UNIVERSITY OF BRADFORD
Faculty of Engineering and Informatics
School of Electrical Engineering and Computer Science
Programme title: MSc Networks and Performance Engineering

<table>
<thead>
<tr>
<th>Awarding and teaching institution:</th>
<th>University of Bradford</th>
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<tbody>
<tr>
<td>Final award:</td>
<td>Master of Science (MSc) [Framework for Higher Education Qualifications Level 7]</td>
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<tr>
<td></td>
<td>Postgraduate Certificate (PG Cert)</td>
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<td>Postgraduate Diploma (PG Dip)</td>
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<td>Programme titles:</td>
<td>Networks and Performance Engineering</td>
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<td>Programme accredited by:</td>
<td>British Computer Society</td>
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<tr>
<td>Duration:</td>
<td>1 year full time; 2 years part-time</td>
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<tr>
<td>Subject benchmark statement:</td>
<td>Computing and Engineering</td>
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<tr>
<td>Date produced:</td>
<td>April 2003</td>
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<tr>
<td>Last updated:</td>
<td>June 2014</td>
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Introduction

Over the last few years there has been a growth in demand for Computing, Information Systems, Networks and Multimedia reflecting a trend towards Information Processing and Communications Management in both UK and worldwide. The technologies of Computing and Networking are rapidly converging and are already integrated into core activities of industrial, commercial and governmental organisations and are seen to be essential towards increasing their cost-effectiveness and competitiveness. This convergence of disciplines will become even more pronounced in the future as integrated networking technologies and infrastructure allow for the deployment of high speed distributed computing and its many applications.

The UK market is now strongly demanding more computing and networking professionals with both theoretical knowledge and practical skills in computing engineering, software development and industrial information systems applications. In particular, there is a great need to produce computing postgraduates with in-depth education and training towards the design, development, tuning and upgrading of computer, communication and software systems which meet performance objectives.

To respond to such a challenge and given current universal needs to use modelling and quantitative analysis techniques to predict and evaluate performance implications of design and implementation decisions, the School has introduced a pioneering MSc programme in 'Networks and Performance Engineering.' This innovative programme is the first one in the world concerned with modelling and quantitative analysis techniques for the design, development, tuning and upgrading of computer communications and software systems. It is aimed at graduates from science, mathematics, computing, engineering and related degree programmes.
The School has, for many years, successfully taught a range of programmes within Computing at both undergraduate and postgraduate level. This programme situated within the Faculty of Electrical Engineering and Computer Science (SEECS) of the School of Engineering and Informatics (SEI), would also be of relevance to graduates from Engineering, Mathematics and Operational Research, wishing to convert into Computing, with special emphasis on system performance aspects.

Graduates of this programme will be particularly suited to the field of mobile and high-speed networks, but the techniques covered will be equally applicable to the traditional computing areas including manufacturing and logistics.

**Programme Aims**

This programme aims to enable you to respond to current academic challenges for computing and networking and meet industrial needs for performance engineering, to provide a high academic quality of service to you covering both theoretical and practical aspects of computing and networking, and to enable you to equip yourself with knowledge, skills and understanding, at an advanced level. These aims will be achieved by:

- Providing you with a set of core fundamental modules in semester 1, and a choice of subject related optional modules in semester 2 that will allow some degree of specialization. An individual project/dissertation will allow you to apply the techniques and disciplines that you have learned within a more practical context.

- Providing the support in the form of lectures, labs and tutorials that will enable you to develop your personal portfolio of skills. The School of Electrical Engineering and Computer Science is committed to providing a very high standard of up-to-date computing facilities to support the practical hardware and programming requirements of the programme.

- Developing discipline skills and personal transferable skills so that on graduation you may move directly into responsible positions in industry or commerce, or may pursue further programmes of study.

**Programme Learning Outcomes**

On completion of this award you will be able to:

At PG Certificate and PG Diploma level:

- LO1. Demonstrate an advanced understanding and application of some of the theories, principles and techniques applicable in the field of networks and performance;
- LO2. Model and evaluate system/network performance and predict the effects of changes in operational parameters on system/network behaviour;
- LO3. Explain and relate concepts and be able to apply appropriate practical techniques in the area of computing and networking;
LO4. Critically analyse, model, construct and evaluate systems by means of simulation and propose solutions for the design of systems based on the simulation results;

LO5. Select, adapt and apply a modern object oriented programming language;

LO6. Demonstrate an advanced understanding of, and ability to apply, concepts, principles and theories underpinning software engineering to differing situations;

LO7. Analyse real-time systems and select and adapt technical to construct appropriate control software;

LO8. Demonstrate a critical understanding of the importance of probabilistic concepts for the definition of adequate reliability measures for systems and networks.

At MSc level, all the above and including:

LO9. Select, design, plan and manage a self-directed and managed research-informed project;

LO10. Demonstrate a critical awareness of current and possible future opportunities and problems in computing and networking; evaluating current developments and trends.

On completion of the MSc in Networks and Performance Engineering the successful student will be able to achieve mastery of computing and performance engineering by demonstrating

- **Knowledge and understanding** at advanced level of core computing and networking subjects including computer and networking architectures, software systems & development, protocols.

- **Discipline Specific Skills** including; Specialist understanding of and ability in analytic and simulation modelling techniques with applications to the performance/reliability modelling and evaluation of discrete flow systems such as computers, high speed networks, flexible manufacturing systems and highway/railway/airway networks.

- **Personal and Transferable Skills** in performance evaluation, interpretation and presentation; networking and communications skills; report writing and presentation skills: creative and systematic problem solving; teamwork and leadership; project management; and personal management

**The Curriculum**
The MSc Networks and Performance Engineering programme covers a range of specialist topics, through a series of integrated modules forming a complete and coherent programme of study leading to the qualification of a Master’s degree. The programme has two stages: the taught programme stage which takes place during the two semesters over one academic year (or four semesters for the part-time route over 2 academic years), and the project/dissertation stage to be undertaken over the summer.
period. Students must agree their project with the School during the first taught semesters.

Programme Structure

<table>
<thead>
<tr>
<th>Module Code</th>
<th>Credit</th>
<th>Sem</th>
<th>Level</th>
<th>Module Title</th>
<th>Type</th>
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<tbody>
<tr>
<td>CM1066D</td>
<td>20</td>
<td>1</td>
<td>7</td>
<td>Networks and Protocols</td>
<td>C</td>
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<td>CM1003D</td>
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<td>Software Development (PG)</td>
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<td>CM0602D</td>
<td>20</td>
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<td>7</td>
<td>Networks Performance Modelling and Analysis</td>
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<tr>
<td>CM0418D</td>
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<td>2</td>
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<td>Software (Performance) Engineering Group Project (PG)</td>
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<td>CM1054D</td>
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<td>CM1068D</td>
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<td>DISS</td>
<td>7</td>
<td>Dissertation</td>
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C = Core     O = Option

The curriculum may change, subject to the University's programme approval, monitoring and review procedures.

Assessment Regulations

This Programme conforms to the standard University Assessment Regulations for Postgraduate Programmes which are available at the following link: [http://www.bradford.ac.uk/aqpo/ordinances-and-regulations/](http://www.bradford.ac.uk/aqpo/ordinances-and-regulations/)

Teaching and Assessment Strategies

You will experience a wide range of teaching and learning environments. Concepts, principles and theories are generally explored in formal lectures, practiced in associated tutorials and seminars, and demonstrated in laboratory classes. Practical skills are developed in laboratory sessions, and professional and personal skills are implicitly developed through the programme in both group work and presentations. The Group Project develops an appreciation of how to manage group dynamics while working on a substantial performance engineering exercise. The individual project/dissertation brings various aspects of the programme together.

Each 20-credit module on the programme requires you to commit 200 hours of study. Some of these hours will be formally timetabled - lectures, laboratories, seminars and tutorials – and others will involve you in carrying out private study. The balance between these forms of study changes as you pass through the programme.

Methods of assessment are similarly varied and your progress will be assessed using a mix of formal examinations, presentations, reports, laboratory tests, essays, coursework assignments, and projects. The appropriate method is chosen so that you may demonstrate the particular learning outcomes of each module.
The School is committed to Education for Sustainable Development (ESD) and endeavours to integrate ESD wherever possible into the curriculum.

**Admission Requirements**

The University welcomes applications from all potential students regardless of their previous academic experience; offers are made following detailed consideration of each individual application. Most important in the decision to offer a place is our assessment of a candidate’s potential to benefit from their studies and of their ability to succeed on this particular programme. Entrance requirements for each programme will vary but consideration of your application will be based on a combination of your formal academic qualifications and other relevant experience.

If you have prior certificated learning or professional experience which may be equivalent to parts of this programme, the University has procedures to evaluate this learning in order to provide you with exemptions from specified modules contained within the curriculum. Please talk to us if you do not fit the standard pattern of entry qualifications.

We are continually reviewing and developing our practices and policies to make the University more inclusive, but if you are disabled we may need to make some adjustments to make sure that you are not disadvantaged. We would advise you to contact the programme leader before you apply to discuss these.

We specifically require that all applicants:
- Have a good Honours degree (2:2 or above) awarded by an approved degree-awarding body in Computer Science, or Mathematics or Engineering, following a programme which contained a significant proportion of computing; or
- Have a good Honours Degree in a subject other than those above and can demonstrate sufficient relevant professional computing experience.

Candidates applying to the programme with non-standard qualifications will be judged on an individual basis using the University’s RPL procedures.

**Learning Resources**

The JB Priestley Library on the city campus and our specialist library in the School of Management provide a wide range of printed and electronic resources to support your studies. We offer quiet study space if you want to work on your own, and group study areas for the times when you need to discuss work with fellow students. Subject librarians for each School provide training sessions and individual guidance in finding the information you need for your assignment, and will help you organise your references properly.

Student PC clusters can be found in both our libraries and elsewhere on the campus. Many of these are open 24/7. You can also use the University’s wireless network to access the internet from your own laptop. Most of our journals are available online (both on and off campus), and you can also access your University email account, personal information and programme-related materials this way.
Staff are on hand during the daytime to help you if you get stuck, and there is a 24/7 IT helpline available.

**Student Support and Guidance**

All students admitted to the School of Electrical Engineering and Computer Science go through a process of induction that includes detailed talks by the Dean and Head of School. Afterwards, ongoing support for is provided in the form of one-stop facilities located at the School Student Support Office (SSO) in Horton Building, open throughout the day during term, and in the mornings and afternoons outside term. Support for registered students also is provided 24/7 via the intranets of the School and the School's Technical Support. The School also uses the University’s Virtual Learning Environment (VLE) to support students via their individual modules.

**Programme Team**

Support for you personally and in your programme of study, will be provided both by the University and the Programme Team. You will be allocated a Personal Tutor who is someone with whom you will be able to talk about any academic or personal concerns. The School will ensure that there is someone available with whom you feel comfortable to help and support you. You will be provided with a comprehensive series of handbooks that you can consult on a range of learning issues and your programme tutors will be available to consult on subject specific queries.

All students on our MSc Networks and Performance Engineering will be allocated a Personal Tutor who provides support and guidance on matters relating to learning, teaching, and academic progress. There are Tutors in the School who have specialist responsibilities, and are able to deal with specific issues relating to factors such as disability, equal opportunities and gender.

**Students’ Union**

We value the feedback provided by students and collaborate with the Students’ Union, through a system of student representatives and formal staff student liaison committees, so that any issues you wish to raise are addressed rapidly.

The Students Union provide professional academic representation and advice. The Students’ Union and the University of Bradford work in partnership to provide confidential counselling and welfare services where you can get help with any aspect of your personal or academic life. Student Financial and Information Services (part of the Hub) will provide you with information about a diverse range of issues such as council tax, personal safety and tourist information. International Students can access a range of additional advice and support services through the Student’s Union.
The Hub, Student Support Centre

The Hub, Student Support Centre provides a central reception where students can receive information, advice and guidance on a whole range of topics about their life at University. The Hub is located in the Richmond Building adjacent to the Atrium.

The teams located within The Hub:

- Accommodation
- Admissions
  - Education Liaison
  - Enquiries
- Student Administration and Support
  - Bursaries and Financial Support
  - Finance and Credit Control Group
  - Payzone
  - Records and Tuition Fees
- International Office
- Customer Service Team

www.brad.ac.uk/hub
+44 1274 232233

Employability and Career Development

The University is committed to helping students develop and enhance their employability profile, commitment towards a career pathway(s) and to implementing a career plan.

Professional career guidance and development support is available throughout your time as a student and as a graduate from Career Development Services. The support available from Career Development Services includes a wide range of information resources, one to one appointments, a weekly workshop programme, a mentoring programme, graduate recruitment and careers fairs, plus information and help to you find part time work, summer work placements, internship programmes and graduate/postgraduate entry vacancies. In addition, some students will receive seminars and workshops delivered by Career Development Services as part of their programme of study. All students are encouraged to access Career Development Services at an early stage during their studies and to use the extensive resources available on their web site www.careers.brad.ac.uk.

Career Development Services annually undertakes a survey of all postgraduates to find out their destination six months after graduation. The survey gathers data on the employment and further study routes graduates have entered and a range of other information including job roles, name and location of employers, salary details etc. The survey findings for each programme of study are presented on the programme information pages on the University website and via Career Development Services’ website www.careers.brad.ac.uk.
Learner Development Unit for Academic Skills Advice

For postgraduate students on taught programmes who are looking to improve their marks during their time at university, study skills and maths advice is available to all regardless of degree discipline. Students can access a programme of interactive workshops and clinics which is delivered throughout the year. This is in addition to our extremely popular face-to-face guidance from our advisers, who also offer a wide range of online and paper based materials for self-study. http://www.bradford.ac.uk/academic-skills/

Disability

Disabled students will find a supportive environment at Bradford where we are committed to ensuring that all aspects of student life are accessible to everyone. The Disability Service can help by providing support, advice and equipment to help you get the most out of your time at Bradford. It is a place where you can discuss any concerns you may have about adjustments that you may need, whether these relate to study, personal care or other issues. For more information contact the Disability Service by phoning: 01274 233739 or via email: disabilities@bradford.ac.uk

University policies and initiatives

Ecoversity

Ecoversity is a strategic project of the University which aims to embed the principles of sustainable development into our decision-making, learning and teaching, research activities campus operations and lives of our staff and students. We do not claim to be a beacon for sustainable development but we aspire to become a leading University in this area. The facilities we create for teaching and learning, including teaching spaces, laboratories, IT labs and social spaces, will increasingly reflect our commitments to sustainable development. Staff and student participation in this initiative is crucial to its success and its inclusion in the programme specification is a clear signal that it is at the forefront of our thinking in programme development, delivery, monitoring and review. For more details see www.bradford.ac.uk/ecoversity/

Further Information:

For further information, please check the University prospectus or contact Admissions.

The Admissions Office  The Recruitment and Marketing Office
The University of Bradford  Faculty of Engineering and Informatics
Richmond Road  The University of Bradford
Bradford, BD7 1DP  Horton Building, Richmond Road
UK  Bradford, BD7 1DP, UK
Disclaimer

The details of this Programme Specification and information contained therein are subject to change in accordance with the University of Bradford’s programme approval, monitoring and review procedures.