Personal details

Personal details

First / given name	Stephen
Second given name	Graham
Third given name	
Surname/family name	Richardson
Date of birth	25 April 1999
Preferred first/given name	Stephen
Previous surname	
Country of birth	United Kingdom
Legal nationality	British National
Dual nationality	
Country of residence	United Kingdom
Have you previously studied with us at the University of Bristol?	No

Contact details

Home address

Please provide your permanent residential address. If you have another address and would prefer for us to contact you at that address instead you have the opportunity to add a correspondence address in the next section.

Country	United Kingdom
Postcode	SE21 8BT
Address Line 1	Flat 21, Clevedon Court
Address Line 2	Clive Road
City	London
County	
Telephone	

If you would like us to send any postal correspondence to an address which is not your home address please enter an alternative address here. If you want us to send correspondence to your home address then please select No.

Do you want to add a correspondence address?	No
Country	United Kingdom
Postcode	SE21 8BT
Address Line 1	Flat 21, Clevedon Court
Address Line 2	Clive Road
City	London
County	
Telephone	

Agent

Agent details

Agency Name	
Email address	

Additional Documents

Please upload required documents as outlined in your admissions statement

Mode of study

How would like to study this Full Time
programme?

Qualifications

Institution	Qualification	Type	Subject	Actual/predicted	Grade	Start date	End date
University of Warwick	Master's Degree (PG)	Academic Qualification	Mathematics	Actual	First class	24/Sep/2018	02/Jul/2022

If these qualifications have altered since your last application please note the changes in the free text box here.

English Language

Is English your first language? Yes

What is your first language?

Did you study at school/university where you were taught in English?

For how many years?

Have you sat a relevant English language test?

TOEFL (internet-based)

Registration number
Date of TOEFL test
TOEFL reading score
TOEFL listening score
TOEFL speaking score
TOEFL writing score
TOEFL total score

IELTS (International English Language Testing System)

Test report form (TRF) number
UKVI number (if applicable)
Date of IELTS test
IELTS listening score
IELTS reading score
IELTS writing score
IELTS speaking score
IELTS total score

Pearson Test of English

Score report code
Date of Pearson test
Pearson listening score
Pearson reading score
Pearson speaking score
Pearson writing score
Pearson overall score

Other English Language test

Name of course

Registration number

Date of test

Listening score

Writing score

Reading score

Total score

Experience

Current Employer

Employer name and address Department for Science, Innovation and Technology 100 Parliament Street, London, SW1A 2BQ

Job title and main duties Future Telecommunications Policy Adviser I sit within the Future Telecommunications Technology Policy Unit, developing and coordinating policy around the UK contribution to Open RAN and 6G standards – with particular focus on supporting the UK gove

Full time/Part time Full time

Date of Appointment 02 October 2023

End date (if applicable)

Previous employment 1

Employer name and address Defence Science and Technology Laboratory Porton Down, Salisbury, SP4 0QJ

Job title and main duties Communications and Networks Scientist I researched generation after next communications systems and network routing for defence and security applications – with particular focus on error-correction codes and Quantum Communications.

Full time/Part time Full time

Date of Appointment 17 October 2022

End date (if applicable) 01 October 2023

Previous employment 2

Employer name and address

Job title and main duties

Full time/Part time

Date of Appointment

End date (if applicable)

Previous employment 3

Employer name and address

Job title and main duties

Full time/Part time

Date of Appointment

End date (if applicable)

Other Experience

Do you have any other relevant work experience to support your application? No

Please provide details

Personal statement

Personal details

Do you have a personal statement to upload? Yes

Please type your personal statement in the box

Research proposal

Research proposal

Proposed supervisor 1 Alice Pozzi

Proposed supervisor 1 Tim Dokchitser

Proposed project title (max 150 chars)

Passport and visa

Visa required

Do you require a visa to study in the UK? No

Please fill out your passport details below. If you are unable to provide these at the current time you will have another opportunity to upload your passport after you submit the form. If you do not provide us with this information we will be unable to issue you with your confirmation of acceptance number and you will be unable to obtain a visa.

Passport details

Passport number

Further details

Have you previously studied in the UK?

What was the highest level of study in the UK?

Please confirm the total length of your UK study in years

Referees

Referee 1

Do you have a reference to upload?	No
Type of reference	Academic
Referee title	Dr
Forename	Christopher
Surname	Lazda
Position	Lecturer in Mathematics
Institution/Company	University of Exeter
Email address	C.D.Lazda@exeter.ac.uk
Country	United Kingdom

Referee 2

Do you have a second reference to upload?	Yes
Type of reference	
Referee title	
Forename	
Surname	
Position	
Institution/Company	
Email address	
Country	

Funding

Funding 1

What is your likely source of funding?	Studentship
Please give the name of your scholarship or Studentship	Heilbronn Doctoral Partnership
Please specify	
Percentage from this source	100
Is this funding already secured?	No

Funding 2

What is your likely source of funding?	
Please give the name of your scholarship or Studentship	
Please specify	
Percentage from this source	
Is this funding already secured?	

Funding 3

What is your likely source of funding?	
Please give the name of your scholarship or Studentship	
Please specify	
Percentage from this source	
Is this funding already secured?	

Other funding

I would like to be considered for other funding opportunities	Yes

Submission

Documents

Document type	File name
Degree certificate	CERT_1476073_1.pdf
Transcript	Uni Transcript.pdf
Research proposal	Bristol Research Proposal.pdf
Personal statement	Personal Statement.pdf
Curriculum vitae	Anonymised CV.pdf
References	2023-StephenRichardson.pdf

By ticking the checkbox below and submitting your completed online application form, you acknowledge the University of Bristol will use the information provided from time to time, along with any further information about you the University may hold, for the purposes set out in the [University's full Data Protection Statement](#). Applicants applying to the collaborative programmes of doctoral training should also read the [Data Protection Statement](#) for collaborative programmes of doctoral training.

The information that you provided on your application form will be used for the following purposes:

- To enable your application for entry to be considered and allow our Admissions Advisors, where applicable, to assist you through the application process;
- To enable the University to compile statistics, or to assist other organisations to do so. No statistical information will be published that would identify you personally;
- To enable the University to initiate your student record should you be offered a place at the University.

All applicants should note that the University reserves the right to make without notice changes in regulations, courses, fees etc at any time before or after a candidate's admission. Admission to the University is subject to the requirement that the candidate will comply with the University's registration procedure and will duly observe the Charter, Statutes, Ordinances and Regulations from time to time in force.

By ticking the checkbox below and submitting your completed online application form, you are confirming that the information given in this form is true, complete and accurate and that no information requested or other material information has been omitted. You are also confirming that you have read the Data Protection Statement and you confirm the statement below.

I can confirm that the information I have provided is true, complete and accurate. I accept that the information given in my application will be stored and processed by the University of Bristol, in accordance with the *UK General Data Protection Regulation and Data Protection Act 2018*, in order to:

- Consider my application and operate an effective and impartial admissions process;
- Monitor the University's applicant and student profile;
- Comply with all laws and regulations;
- Ensure the wellbeing and security of all students and staff;
- If my application is successful to form the basis of the statement made within my application.

If the University of Bristol discovers that I have made a false statement or omitted signification information from my application, for example examination results, I understand that it may have to withdraw or amend its offer or terminate my registration, according to circumstances.

Key Attributes:

- I have strong analytical skills, and the ability to work with data at very high levels of abstraction. This has been developed over 4 years of working in a variety of areas of pure maths throughout my degree, managing to properly understand and apply deep and complex concepts under the constant pressure of weekly deadlines.
- I have a keen interest, and have developed a foundational proficiency, in programming languages/software such as Python and MATLAB. I have cultivated this through university modules such as computational physics, which focused on simulating physics experiments in Python and handling the resulting data, as well as deconstructing and experimenting with waveform reference code in MATLAB at Dstl.
- I demonstrated effective project management and communication skills, organising a series of interviews with various cyber security executives across multiple different industries, and then producing a report for QA on the different soft skills requirements for graduates entering the sector.
- I am adept at self-motivating and keeping my time well structured, even during long periods of independent learning. I completed a 50-hour independent research project on quantum cryptography alongside my summer cyber security course, and successfully maintained an average of around 90% or above at university, despite a plethora of pandemic-induced changes and disruptions during my final three years.

Education:

MMath Mathematics, University of Warwick – First Class Honours (91% Average)
Dissertation: Isogeny-Based Cryptography
Modules Including: Computational Physics, Programming for Scientists, Quantum Computing, Partial Differential Equations, Manifolds, Algebraic Geometry

A Level
A level Mathematics, Further Mathematics, Further Mathematics (Additional), Physics, Chemistry, Economics (A*A*A*A*AA)

Work Experience:

Future Telecommunications Policy Adviser, Department for Science, Innovation and Technology, 100 Parliament Street, London, SW1A 2BQ
(October 2023 – Present)

- I sit within the Future Telecommunications Technology Policy Unit, developing and coordinating policy around the UK contribution to Open RAN and 6G standards – with particular focus on supporting the UK government's contribution to ITU-R and removing barriers for increased contribution by UK SMEs to the O-RAN Alliance.

Communications & Networks Scientist, Defence Science and Technology Laboratory, Porton Down, Salisbury, SP4 0QJ
(October 2022 – October 2023)

- I researched generation after next communications systems and network routing for defence and security applications – with particular focus on error-correction codes and Quantum Communications.

Graduate Teaching Assistant, Warwick Mathematics Institute, University of Warwick, Coventry, CV4 7AL
(October 2021 – December 2021)
- I marked assignments and provided feedback to small groups of first year mathematics students and supported their teaching in core maths modules.

Teaching Assistant, Repton School, Repton, DE65 6FH (unpaid work experience)
(October 2017 – March 2018)

- I helped students through exercises and provided one to one support during maths lessons.

Kitchen Staff, The Dog & Partridge, Tutbury, DE13 9LS
(September 2017 – June 2018)
- I experienced the pace and intensity of all roles of kitchen work, including cooking and plating of mains meals & starters, pot washing and cleaning.

Accountancy & IT Assistant, Davis & Co Accountants, Derby, DE22 2HH
(August 2015)
- I shadowed and assisted chartered accountant, in areas including input of supplier invoices, simple client accounts and bank reconciliation.

Labourer/ Office Assistant, JEC Scaffolding, Derby, DE21 6JY
(July - August 2015)
- I broadened my understanding of small businesses in the construction industry by labouring for the scaffolders and supporting the office manager with basic accounts and setting up IT-based invoice organisation systems.

Assistant to Financial Director, The Stuart Hotel, Derby (unpaid work experience)
(February 2014)
- I examined the role of an internal accounts department, assisting the financial director via duties such as daily completion of the revenue report, entering and filing of invoices, and completion and distribution of wage slips.

References:
References available on request.
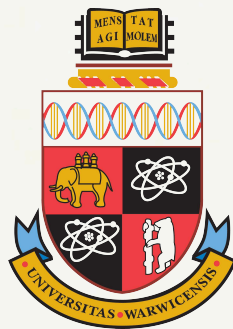
It is hereby certified that

Stephen Graham Richardson

was awarded the degree of

Master of Mathematics (with Honours)

First Class

of this University by the Senate on
Tuesday 5th July 2022

Vice-Chancellor and President

Registrar

WARWICK

THE UNIVERSITY OF WARWICK

During the first half of my integrated masters degree, I alternated a lot between analysis and algebra – often finding the problems considered in analysis to be more tangible and interesting (compared to the seemingly more "contrived" problems of first and second year algebra), whilst deeply admiring the often greater elegance of algebraic solutions. My first course in number theory was very much on the analytic side and many of the techniques seemed a bit "heavy handed" – using bounds to almost try and force a pre-determined solution out of a problem – initially persuading me that number theory wasn't for me. Going into my third year I still wanted to try almost every module available, but my growing interest in the world of cryptography persuaded me to take the fourth year Elliptic Curves module, as well as Galois Theory and Algebraic Number Theory to go alongside it. These three modules convinced me that I was an algebraic number theorist. Elliptic curves and Galois theory seemed to fall so incredibly naturally out of the universe – the sheer elegance of the algebra and the power of such seemingly natural structures made me feel like the results followed directly from some fundamental underpinning of mathematics.

Despite this, and my deeply academic leanings throughout most of my life, going into my final year at university, I felt like I'd been in academia for too long and needed a break. I was determined to "get out and do something", and so decided that instead of doing the PhD that I'd planned on doing since roughly the start of A-level Mathematics, I was going to join the Civil Service – though still in a role that allowed me to keep one foot in mathematical research, as a Communications and Networks scientist at the Defence Science and Technology Laboratory (dstl). I believed at the time, and still believe, that a change was the right choice, but I loved diving deeper into algebraic geometry, modular forms, and more algebraic number theory during my final year. In particular, the Local Fields module in my second term really made me think twice about my decision not to pursue a PhD. The p-adic numbers seemed to combine both the deep, rich structure that I had loved so much in analysis with the immense elegance of Galois theory. This culminated in the final lecture, where my lecturer laid out how of our work on the Galois theory of local fields extended to infinite Galois theory, and the deep underlying connections with elliptic curves and modular forms – looking towards L-functions, Iwasawa Theory, and the Langlands program. What caught my imagination was again how natural all of these connections felt, and the almost deeply philosophical nature of the proposed immense underlying interconnectedness of seemingly very distinct areas of mathematics.

After this I went a talked to my lecturer for a long time about his work – where my Modular Forms course had focused mainly on the foundational complex analysis, he helped me to see some of the richer connections with elliptic curves. I was so desperate to dig further that I began to apply for PhDs after all, to start in 2023. In the end, however, I decided that I wanted to give dstl a real chance first – I was still getting to work in interesting theoretical areas and wanted to give my full attention to my job.

Over time, however, partially because I've now drifted further away from the more technical side of the Civil Service, I've realised how much I've missed algebraic number theory, how much more of the field I really want to explore, and how I more generally miss academia's pure pursuit of deeply interesting problems. It is obviously taking a certain amount of time to fully refresh some of my university background – working back through key texts such as A First Course in Modular Forms and The Arithmetic of Elliptic Curves – but my time in a more standard working environment has helped me better manage my time workload and guard against burning myself out. Most of all, my break from academia has given me the time and space to properly consider my choice to do a PhD, with a clearer idea of what my other options are. This has reinvigorated my drive and enthusiasm to tackle abstract mathematical problems, and helped me ensure that my decision isn't driven by fear of leaving my "academic comfort zone" but by a true desire to delve deeper into the algebraic number theory problems that intrigued me so much during my undergraduate degree.

Research Proposal

I would like to study Algebraic Number Theory – with a particular view towards Iwasawa Theory or the Langlands Programme more generally. My favourite module from my undergraduate degree was Local Fields, and I particularly enjoyed the final third of the module applying earlier results on the splitting of polynomials to the Galois theory of local fields. It was my Local Fields' lecturers final lecture, laying out the beginnings of infinite Galois theory and the Langlands Programme that made me reconsider my choice to join the Civil Service after university instead of pursuing a PhD – as I had initially planned for most of my undergraduate degree. Iwasawa Theory seemed to combine what I loved about Local Fields with the best parts of my Elliptic Curves, Galois Theory, and Algebraic Geometry modules, as well as showcasing the deeper connections between Modular Forms and Elliptic Curves – something that had been mostly lost in my Modular Forms module's focus on the complex analytical underpinnings.

I also have a deep interest in algebraic number theory from an application side. My masters dissertation, titled Isogeny-Based Cryptography, explored the structure of the endomorphism rings of elliptic curves defined over finite fields, and the correspondence between (left) ideals of the endomorphism ring and isogenies from the corresponding elliptic curves, to understand cryptographic key exchange algorithms using isogeny graphs of first ordinary then supersingular elliptic curves. During my time at the Defence Science and Technology Laboratory, I then further undertook projects exploring error-correction codes – including the more applied simulation of different implemented codes to compare performance, as well as the deeper theoretical exploration of the respectively algebraic and information theoretic underpinnings of the design and potential performance limits of such codes.

I would like to undertake my PhD at the University of Bristol because I believe Dr Alice Pozzi or Prof Tim Dokchitser would be an excellent supervisor, and I believe the university would be the perfect environment for me to undertake such research. I attended the 2023 European School of Information Theory, hosted at the School of Mathematics, and was deeply impressed with both the Fry building itself but also the vibrant academic atmosphere. The universities' unique connection with the Heilbronn institute also offers the opportunity for me to both pursue a much more theoretical algebraic line of research whilst still having sight of the defence and security applications – something I believe I am particularly well-placed to take advantage of given my work at dstl and my continuing work on communications security within the Civil Service.

HIGHER EDUCATION ACHIEVEMENT REPORT

Stephen Graham Richardson
Master of Mathematics (with Honours) Mathematics (MMath)
First Class Honours
05/07/2022

This Higher Education Achievement Report incorporates the model developed by the European Commission, Council of Europe and UNESCO/CEPES for the Diploma Supplement.

The purpose of the Supplement is to provide sufficient recognition of qualifications (diplomas, degrees, certificates etc). It is designed to provide a description of the nature, level, context and status of the studies that were pursued and successfully completed by the individual named on the original qualifications to which this Supplement is appended. It should be free from any value judgements, equivalence statements or suggestions about recognition.

Information in all eight sections should be provided. Where information is not provided, an explanation should give the reason why. The University of Warwick only produces HEARs in a digital format. Only HEARs accessed or verified via www.gradintel.com can be considered valid.

Section 1: Information identifying the holder of the qualification

1.1	**Family name(s):**	Richardson
1.2	**Given name(s):**	Stephen Graham
1.3	**Date of birth (day/month/year):**	25/04/1999
1.4	**Student identification number:**	1703113
	HESA identification number:	1811637031135

HUSID (HESA Unique Student Identifier) is the unique national identifying number for students registered at a UK university. It is defined by HESA, the UK's Higher Education Statistics Agency.

Section 2: Information identifying the qualification

2.1	**Qualification achieved:**	Master of Mathematics (with Honours)

The power to award degrees is regulated by law in the UK.

2.2	**Main field(s) of study:**	Mathematics (MMath)
2.3	**Name and status of awarding institution:**	The University of Warwick

The University of Warwick is self-governing and legally independent of government but subject to its policies and laws. The University is a degree awarding institution, operating under a Royal Charter which was established in 1965.

2.4	**Name and status of institution (if different from 2.3) administering studies:**	As awarding institution
2.5	**Language(s) of instruction/examination:**	English

Section 3: Information on the level of the qualification

3.1 HESA level of qualification: UK Integrated Masters Degree with Honours Level 7 (European HE 2nd cycle qualification)

See section 8 for reference to nationally devised "level indicators" which relate to the qualification as contained within the Framework for Higher Education Qualifications in England, Wales and Northern Ireland, (QAA, 2008). Also available at http://www.qaa.ac.uk/.

3.2 Official length of programme: 4 years full-time

3.3 Programme entry requirements or access:

The University aims to admit students of the highest calibre, who have the academic potential and the motivation to succeed on its challenging courses. The University encourages applications from applicants from all backgrounds and it consistently evaluates the potential of each applicant individually and on their own merits.

Section 4: Information on the contents and results gained

4.1 Mode of study:

Year	Mode of Study
18/19	Full-time according to Funding Council definitions
19/20	Full-time according to Funding Council definitions
20/21	Full-time according to Funding Council definitions
21/22	Full-time according to Funding Council definitions

4.2 Programme requirements:

A Mathematics degree enhances a student's ability to think clearly, learn new ideas quickly, manipulate precise and intricate concepts, follow complex reasoning, construct logical arguments and expose illogical ones, invaluable skills which prepare our students for the rapidly changing modern world of employment.

Our undergraduate Mathematics programmes are distinguished by their academic excellence, flexibility and choice. All courses contain the same basic core of Mathematics in the first year, allowing easy transfer between degree courses. Our curriculum is broad, modern, and rigorous; and our degrees internationally recognised. Warwick Mathematics Institute is consistently ranked as one of the UK's top mathematics departments, with internationally renowned research that drives the quality of our teaching and the mathematical experience of students.

In undertaking study in Mathematics at Warwick, students develop an advanced knowledge of a foundational core of pure mathematics and an understanding of a range of applied mathematics and techniques. This, teamed with the ability to think independently, deploy research skills and the capacity to integrate separate arguments coherently, prepares students for professions requiring strong reasoning and analytic skills.

The MMath extends the opportunities over students on the three year BSc. by introducing them to more advanced topics, largely based on the current research interests of the department. This additional depth provides excellent preparation for further postgraduate study, as well as allowing students to pursue strains of mathematics to a much higher level than they may otherwise encounter.

4.3 Programme details, and the individual grades/marks/credits obtained:

Programme start date: 24/09/2018

Programme end date: 02/07/2022

The University of Warwick introduced component assessment marks for the HEAR in the academic year 2021/2022. Prior to 2021/2022 component assessment marks are not available.

Mathematics (MMath) 18/19

Year	Module Code	Title	Mark %	Credits	ECTS Credits
18/19	MA106-12	Linear Algebra	93	12.0	6.00
18/19	MA117-12	Programming for Scientists	92	12.0	6.00
18/19	MA124-6	Mathematics by Computer	65	6.0	3.00
18/19	MA125-6	Introduction to Geometry	80	6.0	3.00
18/19	MA131-24	Analysis	90	24.0	12.00
18/19	MA132-12	Foundations	65	12.0	6.00
18/19	MA133-12	Differential Equations	93	12.0	6.00
18/19	MA134-12	Geometry and Motion	89	12.0	6.00
18/19	MA136-6	Introduction to Abstract Algebra	99	6.0	3.00
18/19	PX148-12	Classical Mechanics & Special Relativity	88	12.0	6.00
18/19	ST111-6	Probability (Part A)	82	6.0	3.00
18/19	ST112-6	Probability (Part B)	93	6.0	3.00
		TOTAL YEAR 18/19 CREDITS		126.0	63.00

Mathematics (MMath) 19/20

Year	Module Code	Title	Mark %	Credits	ECTS Credits
19/20	MA213-6	Second Year Essay	72	6.0	3.00
19/20	MA243-12	Geometry	96	12.0	6.00
19/20	MA244-12	Analysis III	84	12.0	6.00
19/20	MA249-12	Algebra II: Groups and Rings	91	12.0	6.00
19/20	MA250-12	Partial Differential Equations	100	12.0	6.00
19/20	MA251-12	Algebra I: Advanced Linear Algebra	97	12.0	6.00
19/20	MA254-12	Theory of ODEs	98	12.0	6.00
19/20	MA257-12	Introduction to Number Theory	79	12.0	6.00
19/20	MA259-12	Multivariable Calculus	94	12.0	6.00
19/20	MA260-12	Norms, Metrics and Topologies	90	12.0	6.00
19/20	PX267-7.5	Hamiltonian Mechanics	69	7.5	3.75
19/20	PX277-7.5	Computational Physics	100	7.5	3.75
		TOTAL YEAR 19/20 CREDITS		129.0	64.50

Mathematics (MMath) 20/21

Year	Module Code	Title	Mark %	Credits	ECTS Credits
20/21	MA377-15	Rings and Modules	95	15.0	7.50
20/21	MA3A6-15	Algebraic Number Theory	82	15.0	7.50
20/21	MA3B8-15	Complex Analysis	96	15.0	7.50
20/21	MA3D5-15	Galois Theory	96	15.0	7.50
20/21	MA3E1-15	Groups & Representations	88	15.0	7.50
20/21	MA3F1-15	Introduction to Topology	95	15.0	7.50
20/21	MA3H5-15	Manifolds	95	15.0	7.50
20/21	MA3H6-15	Algebraic Topology	85	15.0	7.50
20/21	MA426-15	Elliptic Curves	81	15.0	7.50
		TOTAL YEAR 20/21 CREDITS		135.0	67.50

Mathematics (MMath) 21/22

Year	Module Code	Title	Mark %	Credits	ECTS Credits
21/22	CS419-15	Quantum Computing	97	15.0	7.50

Assessment	Weight	Mark
Worksheet	10%	88.00
Worksheet	10%	100.00
Examination - Summer (Weeks 4 to 9)	70%	97.00
Worksheet	10%	100.00

Year	Module Code	Title	Mark %	Credits	ECTS Credits
21/22	MA3G6-15	Commutative Algebra	99	15.0	7.50

Assessment	Weight	Mark
Worksheet	15%	98.00
Examination - April	85%	99.00

Year	Module Code	Title	Mark %	Credits	ECTS Credits
21/22	MA4A5-15	Algebraic Geometry	94	15.0	7.50

Assessment	Weight	Mark
Worksheet	15%	78.00
Examination - April	85%	97.00

Year	Module Code	Title	Mark %	Credits	ECTS Credits
21/22	MA4H9-15	Modular Forms	94	15.0	7.50

Assessment	Weight	Mark
Examination - Summer (Weeks 4 to 9)	100%	94.00

Year	Module Code	Title	Mark %	Credits	ECTS Credits
21/22	MA4J7-15	Cohomology and Poincare Duality	87	15.0	7.50

Assessment	Weight	Mark
Examination - Summer (Weeks 4 to 9)	85%	85.00
Worksheet	15%	100.00

Year	Module Code	Title	Mark %	Credits	ECTS Credits
21/22	MA4K9-30	Project (Research)	84	30.0	15.00

Assessment	Weight	Mark
Written Report	80%	83.00
Other	5%	100.00
Other	15%	83.00

Year	Module Code	Title	Mark %	Credits	ECTS Credits
21/22	MA4M3-15	Local Fields	97	15.0	7.50

Assessment	Weight	Mark
Examination - Summer (Weeks 4 to 9)	85%	96.00
Worksheet	15%	100.00

TOTAL YEAR 21/22 CREDITS	120.0	60.00
TOTAL CREDITS AWARDED	510.0	255.00

4.4 Grading scheme and, if available, grade distribution guidance:

The following classes of degree are awarded at undergraduate level, see
http://go.warwick.ac.uk/assessmentconventions for more information:

Classification	Normal Average Grade
First Class Honours	At least 70%
Second Class Honours (1st Division)	At least 60%
Second Class Honours (2nd Division)	At least 50%
Third Class Honours	At least 40%
Pass	At least 35%

4.5 Overall classification of the qualification (in original language):   First Class Honours

Section 5: Information on the function of the qualification

5.1 Access to further study:

This qualification may allow access to further study (at FHEQ level 7 or for equivalent EHEA second cycle qualifications) subject to individual requirements of the institution concerned.

5.2 Professional status (if applicable):

Not applicable

Section 6: Additional information

The University of Warwick has agreed a list of activities undertaken outside the academic curriculum that will be recorded in the HEAR. All activities recorded in this section have been verified by the University. This section also includes any departmental or University prizes won. Other activities and achievements not included in the HEAR, may be recorded in a CV or e-portfolio. Visit http://www.warwick.ac.uk/hear for a full list of activities.

Note: The HEAR was introduced at the University of Warwick at the beginning of the 2011/12 academic year, and therefore includes only information about activities undertaken and prizes awarded in the 2011/12 academic year or later.

6.1 Additional information:

2020/21

Society Executive
Responsible for the running of a Students' Union Society, alongside other executive members - Warwick Liberal Democrats : Treasurer

6.2 Further information sources:

The University of Warwick is one of the UK's leading universities, with an acknowledged reputation for excellence in research and teaching, for innovation, and for links with business and industry. Its mission is:
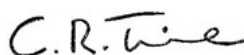
- To become a world leader in research and teaching
- Through research of international excellence, to increase significantly the range of human knowledge and understanding
- To equip graduates to make an important contribution to the economy and to society
- To serve our local region - academically, culturally and economically
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Section 7: Certification of the HEAR

7.1 Date   05/07/2022

7.2 Signatory: Dr Chris Twine

7.3 Official capacity: Academic Registrar

7.4 Official stamp or seal

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Dr. Christopher Lazda

11 December 2023

To whom it may concern,

I know Stephen through supervising his M.Math. project entitled "Supersingular isogeny based cryptography" while I was a Zeeman Lecturer at Warwick. Over the duration of the projection, I was extremely impressed by both his ability and his enthusiasm, and found him dedicated, and incredibly eager to learn.

He consistently showed an impressive willingness to really delve into the details of the topic, and never wanted to take anything as a black box, instead tracing his way back through all the references until he really understood why a particular result was true, or how a particular proof worked. If he felt details were lacking in some of these references, he was scrupulous about filling them in, and most of our meetings consisted of him explaining to me how things worked, rather than the other way round.

The only (very!) minor criticism that I had was that this occasionally led to him losing track of the bigger picture by being too focussed on the details, but he nevertheless ended up writing an excellent dissertation that reflected well on his mathematical ability and curiosity.

Overall his grades are excellent. He achieved a 1st class final degree, and with marks placing him comfotably in the top 5% of his M.Math. cohort at Warwick (out of a total of around 100 students). He is certainly one of the strongest masters students that I have supervised, and I have absolutely no doubt that he has the skills, ambition, and enthusiasm fr the subject to make an excelllent Ph.D. student, and one that I myself would take on without hesitation.

Yours sincerely,

Christopher Lazda

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December 24, 2023

Re: reference for **Stephen Richardson**

To whom it may concern,

I am writing to enthusiastically support Stephen Richardson's application to for number theory PhDs. I met Stephen in January 2022, whilst he was taking my MMath course 'Local Fields' at Warwick (in my previous role as a Warwick Zeeman Lecturer). That Stephen has strong mathematical intuition was immediately apparent. He is comfortably the best undergraduate student I've taught, and one of the clearest-cut candidates for a doctoral place that I've encountered in my career.

Break from academia

I should start by discussing Stephen's break from academia. Early in his 4th year (that is, late 2021) Stephen decided to apply for mathematical civil service jobs. Despite the fact he was not going to immediately be doing a PhD, he remained more enthusiastic for research-level pure mathematics than any undergraduate I've ever taught. During his exams, he was asking me for further reading on a wide array of topics, as well as taking an active interest in current research trends. The day after his exams ended – at a time when most students would be keen to do anything *but* mathematics – he was in the department, working through materials I'd given him, and keen to talk more about research programs in number theory.

Initially the civil service provided an array of interesting mathematical topics for Stephen to research, and he supplemented this with various number theory textbooks and lecture notes. It also offered personal stability and a solution to his two body problem. As time has progressed, the civil service job has drifted further from the mathematics that really interests Stephen, and he has now decided that he needs to be doing something richer in the mathematical world: hence the decision to apply for a PhD place.

I find it hard to imagine more compelling evidence of his willingness to work hard in research. Arguably this break will also be beneficial in the longer term, as it provides Stephen with experience of mathematics in wider contexts, and has given him time to process and reflect on material from his degree/read more widely.

Academic results to date

Stephen's results at Warwick were exceptional. On my own course, I set an exam with deliberately challenging unseen aspects, simultaneously requiring mastery of totally separate parts of the course. Very few students answered these questions successfully, but Stephen handled them all superbly, scoring 97% overall, additionally scoring over 90% on all five questions on the exam (even though he was required to attempt only four).

Stephen's other examination results, across his entire degree, were also exceptional. Across his first 3 years, his weighted average of 91% was inside the top 10 from a cohort of 284 at Warwick. His even more impressive 4th year average of 92% put him in the top 2% in the year (we are not provided more precise placings).

Even Stephen's *lowest* 4th year module mark, the grade of 84% for his essay, hit the following descriptor: "such marks are given occasionally, and require the student to have demonstrated the initiative, aptitude and independence normally expected of a good early-stage PhD student."

Knowledge of proposed field of study

Stephen has taken all of the standard number theory Master's level courses (Modular Forms, Elliptic Curves, Local Fields) available to UK students, and has supplemented this by reading widely: particularly classic textbooks by Silverman and Diamond–Shurman. He's also taken a keen interest in research topics such as the Langlands program and Iwasawa theory. Moreover he is highly motivated to read more, and has plenty of time between now and starting the PhD to pursue other appropriate background reading.

Critical evaluation skills/aptitude

Stephen was by a distance the strongest student (out of 38) taking my course. In lectures, he frequently posed thoughtful questions that displayed a complete understanding of the material. Sometimes he recognised and dragged out subtle difficulties that I had deliberately tried to suppress.

Our discussions have always been interactive, with Stephen being quick to grasp new concepts and place them into the bigger picture. He has come equipped with perceptive questions, intuitively sensing the most important parts of the theory. The pace with which he processed advanced written materials was also remarkable.

Summarising: I am genuinely delighted that Stephen has chosen to take this route. He excelled at every point in his degree, and has the enthusiasm, intuition, work ethic and clarity of thought to continue to excel when he turns to mathematical research. If offered a PhD place, I have absolutely no doubt that he'll prove a superb student.

Yours sincerely,

Dr. Chris Williams

Assistant Professor of Pure Mathematics
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