MSc/PG Diploma/PG Certificate in Digital Signal Processing and Communications

For students entering in October 2010

Awarding Institution:	University of Reading
Teaching Institution:	University of Reading
Relevant QAA subject benchmarking group(s):	Engineering
Faculty:	Science
Programme length:	1, 2, or up to 5 years
Date of profile:	14/07/10
Programme Director:	Fu-Chun Zheng
Programme Advisers:	Prof C.G. Guy and R.S. Sherratt
Board of Studies:	MSc in DSPC
Accreditation:	IET accreditation can be considered.

Summary of programme aims

The programme aims to provide an industry oriented Master course in digital signal processing and communications (DSPC), covering not only the theoretical but also the implementation aspects of the subject, thus allowing the students, upon graduation, to be job-ready (For a full statement of the programme aims and learning outcomes, see below).

Transferable skills

As part of this programme students are expected to have gained experience and show competence in the following transferable skills: IT (word-processing, using standard and mathematical software, scientific programming), scientific writing, oral presentation, team-working, problem-solving, use of library resources and time-management.

Programme content

The profile below states modules of this taught MSc course. The modules in Term 1 (Autumn) are worth 60 credit points, those in Term 2 (Spring) 60 credit points, and the project in Term 3 (Summer) another 60 credit points, totalling 180 credit points. All the modules will be taught uniformly across all 10 weeks of the Autumn/Spring term.

Modules*		*Credits*	*Level*
Term 1 (or two terms part-time)			
CYMS2	*Signal Processing*	10	7
EEM22	*DSP architecture*	10	7
EEM13	*Digital Communications*	10	7
EEM14	*Personal and mobile communications*	10	7
EEM15	*Embedded DSP systems*	10	7
EEM16	*Image Processing*	10	7
Term 2 (or two terms part-time)			
SEM21	*Advanced DSP*	10	7
CY4C9	*Advanced neural networks*	10	7
EEM23	*Advanced wireless communications*	20	7
EEM24	*DSP simulations for wireless communications*	10	7
EEM25	*Communications for the real world: case study*	10	7

Term 3 (or two terms part-time)

EEM31	*MSc project (can be group project or industry project)*	60	7

* Denotation: Subject code EEM*mn* denotes Subject *n* in Term *m*.
* Module definition and sourcing: see the attachments

Part-time/Modular arrangements
Part-time students will be able to take the taught elements of the MSc in the Autumn and Spring terms over two consecutive academic years in he following manner.

Year 1: DSP stream:
Autumn term: CYMS2, EEM16, and EEM22
Spring term: SEM21, CY4C9

Year 2: Communications stream:
Autumn term: EEM13, EEM14, EEM15
Spring term: EEM23, EEM24, EEM25

The MSc project for part-time students will start in April of the first year of registration and will end in September of the second year of registration.

In addition to the full-time and two year part-time options, the programme is offered on a flexible modular basis, giving the opportunity to individuals who are in full-time employment to gain an MSc in Digital Signal Processing and Communications (180 credits, including a dissertation), a Postgraduate Diploma (120 credits without a dissertation) or a Certificate (60 credits), or to take the taught modules as free-standing CPD courses. Students in the flexible mode will have a maximum of five years to earn up to 180 credits.

The award of the Postgraduate Certificate and the Postgraduate Diploma will be dependent upon the successful completion of 60 credits and 120 credits, respectively, of the course at the same pass marks as for the Masters Degree. Because of the nature of the flexible modular option, students may be awarded the Postgraduate Certificate or Diploma at the termination of any appropriate module.

The maximum study period of five years will allow candidates considerable flexibility in achieving a postgraduate award while continuing to pursue a full-time career in industry. The flexible modular students will take their choice of modules together with the full-time students over the Autumn and Spring terms of each academic year. All the modules last for one term (i.e. 10 weeks). 10-credit modules involves *two* hours of lecture per week while 20-credit modules involve two hours of lecture as well as a hands-on session or a case study session of two hours per week.

It is also possible to take the taught modules as free-standing training courses and enroll on one of two different basis:

i. Continuing Professional Development (CPD) undertaking no assessment;

ii. as a module with assessment which would then contribute towards a postgraduate qualification (MSc, Diploma, or Certificate).

Summary of teaching and assessment
Teaching is organised in modules that typically involve lectures and tutorial and/or laboratory sessions. Most modules are assessed by a mixture of coursework and formal examination. Some modules are assessed only as coursework. Details are given in the relevant module description.

Awards Classification

Mark Interpretation
70 – 100% Distinction
60 – 69% Merit
50 – 59% Good standard (Pass)

Failing categories:
40 – 49% Work below threshold standard
0 – 39% Unsatisfactory Work

For Masters Degrees
To pass the MSc students must gain an average mark of 50 or more overall including a mark of 50 or more for the project. In addition the total credit value of all modules marked below 40 must not exceed 30 credits and for all modules marked below 50 must not exceed 55 credits.
Students who gain an average mark of 70 or more overall including a mark of 60 or more for the project and have no mark below 40 will be eligible for a Distinction. Those gaining an average mark of 60 or more overall including a mark of 50 or more for the project and have no mark below 40 will be eligible for a Merit.

For PG Diplomas
To pass the Postgraduate Diploma students must gain an average mark of 50 or more. In addition the total credit value of all modules marked below 40 must not exceed 30 credits and for all modules marked below 50 must not exceed 55 credits.
Students who gain an average mark of 70 or more and have no mark below 40 will be eligible for the award of a Distinction. Those gaining an average mark of 60 or more and have no mark below 40 will be eligible for a Merit.

For PG Certificates
To pass the Postgraduate Certificate students must gain an average mark of 50 or more. In addition the total credit value of all modules marked below 40 must not exceed 10 credits.

Awarding is made by the Examiners' exercising judgement of the category which best represents the candidate's achievement based on the overall level of performance (the weighted average of the marks), on the profile of marks overall, and on any specific restriction which may apply (for accreditation or other proper purposes), taking into account any relevant special circumstances.

Further information on marking criteria, awarding classifications (including the Master's course, Postgraduate Diploma, the Postgraduate Certificate), resits, and resubmissions, is given in the following document: www.reading.ac.uk/Exams/pgaward08-09.pdf.

Admission requirements

Undergraduate Degree
At least a 2.2 Honours UK BSc/BEng degree or overseas equivalent

Degree Discipline
Electrical Engineering, Electronic Engineering, Control Engineering, or any other engineering disciplines with preferably an introductory course in Signal Processing and/or Wireless Communications and adequate mathematical background (which should include linear algebra, matrix theory, probability and statistics, optimisation, and Fourier series). Applications from graduates of Mathematics are also welcome but will be considered on a case-by-case basis.

English
For candidates whose native language is not English, proof of competency is required. The two approved tests are:
IELTS (British Council International English Language Test) - score of 6.5
TOEFL (Test of English as a Foreign Language) - score of 590 (computer based version 243)

Admissions Tutor: F. Zheng

Support for students and their learning

University support for students and their learning falls into two categories. Learning support includes IT Services, which has several hundred computers, and the University Library, which across its three sites holds over a million volumes, subscribes to around 4,000 current periodicals, has a range of electronic sources of information and houses the Student Access to Independent Learning (S@il) computer-based teaching and learning facilities. There are language laboratory facilities both for those students studying on a language degree and for those taking modules offered by the Institution-wide Language Programme.

Student guidance and welfare support is provided by Personal Tutors, School Senior Tutors, the Students' Union, the Medical Practice and the Student Services Directorate. The Student Services Directorate is housed in the Carrington Building and includes the Careers Advisory Service, the Disability Advisory Service, Accommodation Advisory Team, Student Financial Support, Counselling and Study Advisors. Student Services has a Helpdesk available for enquiries made in person or online (www.risisweb.reading.ac.uk), or by calling the central enquiry number on (0118) 378 5555. Students can get key information and guidance from the team of Helpdesk Advisers, or make an appointment with a specialist adviser; Student Services also offer drop-in sessions on everything from accommodation to finance. The Carrington Building is open between 8:30 and 17:30 Monday to Thursday (17:00 Friday and during vacation periods). Further information can be found in the Student website (www.reading.ac.uk/student).

The Programme Director will offer advice on the choice of modules within the programme. A course handbook is provided which gives more details about the modules that make up the MSc degree. In addition, the School of Systems Engineering produces a Handbook for Students, which provides general information about the staff and facilities within the school.

Each student will have a supervisor with expertise in the subject area of the student's dissertation project. It is the responsibility of the supervisor to give guidance to the student through regular meetings. For full-time students these meetings should take place at least once every three weeks (appropriately longer for part-time students). It is the responsibility of the student to raise with the supervisor any difficulties or problems which occur in the course of the work and to submit coursework and progress reports as required by the course handbook.

Career prospects
Career prospects for the students of this course tend be strong as the DSPC knowledge and skills acquired are very relevant to the current and future DSP and communications industry. Since DSP is now the technology underpinning most signal and sensor related industry areas and wireless communications has penetrated into almost every aspect of today's society, the graduates are

expected to be employed in a large variety of sectors. Some graduates will join large multinational companies (DSP companies and telecommunications manufacturers and operators); others join smaller companies and consultancies; and some may well choose to further their research interests either in the School of Systems Engineering or at other Universities.

Opportunities for study abroad or placements
N/A

Educational aims of the programme
The programme aims to provide an industry oriented Master course in digital signal processing and communications (DSPC), covering not only the theoretical but also the implementation aspects of the subject, thus allowing the students, upon completion, to be job-ready.

Specifically, this MSc programme aims to provide its participants with:

1. An in-depth understanding of the DSP theory.
2. A thorough familiarisation with, and hands-on experience of, real-time or embedded DSP implementation.
3. A broad training in both digital communications and digital signal processing – two historically separate but rapidly converging areas.
4. An appreciation of current and future wireless communications systems (e.g. 3GPP, 802.11a/b/g, 802.15, and 802.16 or WiMax).
5. An opportunity to interact with senior engineers from the industry, as at least two of the modules will be taught by external experts from industry (a key feature of this course).
6. An easier choice for the next step in their career: they can either pursue a career in academia by continuing onto a PhD programme, or join the DSP or wireless communications industry immediately after their graduation.

Programme Outcomes

The programme provides opportunities for students to develop and demonstrate knowledge and understanding, skills, qualities and other attributes in the following areas:

Knowledge and Understanding

A. Knowledge and understanding of:	**Teaching/learning methods and strategies**
1. Advanced mathematical techniques to help model and analyse DSP systems. 2. Science underlying DSP and wireless communications systems. 3. Information technology as applied in DSP and wireless communications. 4. Real-time or embedded design of DSP systems, including a critical awareness of existing hardware and software design tools. 5. The state of the art, current problems and new insights in the fields of DSP and wireless communications.	The knowledge required for the different topics is obtained via lectures, tutorials, laboratory sessions, assignments and project work. Appropriate IT packages are used and introduced when necessary. Postgraduate demonstrators in laboratory and project supervisors advise students, and feedback is provided on all continually assessed work. By pursuing the course, students are expected to acquire greater initiative and undertake independent research. *Assessment* Most knowledge is tested through a combination of practicals, assignments and formal examinations: students write reports on most assignments and oral presentations are also assessed.

Skills and other attributes

B. Intellectual skills – able to:	**Teaching/learning methods and strategies**
1. Select and critically apply scientific principles, mathematical and computer based methods for analysing DSP and communications systems. 2. Analyse and solve DSP problems showing self-direction and originality. 3. Be innovative and creative. 4. Organise tasks into a structured form. 5. Understand the evolving state of knowledge in a rapidly developing area. 6. Transfer appropriate knowledge and methods from one topic in DSP to another. 7. Plan and conduct a research project and write a dissertation. 8. Prepare an oral presentation.	Appropriate mathematical, scientific and IT skills and tools are taught in lectures, and problems to be solved are given as projects or assignments. Project planning is part of the MSc project, and written and oral presentations are required for various assignments and for the MSc project. *Assessment* 1-6 are assessed partly by examination, though sometimes also by project or assignment work. 7 and 8 are assessed as part of project work.

C. Practical skills – able to:

1. Use appropriate mathematical methods or IT tools.
2. Program a computer to solve problems especially real-time problems.
3. Use relevant laboratory equipment and analyse the results critically.
4. Research into DSP and wireless communications problems.
5. Manage projects.
6. Present work.

Teaching/learning methods and strategies

Mathematics and IT tools are introduced in lectures and their use is assessed by examinations and assignments.

Programming assignments are set, and students may write programs as part of their MSc project.

Laboratory practicals and the MSc project are used to teach about 3, and the MSc project is used for 4, 5, and 6.

Assessment

1 is tested in coursework and in examinations. 2 is tested by assignments, the MSc project and occasionally by examination, 6 is assessed in assignments and the MSc project. 3 is assessed in practicals and sometimes in the MSc project while 4 and 5 are assessed through project work.

D. Transferable skills – able to:

1. Use IT tools.
2. Acquire, manipulate and process data.
3. Use creativity and innovation.
4. Solve problems.
5. Communicate scientific ideas.
6. Give oral presentations.
7. Work as part of a team.
8. Use information resources.
9. Manage time.

Teaching/learning methods and strategies

Some IT tools are taught in lectures, but most through laboratory sessions and assignments.

Data skills are acquired in laboratory and projects. Creativity, innovation and problem solving are experienced through the MSc project, time management and presentations. Team working skills are acquired through laboratory work. Use of information resources, such as the library and IT methods, is experienced through projects and assignments.

Assessment

Some skills, like the use of IT tools and the ability to communicate orally and in written form are directly assessed, in assignments or through the MSc project, other skills are not directly assessed but their effective use will enhance the students' overall performance.

Please note: **this specification provides a concise summary of the main features of the programme and the learning outcomes that a typical student might reasonably be expected to achieve and demonstrate if he/she takes full advantage of the learning opportunities that are provided. More detailed information on the learning outcomes, content and teaching, learning and assessment methods of each module can be found in the module description and in the programme handbook. The University reserves the right to modify this specification in unforeseen circumstances, or where the process of academic development and feedback from students, quality assurance processes or external sources, such as professional bodies, requires a change to be made. In such circumstances, a revised specification will be issued.**