University of Warwick

Centre for Scientific Computing

MSc in Scientific Computing
Course Handbook

September 2016

Course Director: Dr David Quigley
# Table of Contents

1. Introduction ................................................................................................................. 4

2. General Departmental Information ........................................................................... 4
   Personal Tutors ............................................................................................................... 4
   Communication .............................................................................................................. 5
   Photocopying and Printing .......................................................................................... 5
   Health, Safety and Wellbeing ....................................................................................... 5
   Complaints ..................................................................................................................... 5
   Scientific Computing Facilities .................................................................................... 6
   CSC Website and Intranet ............................................................................................. 6
   Timetabling ................................................................................................................... 6

3. Your first weeks at the CSC ....................................................................................... 6

4. Finding Your Way Around .......................................................................................... 6
   Lecture Room Locations ............................................................................................... 8

5. Data Protection .......................................................................................................... 8

6. Attendance Monitoring .............................................................................................. 9

7. Staff ............................................................................................................................ 10

8. Course Structure ...................................................................................................... 11
   Core Modules ............................................................................................................... 11
   Core Optional Modules ............................................................................................... 11
   Projects ......................................................................................................................... 12
   Course Calendar ........................................................................................................... 12

9. Assessment .................................................................................................................. 13
   Submission of Assessed Work ...................................................................................... 13
   Module Evaluation Forms ............................................................................................. 13
   Awarding of Degree (Exam Board Conventions) ......................................................... 13
   Resubmission of Dissertations: .................................................................................. 14
   Student Support Services ............................................................................................. 14

10. University and Departmental Regulations ................................................................. 15
    Regulations on Cheating in Assessed Work ................................................................. 15
    Divulging of Marks to Students .................................................................................. 17
Return of Assessed Work to Students ................................................................. 17
Use of Calculators in Examinations .................................................................. 18
Mitigating Circumstances .................................................................................. 18
Departmental Procedures Concerning Medical Self-Certification ...................... 18
11. Course Syllabus ............................................................................................ 19
   CY900 Foundations in Scientific Computing .................................................... 19
   CY901 High Performance Scientific Computing ................................................. 20
   CY903 Practical algorithms and Data Structures .............................................. 21
   Core Optional Modules .................................................................................... 22
12. Your MSc Dissertation ................................................................................... 23
   Background Information .................................................................................. 23
   Choosing a supervisor ..................................................................................... 23
   Guidelines for the Dissertation ....................................................................... 23
   Role of the dissertation supervisor ................................................................. 24
   Contact with your supervisor ......................................................................... 24

'Learn on the Fly' simulation of a crack in silicon stumbling at a boron impurity (orange)
Dr James Kermode
1. **Introduction**

Welcome to the Centre for Scientific Computing (CSC) at the University of Warwick.

The aim of the MSc in Scientific Computing is to provide graduates who have a first degree in a natural sciences or computing, with advanced training in Scientific Computing. This will enable them to pursue careers in the Sciences and/or Scientific Computing fields or to continue their studies into a PhD.

The Centre for Scientific Computing at Warwick has a strong research base in scientific techniques; it maintains links with all Science departments and with the Scientific Computing Research Technology Platform (SCRTP) which provides high performance computing equipment for the University.

Our course is designed to leverage this expertise and equipment. Although the emphasis of the course is on Scientific Computing, it will also develop your skills in using a range of computing equipment and software tools, transferable to any quantitative field of study.

The CSC at Warwick is committed to providing the best possible training in Scientific Computing and our MSc students are exposed to the widest possible range of computer equipment and software, working with academics from across the Science Faculty.

2. **General Departmental Information**

The Centre for Scientific Computing (CSC) is a multi-disciplinary research centre with members drawn from across the sciences and engineering at Warwick. It is administratively based within the Physics Department, which is the home department for Scientific Computing MSc students. The Postgraduate Coordinator is located on the fifth floor of the main physics building, in room P565 and should be your first point of contact for any queries or problems with the course. Please use the address physicspg@warwick.ac.uk for e-mail contact.

The Physics Department has two workrooms for use by students. These are located on the fifth floor of the main physics building (P520) and the first floor of the physical sciences building (PS151). Both rooms contain Windows computers available for general usage, and which can be used as remote terminals for the SCRTP Linux systems. In some cases, desk space for your dissertation project will be provided within the department of your dissertation supervisor.

The CSC has Coffee and Cookies every Friday at 2pm. This is announced via email. Everyone associated with the CSC, from lecturers to students, including you, is very welcome to join us.

The CSC runs a series of seminars which you are also welcome to attend. Keep your eyes open for posters around the building and emails about them. Speakers come from many different disciplines but all use scientific computing prominently in their research.

**Personal Tutors**

At the start of your course, all MSc Scientific Computing students are assigned a personal tutor. Your personal tutor can be consulted at any time on any issue arising from the MSc course (problems with modules or research projects, career prospects, etc.). She/he will write official letters or references for you, argue your case on University bodies if necessary, and generally do all she/he can to help you.
It is possible to request a different tutor in some circumstances. For example, if you have been assigned a tutor of the opposite gender, and would be happier with a tutor of the same gender as yourself, or if you are assigned a tutor who (once research projects have been assigned) also turns out to be your project supervisor.

The Director of the CSC has overall departmental responsibility for the MSc course and can be contacted by email at csc-director@warwick.ac.uk or via the Postgraduate Co-ordinator: physicspg@warwick.ac.uk

Communication

Some course information may be put into your mail pigeon hole (located in the Physics common room), which is where all University communications will also be delivered. Please do not use the department as your correspondence address. Your private (Royal Mail) post should go to your accommodation.

All urgent messages about your course, e.g. room changes and rearranged lectures, will be communicated to your **University** email address. You should check your email account regularly (preferably daily) as some members of academic staff may also use this as a method of communication. If you have another email address that you use on a regular basis, you should arrange for the emails from your university account to be forwarded on; the Postgraduate Office will not use any personal email addresses. If you are unsure of your university email account address please speak to IT services (ext 73737).

You should also sign up to the csc-events mailing list to keep informed about courses, seminars etc that might be of interest to you.

Photocopying and Printing

Postgraduate students can print via the Kyocera printers in the Physics common room.

Health, Safety and Wellbeing

All matters of safety referring to the University can be found from the Health, Safety and Wellbeing webpages

http://www2.warwick.ac.uk/services/safety/health_and_safety/policy/

All staff and students must attend the annual health and safety briefing and must work and study within the guidelines set out by the Health and Safety Office. Information on first aiders, fire alarms, etc. is prominently displayed around the Department.

Complaints

The University has created the Student Complaints Resolution Pathway, details of which can be found here

http://www2.warwick.ac.uk/services/aro/studentfeedbackandcomplaints/student_complaints/

If you have a complaint please do not hesitate to let us know. Your first point of contact would usually be the Postgraduate Coordinator but you should feel able to speak to your personal tutor, your supervisor or the course director if you feel that is necessary.
Scientific Computing Facilities

The Centre for Scientific Computing’s computing systems are run by the SCRT technical team headed by Facilities Manager Dr Matthew Ismail. Access to these resources is governed by the centre and university regulations which you are expected to follow. Please see http://www2.warwick.ac.uk/fac/sci/csc/local/ for details.

CSC Website and Intranet

The CSC Website contains a range of information that you will find useful. Much of this, including current MSc Scientific Computing timetables and some course material, is available via the departmental intranet. To access the intranet, go to the departmental website at http://www.warwick.ac.uk/go/csc/.

Some web pages are access restricted. If you want to see these local pages you will need to click on the Sign In link located at the top right of the screen. Sign in with the username assigned to you by IT Services and your password.

This will add the Intranet link to the navigation panel.

Timetabling

The timetable for the MSc Core modules can be found via the link on this page of the CSC website http://www2.warwick.ac.uk/fac/sci/csc/teaching/modules/.

Any changes or timetables for the Spring term may also be printed and given to you via your pigeon hole, as well as being displayed on notice boards. Please report any problems to the Postgraduate Coordinator. When choosing your Core Optional Modules please check their timetabling to ensure that you spread your workload over the Autumn and Spring terms evenly.

3. Your first weeks at the CSC

Your first Core Module CY900 starts on the Monday of the last week of the university’s holiday, so you will be starting before most of the other university students arrive.

On your first day we will invite you to meet each other, the Director and Postgraduate Coordinator and your Personal Tutors. We’ll also show you around the building, and to the teaching space used for CY900. Unfortunately, there is always paperwork to be completed and questions to ask but we will be there to try to answer them.

The University organises many induction events and socials during the first few weeks, many at the Post Graduate Hub. You can find out more about them here http://www2.warwick.ac.uk/services/library/pghub/.

In the first few weeks of term we usually hold a social event where you can meet some of the PhD students involved with the CSC, and previous MSc students. This is a good opportunity to learn about the various departments engaged with the CSC.

4. Finding Your Way Around

Teaching rooms for all core modules will be stated on the CSC web site http://www2.warwick.ac.uk/fac/sci/csc/teaching/modules/.
Please print a map which can be found at: 
http://www2.warwick.ac.uk/about/visiting/maps/central/.

The main courses will be held in Mathematics, Statistics, Computer Science, Physics and Physical Sciences. All are within just a few minutes’ walk of each other. The location for practicals will be stated on the websites for the appropriate modules, and will appear on these sites in due course.
Lecture Room Locations

Most rooms can easily be located using “search” on the University interactive map: http://www2.warwick.ac.uk/about/visiting/maps/interactive/. Rooms tend to follow a consistent numbering system, consisting of letter(s) followed by a three digit number. The letter(s) indicate the building, the first digit specifies the floor, and the final two digits identify the room.

For example: You will find **MS3.01** on the third floor of the Mathematics building.

The following list tells you which code is used for which building:

- **A** Engineering Department
- **B** B Block Science Concourse
- **C** Chemistry Department
- **CS** Computer Science Department
- **D** Engineering Department
- **G** Theoretical Chemistry Annexe, or Gibbet Hill Site
- **F** Engineering Department
- **H** Humanities Building
- **L** Lecture Theatres
- **LIB** Library
- **MS** Maths and Statistics Building
- **MAS** Materials and Analytical Sciences Building
- **P** Physics Department
- **PS** Physical Sciences Building
- **R** Ramphal Building
- **S** Social Studies Department

Complete maps of the University are available online at http://www2.warwick.ac.uk/about/visiting/maps/.

5. Data Protection

Staff, students and members of the University must comply with the eight data protection principles set out by the Information Commissioners Office. These can be found here http://www2.warwick.ac.uk/services/legalservices/dataprotection/dpprinciples.
6. **Attendance Monitoring**

Students are required to attend all agreed supervisions or training sessions and examinations. All assessment tasks set are compulsory. The Centre will monitor your attendance, academic engagement and progress in order to offer you appropriate academic and pastoral support and to identify where support from outside the department may be necessary. The monitoring points are designed to help the Centre to monitor attendance in line with University policy. You should be aware that missed monitoring points are reported to the Academic Office at the end of each term unless the monitoring point was missed through illness or circumstances beyond your control and medical or other evidence is submitted to the Centre to support this. Where a student has missed more than three monitoring points any further missed points are reported immediately. Further missed monitoring points will cause an escalation in response which could ultimately result in a student being required to withdraw from the course.

Monitoring points are:

<table>
<thead>
<tr>
<th>Monitoring point</th>
<th>Activity</th>
<th>Week</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Term 1</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Attend induction week and complete CY900</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>Meeting with personal tutor</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>Attend CY900/MA913 supervised lab</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Submit CY901 assignment 1</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td>Submit project approval form</td>
<td>8</td>
</tr>
<tr>
<td>6</td>
<td>Meeting with personal tutor</td>
<td>10</td>
</tr>
<tr>
<td><strong>Term 2</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Submission of CY903 assignment 2</td>
<td>17</td>
</tr>
<tr>
<td>8</td>
<td>Attend 1(^{st}) briefing for CY901 final assignment</td>
<td>19</td>
</tr>
<tr>
<td>9</td>
<td>Attend 2(^{nd}) briefing for CY901 final assignment</td>
<td>21</td>
</tr>
<tr>
<td>10</td>
<td>Meeting with personal tutor</td>
<td>24</td>
</tr>
<tr>
<td><strong>Term 3</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Meeting with personal tutor</td>
<td>30</td>
</tr>
<tr>
<td>12</td>
<td>Dissertation supervisor contact</td>
<td>32</td>
</tr>
<tr>
<td>13</td>
<td>Dissertation supervisor contact</td>
<td>39</td>
</tr>
<tr>
<td><strong>Summer</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Dissertation supervisor contact</td>
<td>44</td>
</tr>
<tr>
<td>15</td>
<td>Submission of dissertation</td>
<td>49</td>
</tr>
</tbody>
</table>
International students should be particularly aware of the consequences of missing Monitoring Points: the Academic Office is obliged to report to the Home Office UK Visas and Immigration (formerly the UK Border Agency) if any Tier 4 students have been found not to be engaging with and attending their degree course. This will normally lead to the curtailment of their visas.

Attendance is recorded through the on-line Tabula system. The relevant person will record your attendance or absence at a given monitoring point, if nothing is recorded you will be contacted so that any mistakes can be rectified.

Should you need help or advice on any of the above matters in the first instance please talk to your Personal Tutor.

Other sources of advice can be found at:

Absence due to illness: [http://www2.warwick.ac.uk/services/quality/categories/examinations/faqs/absence](http://www2.warwick.ac.uk/services/quality/categories/examinations/faqs/absence)

Student Support Services: [http://www2.warwick.ac.uk/services/student-support-services/](http://www2.warwick.ac.uk/services/student-support-services/)

International Office Immigration Advice: [http://www2.warwick.ac.uk/services/international/staff/experience/pbs/](http://www2.warwick.ac.uk/services/international/staff/experience/pbs/)

### 7. Staff

Staff involved in teaching the core modules and in running the SCRTP facilities are listed below. A full list of Academics who are associated with the CSC can be found here [http://www2.warwick.ac.uk/fac/sci/csc/people/members](http://www2.warwick.ac.uk/fac/sci/csc/people/members) (too many to list here).

<table>
<thead>
<tr>
<th>Role</th>
<th>Room</th>
<th>Ext</th>
<th>E-Mail</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSC and SCRTP Director</td>
<td>PS132</td>
<td>74580</td>
<td><a href="mailto:CSC-director@warwick.ac.uk">CSC-director@warwick.ac.uk</a></td>
</tr>
<tr>
<td>Postgraduate Coordinator</td>
<td></td>
<td></td>
<td><a href="mailto:S.M.Tatlock@warwick.ac.uk">S.M.Tatlock@warwick.ac.uk</a> or <a href="mailto:physicspg@warwick.ac.uk">physicspg@warwick.ac.uk</a></td>
</tr>
<tr>
<td>Susan Tatlock</td>
<td>P565</td>
<td>23966</td>
<td></td>
</tr>
<tr>
<td>Scientific Computing RTP Staff</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr Matthew Ismail</td>
<td>CS3.21</td>
<td>74267</td>
<td><a href="mailto:Matthew.ismail@warwick.ac.uk">Matthew.ismail@warwick.ac.uk</a></td>
</tr>
<tr>
<td>Mr Magnus Lewis-Smith</td>
<td>CS3.24</td>
<td></td>
<td><a href="mailto:M.Lewis-Smith@warwick.ac.uk">M.Lewis-Smith@warwick.ac.uk</a></td>
</tr>
<tr>
<td>Mr Jaroslaw Zachwieja</td>
<td>CS3.24</td>
<td>48174</td>
<td><a href="mailto:grok@warwick.ac.uk">grok@warwick.ac.uk</a></td>
</tr>
<tr>
<td>Mr Olav Smørholm</td>
<td>CS3.21</td>
<td>46959</td>
<td><a href="mailto:O.Smorholm@warwick.ac.uk">O.Smorholm@warwick.ac.uk</a></td>
</tr>
<tr>
<td>Academic Staff</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dr Nicholas Hine</td>
<td>PS1.40</td>
<td>74415</td>
<td><a href="mailto:N.D.M.Hine@warwick.ac.uk">N.D.M.Hine@warwick.ac.uk</a></td>
</tr>
<tr>
<td>Dr Kurt Debattista</td>
<td>IDL 2nd Flr</td>
<td>50290</td>
<td><a href="mailto:Kurt.Debattista@warwick.ac.uk">Kurt.Debattista@warwick.ac.uk</a></td>
</tr>
</tbody>
</table>
8. **Course Structure**

The course is split 50/50 between taught modules and a project. The taught modules, details below, are examined by a combination of assignments and examinations. The project is marked entirely based on the final submitted dissertation. There are 3 core assessed modules which all students must take and total 30 CATS of credit. The dissertation is 90 CATS of credit. To qualify for the MSc you must take at least 180 CATS. So you must take at least an additional 60 CATS from approved options available in any participating department.

**Core Modules**

These are three modules that all students enrolled on the MSc in Scientific Computing will take.

- **CY900  Foundations of Scientific Computing** (6 CATS level 7)
- **CY901  High Performance Scientific Computing** (12 CATS level 7)
- **CY903  Practical Algorithms and Data Structures** (12 CATS level 7)

**Core Optional Modules**

A list of core options for the MSc in Scientific Computing has been compiled and can be found at [http://www2.warwick.ac.uk/fac/sci/csc/teaching/modules/core_options/](http://www2.warwick.ac.uk/fac/sci/csc/teaching/modules/core_options/). These modules cover material that is central to various aspects of Scientific Computing and allow you to define a specialisation within your degree. You should choose at least 45 CATS from the list and, together with your project-oriented option (see next section), your options should total at least 60 CATS. You should discuss your preferred choices with your personal tutor before signing up to them. Please register for the modules on the OMR (Online Module Registration) by the appropriate deadline and also submit an Unusual Option Form for each optional module.

The options on the list are largely level 7 modules (Masters level). However given the interdisciplinary nature of the MSc, it may be appropriate for you to take an undergraduate-level module to fill certain aspects of your background. Alternatively, it may be that the best background for your chosen dissertation project is an undergraduate-level module. We therefore allow you to include one such module (up to 18 CATS) within your list of options, **but you must first discuss this with your personal tutor and get your personal tutor’s agreement**. Please register for the modules on the OMR (Online Module Registration) by the appropriate deadline and also submit an Unusual Option Form.

**You must study at least 90 CATS of modules (including the Core Modules) which must include at least 60 CATS of level 7**

Please see [Awarding of Degree (Exam Board Conventions)](http://www2.warwick.ac.uk/fac/sci/csc/teaching/modules/core_options/) for the importance of the number of level 7 modules studied and passed.
Projects

A list of the most recently offered potential projects can be found here. Please follow the link at the bottom of the page for a larger list of long standing projects.

If you find that your specific area of interest is not covered by these please feel free to contact any of our members listed here as a potential supervisor.

Course Calendar

**Autumn Term:** Core modules CY900, CY901 and CY903 run in this term. You should choose your core options and additional option course, or courses, as soon as possible at the start of the autumn term. If you are unsure discuss this with a member of CSC staff or your personal tutor.

During this term you must also agree a title/supervisor for your project and agree a reading list with your supervisor. The choice of title/supervisor must be confirmed by submitting in the Project Approval form, which must be approved by the supervisor. You should then submit the form online using the link contained within the form.

*There are 6 attendance monitoring points in the Autumn term*

**Spring Term:** At the start of this term the Module Registration system reopens briefly for you to make any adjustments to the modules that you have previously registered for. Any changes should first be discussed with your personal tutor. You may de-register from a module if you have had less than 10% of the assessed work for the module assessed.

This term you must complete the agreed background reading for your project, discuss this with your supervisor who will then submit an online form with his/her recommendation that either:

A. You have made suitable progress and can proceed on to your dissertation
B. You need to complete some additional work or background study before proceeding
C. You have made no progress and are not prepared for progression.

Once submitted you will receive a report with his/her recommendations and comments for your record. A copy will be held on your file.

*There are 4 attendance monitoring points in the Spring term*

**Summer Term:** Examinations for all those modules with an examined component. After the exams you should begin to work full time on your project.

*There are 3 attendance monitoring point in the Summer term*

**July-September:** Over the summer you are expected to work full time on your project, which should include at least 5-6 meetings with your supervisor. The completed dissertation should be ready for submission in early September; the exact date will be confirmed during the year.

Your meetings with your project supervisor during the summer term and summer will be recorded on Tabula and you will be able to see details recorded and submit your agreement.

*There are 2 attendance monitoring points during the summer.*
9. **Assessment**

Assessment on the MSc Scientific Computing course is carried out through the submission of assessed work for each of the modules, formal examinations for most of these modules, and the submission of a dissertation at the end of your 20-week research project.

Normally this course starts with a Foundation course plus one core module in each of the Autumn and Spring terms; you will typically choose another four modules from the list of approved options, and should consider the resulting time-profile when making your choice. Examinations will typically take place in the Summer Term, but this may vary for some of the options and should be checked with the providing Department.

For all modules, the assessment and examination percentage will be confirmed either by website or written notification to your pigeon holes.

The module component of the MSc must comprise at least 90 CATs. The total number of CATs taken will be considered by the examiners when deciding on your final result. The Seymour formula (often used in Undergraduate courses at Warwick) will not be applied.

The dissertation counts for 90 CATs. The period April-September is free of taught material for you to concentrate on your dissertation.

---

### Submission of Assessed Work

Deadlines for assessed work will be given out to you by the module leaders. Most modules will specify their own arrangements for submission of assessed work. Otherwise all should be submitted to the Postgraduate Coordinator, who will give you a receipt for each assignment.

University regulations for late submission set the penalty for submission where no formal extension has been granted as 3% per working day. Thus, a work that would have scored 65% but was handed in a working day late will only be awarded 62%.

Pieces of work with a credit value less than or equal to 2 credits (i.e. 11% for an 18 CATS module, 16% for a 12 CATS module) are exempt from the regulation. Here it is up to the module leader to decide on an appropriate penalty.

---

### Module Evaluation Forms

In order to help us improve the course year to year, each student is given an evaluation form to complete at the end of each core module. For the CSC core modules this should be returned to the Postgraduate Coordinator. Feedback for optional modules will be collected by the relevant department.

---

### Awarding of Degree (Exam Board Conventions)

In November there is a meeting of the full Board of Examiners for the MSc (including external examiner) where all the results from examinations and the dissertation for each candidate are available. The Board makes use of Science Faculty and Department guidelines on the award of MSc degrees and Postgraduate Certificates. Based on all information, including any special circumstances, the board will make one of the following recommendations. The
percentages given are those in the guidelines; special consideration is given to borderline or special cases:

**Award of MSc degree:**
- When examination and dissertation marks combined is at least 50%,
- That the mark for the dissertation is at least 50%
- At least 60 CATS of level 7 modules have been passed at 50%.

**Award of MSc with merit:**
- Normally awarded if the average mark is at least 65%,
- Both examination and dissertation marks are at least 60%,
- At least 60 CATS of level 7 modules have been passed at, at least 50%.

**Award of MSc with distinction:**
- Normally awarded if both examination and dissertation marks are greater than 70%,
- At least 60 CATS of level 7 modules have been passed at, at least 50%

**Award of Postgraduate Certificate:** There are two ways in which a Certificate can be awarded.

1. Failed to average 50% for examined components, but did pass 60 CATS of M level modules. The mark for a “module pass” in this context is normally 40%.
2. Passed the examined component with greater than 50% but failed to reach a satisfactory level, normally 50%, in the dissertation.

**Note:** All of the CSC MSc core modules are rated as M level.

Decisions of the Exam Board are subject to approval by the Senate.

**Resubmission of Dissertations:**

Resits for examinations are offered only in exceptional (e.g. medical) circumstances. Two exceptions are the dissertation and CY900. Resubmission of dissertations is allowed. Students will be given feedback on their original submission and then given the choice of resubmitting for the following academic year or accepting the Postgraduate Certificate. CY900 is a pass/fail option and is a prerequisite for the other two core modules. It is assessed by tests held during the classes; should you fail to pass the module through these then you will be given the opportunity to sit a resit examination during the first term.

**Student Support Services**

Students support services are available through the University and details can be found on http://www2.warwick.ac.uk/services/student-support-services
Within the Student Support Services is the University’s Disability Services team: http://www2.warwick.ac.uk/services/tutors/disability. Any student can seek support from the Disability Services team. If you have a disability, learning difficulty, or other long term medical condition that could affect your performance in examinations, you may be eligible for examination arrangements. These arrangements could include extra time, the use of a PC or amanuensis, rest breaks or a separate room. In all cases you must submit supporting evidence and discuss your requirements with the Postgraduate Coordinator and Disability Services.

10. **University and Departmental Regulations**

You should be aware of the existence of the University Calendar http://www2.warwick.ac.uk/services/gov/calendar and Course Regulations http://www2.warwick.ac.uk/services/academicoffice/quality/courseregs, which contain ordinances and regulations on all University Matters. Some relevant information is summarised or quoted from them below, together with some departmental regulations (see also Section 3) and other procedures.

**Regulations on Cheating in Assessed Work**

All written work that gives rise to marks counting towards the final degree is subject to the University Regulations on 'Cheating in Examinations'. Not all that appears in the next paragraphs is directly relevant to the MSc in Scientific Computing, but you should nevertheless acquaint yourself with these regulations for future reference.

Written work must be the work of the individual student. Direct copying could be construed as cheating and you may receive a penalty. In the first instance, you will usually be warned that what you are doing is unacceptable. If you repeat the offence then you will be penalised. Direct copying of another student's report will be deemed 'cheating', as will the use of data generated by a student not designated as a member of a group sharing an experiment (unless permission has been given by the member of staff in charge).
It is important that sources of information from texts, and results and conclusions from published papers and the internet, are acknowledged. Students are required to provide comprehensive lists of references in essays and reports. Departments will require students to make a written declaration that the work described in research projects is their own. If results and conclusions are taken from publications without reference to their source, and presented in a manner intended to convince the reader that they are the work of the student concerned, this will be regarded as cheating (see insert below on plagiarism).

Where cheating is suspected to have occurred, an oral examination of the student concerned may be held. The Chair of the Department and the member of staff concerned in the incident will conduct the examination. A third member of staff of the same Department may be nominated by the student to attend the oral examination. The examiners will determine whether cheating has occurred, and adjudge the mark to be awarded; this mark could be zero.

In certain cases, the Chair is advised to refer to the Academic Registrar, with a view to the case being considered by an Investigating Committee. These are cases where:

- cheating is so extensive as to result in the student not being awarded a degree if penalties of zero marks were to be imposed in the pieces of work concerned;
- there is evidence of theft, purchase or other misappropriation of another person’s work;
- the offence appears to be of such seriousness that a penalty over and above the imposition of zero in the work concerned may be appropriate, or additional action against the student under the University's disciplinary regulations may be appropriate.

You should also be aware of the following Senate Resolution: "Assessed work contributing credit towards a final degree classification is comparable to work completed under examination conditions as laid down in the Regulations for the Invigilation of Examinations, in that it is necessary to ensure that such work is the candidate's own. Supervisors may offer general advice and critical comment on such at all stages but shall not at any stage suggest amendments to drafts in such a way as to contravene the principle that work submitted should be the candidate's own work".
**Plagiarism:** it is not acceptable to insert material from external sources (and especially from the internet) directly into an essay without acknowledgement, as this practice constitutes plagiarism, a matter on which the Department and University take a very serious view.

With the ready availability of Google and other tools, it does not take much effort on the marker’s part to work out that unacknowledged material has been taken from the web and included in an essay; therefore this practice is not worth the risk. You may use figures and graphics taken from the internet, if not subject to copyright restrictions, to illustrate your work or for clarification purposes, but you **must** clearly label each one with the URL of the web page from which it was taken.

The Department encourages the use of the internet as an effective and efficient source of information available to staff and students, but material taken from the web (or indeed from any external source) has to be intellectually ‘digested’ by the author of the work in such a way that the resulting piece of work provides evidence of understanding the essay topic.

---

**Divulging of Marks to Students**

The University Senate has regulations on the confidentiality of marks for assessed work and examinations. This means that published marks lists are ‘not more revealing than integers on a 10-point scale’. In practice in the Centre for Scientific Computing marks are not usually listed publicly; the range of marks for a given piece of work is indicated for general information. Precise marks are only revealed to the individual concerned, and a breakdown of the year’s marks should only be given ‘in a counselling’ situation, e.g., by a personal tutor or the Course Director. This also means that no other student can ask to be told your actual results but they may be informed in general terms whether you have passed or failed as this information is made public by the University. You must collect your end of year mark yourself. You cannot ask another student to do so for you. This regulation also prevents us from emailing results to anywhere other than your official university address, or from giving it to friends or parents on your behalf.

You may be informed after the internal examination board, held after the summer exam season, in general terms of your module results. These will be given by your personal tutor as provisional marks for each module. It must be stressed however, that no marks are official until they have been agreed by the University at the end of your course.

**Return of Assessed Work to Students**

University Regulations State...

Work contributing to final degree credit, including essays, dissertations, reports and laboratory notebooks, other than scripts completed in invigilated examinations, may, at the discretion of the appropriate Department, be returned to candidates before the meeting of the Board of Examiners which will consider the marks for that work, subject to the following conditions:
that any mark awarded prior to the examiners’ meeting is subject to revision; that this
will be made clear to the candidate concerned.

that material that is returned shall be resubmitted by the candidate in order that it
shall be available to the examiners' meeting (excluding practical reports constituting
up to 5% of the year's credit).

Use of Calculators in Examinations

Advances in technology have resulted in University regulations governing the use of
calculators in examinations being changed. It is important that students are aware of the
regulations and conform to them. If not, they may find themselves denied the use of their
calculator or they could be involved in disciplinary proceedings.

https://www.warwick.ac.uk/services/academicoffice/examinations/regulations_calculators/

It is your responsibility to ensure that your calculator fulfils the University’s criterion
and that your calculator is not of the prohibited type. Prohibited calculators are those which can accept
alphabetical data. Unfortunately, this includes most graphical calculators of the type acceptable in GCSE and A-level examinations.

Please remember:

- calculators may not be passed from candidate to candidate in an exam;
- responsibility for the calculator’s proper functioning is entirely that of the student;
- students taking examinations other than those of the Centre for Scientific Computing
  must ascertain the regulations governing the use of calculators from the Departments
  concerned.

Mitigating Circumstances

Any mitigating evidence regarding examinations or assessments need to be submitted in
writing (with professional or other suitable documentary corroboration as appropriate) at the
earliest possible stage and by such a date as may be required for the internal or external exam
board meeting. In cases where you have been prevented, for medical reasons, from attending
an examination or any part of an examination, you should submit a medical certificate
confirming your inability to complete the examination at the prescribed time. If at all possible
this should be not later than three days following the last day of your University examinations.

When requesting medical evidence to support your application for mitigation you
are advised to make clear to your doctor that the information will be shared with a number of people,
and to discuss with your doctor the most appropriate wording of the medical evidence. You
might find it helpful to share this advice with your doctor.

Departmental Procedures Concerning Medical Self-Certification

Self-certification forms can be used for up to 3 days of medical absence. Anything more should
be covered by a doctor’s note. (You will find your doctor justifiably unwilling to give a note for
a single day’s illness or a retrospective note after you no longer have any symptoms). It will,
however, be possible for your personal tutor to present a case in mitigation of further
absence(s), for consideration by the Board of Examiners at the end of the year, if they consider
it appropriate.
11. **Course Syllabus**

The core modules are as follows:

**CY900 Foundations in Scientific Computing**

Course Leader: Dr Matteo Icardi  
Course T/A: TBC

**Aims:**

This module aims to ensure that all students embarking on this MSc degree in Scientific Computing will have a common set of basic computational and mathematic skills that will enable full participation in the taught modules that follow this Foundations module. This module will be assessed as P/F. Students must pass this Foundations module to proceed with the rest of the course. Following the initial material in week 0, this module shares lectures and material with MA913 Scientific Computing.

**Learning Outcomes:**

By the end of the module the student should be able to:

- competently manipulate files, directories and utilities under the linux operating system;
- demonstrate a familiarity with the emacs editor;
- write simple code in a scientific programming language;
- demonstrate familiarity with compiling code;
- create and manipulate simple makefiles;
- demonstrate a familiarity with basic linear algebra;
- demonstrate a familiarity with the solving of basic differential equations;
- use MATLAB software for simply symbolic algebra applications;
- demonstrate a familiarity with basic statistics; be able to Use R (or S) for standard applications in statistics.

**Syllabus:**

**Introduction to Linux:** basic concepts, operations on files and directories, linux utilities, shell scripting, the emacs editor, utility packages (e.g. for plotting)

**Refresher Programming:** introduction to writing simple code in either Fortran90 or C

**Compiling:** introduction to compiling, the gnu Portland and Intel compilers, introduction to Makefiles

**Refresher Mathematics:** basic linear algebra, basic ordinary differential equations, basic partial differential equations, use of MATLAB software

Refresher Statistics: concepts of probability, probability models, estimation and hypothesis testing, use of R (or S) software
CY901 High Performance Scientific Computing

Course Leaders: Dr Nicholas Hine and Dr David Quigley

Aims:
This module will address the rapid increase, in recent years, of computer simulations and data analysis on high performance computers, for research in all fields of scientific computing.

Learning Outcomes:
- The ability to formulate, implement, and evaluate an appropriate high-performance computer algorithm to tackle a task in scientific research.
- The concepts of shared memory, and message passing programming constructs, and their utility in scientific programming applications.
- The ability to write a parallel program using shared-memory or message passing constructs, for scientific applications.
- Source of performance bottlenecks in parallel computer programs and how these relate to basics of computing architecture.
- Use of batch systems to access parallel computing hardware. Validate the correctness of a parallel computer program vs equivalent serial software.

Syllabus:


2. Introduction to parallel computing (1 lecture). Modern HPC hardware and parallelisation strategies. Applications in Physics, super problems need super-computers.


4. Distributed memory programming (5 lectures). The MPI standard for message passing. Point-to-point and collective communication. Synchronous vs asynchronous communication. MPI communicators and topologies.

5. GPU programming (1 lecture). CUDA vs OpenCL. Kernels and host-device communication. Shared and constant memory, synchronicity and performance. GPU coding restrictions.


Pre-requisites
A good working knowledge of the C programming as taught in CY900.
CY903 Practical algorithms and Data Structures

Course Leader: Dr Kurt Debattista

Aims:
The module provides students with a coherent introduction to uni- and shared memory multi-processor data structures with a strong focus on practical scientific computing algorithms and parallel computing. The primary focus of this module will be to educate students on the primary building blocks required to solve problems using modern desktop machines composed of uniprocessors or multicore/multiprocessors.

Teaching and learning methods include lectures and reading materials as well as weekly practical computer laboratory sessions.

Learning Outcomes:
By the end of the module, students should be able to

- Understand and develop a variety of techniques for designing algorithms both on uni- and multi-processor technology
- Design a variety of data structures and algorithms and should be able to use them appropriately to solve problems in scientific computing
- Understand some fundamental algorithms used in scientific computing and solve computational problems using these algorithms
- Develop new or re-use already existing efficient algorithms to solve problems
- Comprehend algorithmic complexity and be able to make educated choices when problem solving
- Comprehend the importance of parallelism on modern desktop PCs and understand the pitfalls when designing algorithms for such machines

Support:
Support for this course is provided by a web based bulletin board. Please do not e-mail the lecturer directly with questions and requests for help, but submit them to this forum so that everyone can see them (and answer them) and so that we have an archive of questions raised. All submissions to the bulletin board are also emailed to the lecturer.

Syllabus:
Introduction
Part 1 - Practical Uniprocessor Algorithms and Data Structures
- Sorting and searching
- Data structures
- Trees and Heaps
- Complexity and computability
- Advanced Algorithmic methods
Part 2 - Practical Multiprocessor Algorithms and Data Structures for Shared Memory Multiprocessors
- Parallel algorithms
- Practical parallel data structures
- Advanced methods

23/09/2016
Core Optional Modules

Students may choose one module, usually of level 7, from any offered within the Science faculty if it is required in support of the student’s chosen dissertation topic. The student will need the approval of both their project supervisor and the course director if the option is not Level 7.

A list of the Core Optional modules is given below. Students may choose any combination of these with the approval of their personal tutor and subject to timetabling feasibility. Many of these are delivered by CSC staff, but may be run from the staff members other Department.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>CATS</th>
<th>Dept</th>
<th>Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>CH926</td>
<td>Molecular Modelling</td>
<td>12</td>
<td>MOAC</td>
<td>2</td>
</tr>
<tr>
<td>MA398</td>
<td>Matrix Analysis and Algorithms</td>
<td>15</td>
<td>Maths</td>
<td>1</td>
</tr>
<tr>
<td>ST407/CY904</td>
<td>Monte Carlo Methods</td>
<td>15</td>
<td>Stats</td>
<td>1</td>
</tr>
<tr>
<td>MA3H2</td>
<td>Markov Processes &amp; Percolation Theory</td>
<td>15</td>
<td>Maths</td>
<td>2</td>
</tr>
<tr>
<td>MA482</td>
<td>Stochastic Analysis</td>
<td>18</td>
<td>Maths</td>
<td>1</td>
</tr>
<tr>
<td>CS909</td>
<td>Data Mining</td>
<td>15</td>
<td>DCS</td>
<td>2</td>
</tr>
<tr>
<td>CY905</td>
<td>Computational PDEs</td>
<td>12</td>
<td>Eng/CSC</td>
<td>2</td>
</tr>
<tr>
<td>CO904</td>
<td>Statistical Mechanics &amp; its application to complex systems</td>
<td>12</td>
<td>Cxty</td>
<td>1</td>
</tr>
<tr>
<td>MA930</td>
<td>Data Analysis</td>
<td>12</td>
<td>MathSys</td>
<td>1</td>
</tr>
<tr>
<td>MA934</td>
<td>Numerical methods</td>
<td>12</td>
<td>MathSys</td>
<td>1</td>
</tr>
<tr>
<td>MA4K0</td>
<td>Introduction to Uncertainty Quantification</td>
<td>18</td>
<td>Maths</td>
<td></td>
</tr>
<tr>
<td>MA4K4</td>
<td>Topics in Interacting Particle Systems</td>
<td>18</td>
<td>Maths</td>
<td></td>
</tr>
<tr>
<td>MA3H7</td>
<td>Control Theory</td>
<td>15</td>
<td>Maths</td>
<td>2</td>
</tr>
<tr>
<td>MA913</td>
<td>Scientific Computing</td>
<td>12</td>
<td>MASDOC</td>
<td>1</td>
</tr>
<tr>
<td>CS413</td>
<td>Image and Video Analysis</td>
<td>15</td>
<td>DCS</td>
<td>1</td>
</tr>
<tr>
<td>ES93Q</td>
<td>Systems Modelling and Simulation TBC</td>
<td>15</td>
<td>Eng</td>
<td></td>
</tr>
<tr>
<td>ES4C3</td>
<td>Mathematical and Computational Modelling</td>
<td>15</td>
<td>Eng</td>
<td></td>
</tr>
</tbody>
</table>

_TBC = to be confirmed_

_This list is currently under review for 2016-17_
12. Your MSc Dissertation

Background Information

The dissertation is a piece of work independently executed by the researcher. It will be assessed on its academic merit and intellectual content and also on the quality of presentation. Dissertations are examined in the Department and then sent to the external examiner for his/her assessment. The MSc degree is awarded subject to a satisfactory standard on the dissertation. MSc students who do outstandingly well on both the examination and the dissertation may be awarded the MSc with distinction. A list of possible proposed projects can be found here:

http://www2.warwick.ac.uk/fac/sci/csc/prospective/taughtdegrees/msc/projects/.

This is not an exhaustive list and you are encouraged to follow your interests in your research if there is nothing in the list that appeals to you.

Choosing a supervisor

All CSC academics and affiliate staff are eligible to be supervisors for a CSC MSc thesis. See http://www2.warwick.ac.uk/fac/sci/csc/people/members/ for a current listing. We suggest that you use term one to identify your preferred supervisor!

Guidelines for the Dissertation

Please note that this is provisional guidance only and may be subject to change.

The dissertation is an important part of your MSc degree programme. Some of the objectives of requiring a dissertation for the MSc are given below. These may help you understand what is expected of you in writing a dissertation.

The objectives of writing a dissertation are to allow a student to demonstrate the ability:

- to complete a major and worthwhile piece of research work, with some guidance, but largely self-motivated and with a minimum of supervision;
- to write an academic paper that is well-organised and which clearly and concisely communicates its contents to its readers;
- to apply knowledge of scientific computing gained through coursework to a specific area of study, to demonstrate the ability to acquire a good understanding of the underlying scientific problem.
- to identify and formulate a scientific problem and to show evidence of skills of inquiry, logical reasoning, modelling and analysis in addressing that problem.

The dissertation is your responsibility and is a means of demonstrating your ability to complete, independently, a major piece of work with minimum supervision. The end product must be your work not that of your supervisor and it is your responsibility to determine what needs to be done within the available time frame. It is stressed that the aim of the dissertation is to assess your ability to undertake independent work. Most dissertations are necessarily a compromise between ambition and feasibility. All students
should recognise this and also know that their examiners recognise this. It is of great help if you are genuinely interested in the issue that you are investigating; also if the focus is clear. Try to make your dissertation interesting to read and reflect your own motivation. Use tools of analysis (theoretical, analytical, and empirical) that you have learned during your course and which reflect the literature in the area. Write as a professional to a learned audience. Explain the nature of the models or methods referred to, make any arguments of your own transparently clear, integrate any figures into your discussion, and define all notations when or before they are first used. Make sure that you reference clearly all sources of literature and internet that you have used. A failure to do so will be considered cheating. To meet the deadline for the submission of your dissertation you should schedule your work through a series of self-imposed targets. You must therefore, plan ahead and aim to keep closely to your plan. Your meetings with your supervisor should help in keeping to this plan.

The standard of English, style and overall presentation of the dissertation is your responsibility. The Applied Linguistics department offer English Language support classes for international students in the Summer term which cover the language of dissertation writing. Please refer to: http://www2.warwick.ac.uk/fac/soc/al/learning_english/insessional/ for further details.

Your supervisor will not be responsible for proof reading your work or correcting English grammar and spelling. If you think you may have some problems with grammatical structure or presentation then you ought to seek feedback on your writing from colleagues or friends before presenting work to your supervisor.

**Role of the dissertation supervisor**

The supervisor’s main concerns will be to:

- Advise on the identification, and refinement, of a suitable topic
- Provide some references to the general methodology to be used
- Assist you to identify deficiencies in your work
- Comment on presentation, findings and reporting of the conclusions.

You should not expect your supervisor to read every word in your drafts nor to provide detailed and comprehensive comments on each chapter.

**Contact with your supervisor**

Your first contact with your supervisor will be when you arrange the project title. Please fill out the MSc Project approval form and return to the Postgraduate Coordinator by the end of the Autumn term. It is expected that you work through the reading list before you meet your supervisor again in Spring term. In the second meeting you will discuss your reading with the supervisor. You will now need to fill out the MSc Project Progression form and return it by the end of Spring term.

The frequency of contact and methods of working are matters for you to arrange between yourself and your supervisor. In general, each student has only one supervisor and you
should agree a timetable of contact meetings with her/him. This may be in the form of a sequence of supervision appointments at intervals over the summer or a more flexible arrangement. Students can reasonably expect 5-8 hours of supervision (including supervisor’s reading time) during the preparation of their dissertation and before final submission. Note that this is a guide and that some students might benefit from having supervision in small groups. Your supervisor may require you to prepare summary reports of all meetings to ensure there is a record of ‘actions’ to enable monitoring of progress.

You should note that many supervisors have their own research, conferences, family and other commitments, including dissertation supervision of students during the period from June to September, and are therefore not usually available for the whole of this period. Your meetings/contact with the supervisor will therefore need to be scheduled keeping the supervisor’s availability in view.

Should you have difficulties with your dissertation, always discuss these with your supervisor in the first instance. Where a problem is unresolved, please contact your personal tutor or the MSc Director who will try to address the particular issues as soon as possible.

Please ensure that you always inform your supervisor when you will be away from your normal address over the summer for more than two weeks, just in case your supervisor wishes to make urgent contact with you. You should also inform the Postgraduate Coordinator.

The dissertation should be formatted as follows.

- Your thesis should be typed on A4 size paper with the following settings:
  - Use 1.5 (preferred) or double line spacing, with a 3 cm left hand margin, 2 cm right hand margin, 2.5 cm top and bottom border which contain the header and footer respectively (see below).
  - Use a 12 point font (preferably Times New Roman, although other fonts such as Helvetica and Arial are acceptable).
  - Keep within a typical length of 30–60 pages (excluding the title page, acknowledgments, summary, and any appendices).
  - This length of thesis is to encourage you to write concisely. No credit will be gained by producing an over-long thesis.

- The thesis must contain the following in the order shown:
  - A Title page
  - A Table of Contents immediately after the title page with page references given
  - Any Acknowledgments, including all those that helped you with your research, and acknowledge any measurements made by others on your behalf.
  - A short one–page Abstract (typically 200–300 words) of the research undertaken and the results obtained. This summary must not exceed one page.
  - The main body of the thesis starting on page 1 with the Introduction, and followed by the Project Specific sections (using appropriate chapter order),
Results and Discussion and finally the Conclusions and any suggestions for future studies.

- The footer should contain the page number. Numbering begins (page 1) with the first page of the Introduction.
- A Reference list at the end of the body of the thesis and before any Appendices. References must include the initials and surnames of all authors, and the Journal abbreviations used must conform to those accepted by the RSC, ACS and Chemical Abstracts journals. Inclusion of paper titles is optional (seek guidance from your supervisor as to their preference). A minimum of 10–30 references is usually appropriate. Make sure that your introduction includes a literature search for all related recent papers, and that references to all relevant previous studies are provided.
- A list of any abbreviations used should be listed either on the back page, or immediately following the Contents page(s).

- The main body of the thesis
  - Introduction to project — give background, motivation for project, summary of what has been done before. Sketch out the main aims of your research and, if more than one results chapter is used, in which chapter(s) any achievements are described.
  - Project specific sections: chapters may be presented in the order most appropriate for the subject matter.
  - Results and Discussion

- Conclusions: Each thesis must have a conclusion chapter of 1 – 2 pages summarizing the main achievements of the project and indicating any future direction the work should take.
- Two single-sided copies of your thesis, which will not be returned to you, must be submitted on or before the due date to the Postgraduate Coordinator or in his/her absence to your tutor. Theses must be submitted bound in standard soft covers. Get in touch with the Postgraduate Coordinator for assistance.
- You must also submit a CD/DVD with your dissertation and any code you developed.
- The writing style must include correct English grammar and spelling. In general the third person should be used (though take care to indicate what you have done and what has been done by other workers). In certain circumstances the first person plural may be appropriate. The first person singular is seldom if ever appropriate.
- You will be advised during Summer 2017 of the deadline for submission of your thesis.

Some of you may be required to attend a viva examination with the external examiner, following submission. The date for these examinations will be confirmed nearer the time. Make sure that you are in attendance at the University on that date. The final results will be announced later that day.