte Carlo methods will progressively be introduced as motivated by the models discussed. Emphasis will also be placed on model checking and evaluation.

Big Data Statistics (STAT7017)  new
This course provides an overview of recent statistical theory that addresses topics such as high-dimensionality, large sample sizes, sequential prediction, incremental and parallel statistical learning. The goal of this course is to build on the knowledge developed in Statistical Learning (STAT7040) in order to understand new and effective methods for analysing Big Data. Particular focus will be given to methods for accurately predicting future observations in order to make decisions and for gaining insight into the relationships that exist between features and responses. Further, this course will also develop an understanding of how large sample sizes affect heterogeneity and commonality across different subpopulations present in the data.