Reclassifying UG3 Computer Design as a 20pt Course

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Background

On 29 January 2016 all UG3 lecturers were asked to align their course with the new policy on "Workload and Assessment in Taught Courses" policy:

http://drip.inf.ed.ac.uk/sites/default/files/atoms/files/course_workload_assessment.pdf

This paper is submitted to the Informatics Board of Studies in response to that request, and in relation to the Computer Design (CD) course.

Existing CD Course Structure

At present CD is a 10-point course, taught in semester 1 and comprising:

- 18 lectures over 9 weeks: http://www.inf.ed.ac.uk/teaching/courses/cd/Lecture_Series.html
- Weekly 3-hour laboratory sessions: http://www.inf.ed.ac.uk/teaching/courses/cd/Practicals.html

There are no tutorials, as all non-lecture teaching takes place in laboratory sessions. There are 3 laboratory assignments, all of which culminate in a summative assessment. Formative feedback is given during laboratory sessions through direct one-to-one discussions between the lecturer (or the demonstrator) and the students.

There were 64 students registered for the CD course in 2015-16, a significant increase from previous years. This coincided with a major revision of the laboratory teaching, enabled by a significant donation of laboratory equipment from Xilinx. This gave students individual access to state-of-the-art FPGA devices within the context of weekly 3-hour laboratory sessions. Some of the 3-hour sessions lasted 4 or even 5 hours, in response to student demand and, towards the end of the semester, additional laboratory sessions were scheduled to allow students time to finish their assignments. Although the workload was heavy for a 10-point course, student feedback was very positive; they appreciated the hands-on nature of laboratory-based learning and commented that they enjoyed the course as a whole. This year, all summative feedback was returned within the required period.

It is clear that, under the new workload policy, CD cannot continue as a 10-point course. Several options were given (not reproduced here). Option 4 appears to be most appropriate for CD, given the extensive nature of the coursework and the observation that it is important to retain a significant practical element in the delivery of CD.

It is therefore proposed that CD should become a 20-point course from September 2016.

All aspects of the course, other than those outlined in this paper, will remain unchanged. Future examinations will follow the same format as previous examinations. Hence, past exam papers continue to be relevant to future students.

Changes to the proposed course structure are outlined below.

Proposed CD Course Structure

Very few changes are needed to the existing CD course structure to make it fit with the 20-point profile outlined in the new workload policy document. The number of hours spent in each of the course activities, over the duration of the course, is illustrated in Table 1 below. This follows the expectation of 10 hours per credit point (*i.e.* around 200 hours for a 20-point course). Activities are also structured to limit activity to 13 hours in any given week.

Activity	Wks 1-2	Wks 3-10	Wk 11	Wk 12	Exam week	TOTAL
Lectures	3	2				22
Lab sessions		3				24
Reading	10	3				44
Lab prep. & write-up		5	5			45
Revision time			8	13	9	30
Examination					4	4
Total course hours	26	104	13	13	13	**169**
Course hours/week	**13**	**13**	**13**	**13**	**13**	
Program-level activities	-	-	-	-	-	20
TOTAL						**189**

Table 1: Breakdown of hours spent on each course activity, by week in Semester 1

The first two weeks of the course are entirely lecture based, with 3 lectures per week (one more than we have currently). A weekly 3-hour laboratory session runs from weeks 3 to 10 (one more session than we have currently), during which time the number of lectures reduces to 2 per week (as we have currently).

We expect students to spend 10 hours per week on background reading during the first two weeks, which then becomes 3 hours of reading and 5 hours of laboratory preparation and write-up activities in weeks 3-10. We allow for 5 hours of final coursework write-up time in week 11. The deadline for the last assessment will be Wednesday of week 11 in 2016-17, as exams could start as early as 8th December. A suitable revision gap will always be allocated when scheduling the last submission deadline in subsequent years.

The workload policy document recommends 4 days of exam preparation time, which we notionally allocate as 30 hours (7.5 hours per day x 4 days) spread across weeks 11, 12 and the exam week.

The policy document also notes 20 hours of "program level activity", which we included in the table for completeness.

The maximum number of course hours in any one week is 13, and in fact it is expected to be 13 hours across all weeks. This results in a total of 169 course hours, which works out at 189 hours including the program level activities. Note, it is not possible to reach the notional 200 hours if activity is limited to 13 hours per week.

Changes to CD in 2016-17

The changes proposed for CD, starting from AY 2016-17, are as follows:

- Four additional lectures
- One additional laboratory session (*i.e.* laboratory sessions start one week earlier)

Scheduling four additional lectures will allow improved coverage in several areas of the existing syllabus. It will also permit the section on processor design to be reworked to cover *pipelined* processor design. Currently this is not possible, due to time limitations, and so the course presents a very simple processor that is unrepresentative of real systems. Next year, with a few extra lectures, we can address this by presenting a standard 5-stage in-order single-issue RISC pipeline (currently deferred until the Computer Architecture course). In future, this standard pipeline could be incorporated into the practical work, allowing students to design (small) parts of a realistic processor and incorporate them into a realistic system.

The inclusion of one additional laboratory session turns out to be necessary anyway, given our experiences of the laboratory exercises that ran this academic year. We do not plan to increase the laboratory workload under the new course structure, as it is already consistent with a 20-point course.

Assessment Profile

We would like to take the opportunity of this course revision to adjust the weighting of examination and coursework in the overall assessment profile of CD. The current 2015-16 and future 2016-17 profiles are shown in Table 2 below:

Assessment	2015-16	2016-17
Examination	75	60
Coursework	25	40
TOTAL	100	100

Table 2: Adjustment to CD assessment profile

The significant level of coursework, and the fact that there are three summatively assessed items, suggests that a 60:40 split between examination and coursework would be more appropriate than 75:25.

Contact Hours

The contact hours in weeks 1-2 and weeks 3-10 represent 23% and 38% of the total course hours each of those weeks. There are no scheduled contact hours in weeks 11 and 12.

Teaching Support

The CD laboratory can accommodate at most 40 students in one sitting, due to space and equipment limitations. This year, with 64 students, we required two separate laboratory sessions per week, with each student attending one or the other. Each session requires two experienced instructors. If, as happens currently, the course lecturer is one of the two instructors, then CD will require one laboratory demonstrator/instructor. There is also a requirement for some hours of a teaching assistant, for the preparation of laboratory exercises, and a marker for marking coursework submissions.

The hours of laboratory assistant, teaching assistant and marker for the new CD course will be similar to those allocated to the current (and previous) years of the CD course. The only difference will be slightly higher laboratory assistant hours due to the one extra week of laboratory sessions. Overall, the recognition of CD as a 20-point course will significantly reduce the teaching support cost per student-point (assuming no change in student numbers).

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