COMPUTER APPLICATIONS IN EXPERIMENTAL SCIENCE – I

PHYS1601

2005

Welcome to PHYS1601 and the microcomputer laboratory. This is a 6UC course designed to provide an introduction to microcomputers / microcontrollers and how they can be used for the measurement and control of experiments. It is thus complementary to PHYS2030 (Second Year Laboratory) , where experiments are performed using more traditional techniques, and PHYS2630 (Electronics) which concentrates on the electronics itself.

LECTURES

There are 2 one-hour lectures every week.
Lectures will be held in room 31 (Monday) and room 27 (Tuesday) in the Old Main Building.

Monday 3-4 and Tuesday 10-11

LECTURER

John Smith (room 119 OMB – john.smith@unsw.edu.au)
John is also the convenor for this course.

ASSESSMENT

Laboratory Marks (continous assessment)	40%
Mid-session exam (week 7)	20%
Final 2-hour examination	40%

The mid-session exam will be a 50-minute examination held in one of the normal lecture time slots.

LABORATORY CLASSES

The laboratory classes will be held in the Microcomputer Laboratory – room W106 in the Newton Building. You will generally have access to the laboratory for 4 hours each week.

Because this course is selected by students with a wide range of programs, we cannot predetermine suitable time slots for laboratory classes. We will obtain details of your timetable in the first lecture and use it to assign you to suitable lab classes during week 1. Your lab classes will be displayed on the notice board outside the Microcomputer lab.

Mick Benton is the laboratory manager (room 2 OMB – m.benton@unsw.edu.au)

Jamie Kelly will be demonstrating in the laboratory - (jamiek@student.unsw.edu.au)

Lab classes will begin in week 2. You will be supplied with a copy of the laboratory manual in your first laboratory class in week 2.

LABORATORY ASSESSMENT

The laboratory component is worth 40% of your final mark.

For convenience we divide it into 2 sections.

Section LE1 – LE4 is worth 15% and must be completed by the end of week 6.
Section LE5 - LE10 is worth 25% and must be completed by the end of week 14.

Each exercise is assessed by multiple pass/fail check points specified in your lab manual. Your laboratory demonstrator will assess you on each checkpoint and keep a record of your progress. You are allowed to attempt a checkpoint as often as required until you pass. If you fail to complete all the checkpoints in a section, you will be awarded a *pro rata* mark.

Apart from the following restrictions the labs are self-paced, i.e. you work through at your own speed. We will provide open access time in the laboratory where you can catch-up if you miss a class, etc. However there will not necessarily be a demonstrator available during this open access time. The restrictions are:

- Exercises must be performed in ascending numerical order.
- LE1 – LE5 cannot be performed after the end of week 6

Your demonstrator will keep a record of your attendance and completed exercises. Unsatisfactory attendance could influence your final mark.

THE ROBERT DALGLISH PHYS1601 PRIZE.

This prize is awarded each year for a student with the best performance in a specified project. The prize is named after Robert Dalglish, an academic in the school who played a major role in developing this subject. Details of the project (LE10) will supplied later.

MISCELLANEOUS

Students with disabilities or problems are invited to contact the convenor or laboratory manager.

OBJECTIVES

The objective of this course is to provide an introduction to the operation of microcomputers and microcontrollers, and how they can be used to measure and control experiments.

We will cover the following topics.

- Familiarization with the binary logic used in microprocessors and microcontrollers.
  Topics include: Introduction to binary logic, logic gates, truth tables, Boolean algebra, sequential logic, flip-flops, simple memory elements.

- The representation of numbers as binary variables.
  Topics include: binary, octal and hexadecimal formats, two's complement representation of negative numbers, floating point numbers, simple arithmetic logic units.

- The interconnection of logic units.
  Topics include: Bus structures, data transaction schemes.

- The internal architecture of computers and microcontrollers
  Topics include: stored programs, instruction decode logic, different types of memory

- Introduction to programming in MBASIC

- Binary transducers
  Topics include: voltages and logic, binary input and output transducers,

- Encoding information by variations in time
  Topics include: FM, PWM, bitstream, etc.

- Conversion between analogue and digital
  Topics include: basic analogue circuitry, digital to analogue converters, analogue to digital converters

- Transducers.
  Topics include: temperature, light, sound, motion, etc.

- Interaction schemes with the real world
  Topics include: programmed interaction, interrupts, direct memory access.

PLAGIARISM

Plagiarism is the presentation of the thoughts or work of another as one's own.* Examples include:

- direct duplication of the thoughts or work of another, including by copying work, or knowingly permitting it to be copied. This includes copying material, ideas or concepts from a book, article, report or other written document (whether published or unpublished), composition, artwork, design, drawing, circuitry, computer program or software, web site, Internet, other electronic resource, or another person's assignment without appropriate acknowledgement;
- paraphrasing another person's work with very minor changes keeping the meaning, form and/or progression of ideas of the original;
- piecing together sections of the work of others into a new whole;
- presenting an assessment item as independent work when it has been produced in whole or part in collusion with other people, for example, another student or a tutor; and,
- claiming credit for a proportion a work contributed to a group assessment item that is greater than that actually contributed.†

Submitting an assessment item that has already been submitted for academic credit elsewhere may also be considered plagiarism.

The inclusion of the thoughts or work of another with attribution appropriate to the academic discipline does *not* amount to plagiarism.

Students are reminded of their Rights and Responsibilities in respect of plagiarism, as set out in the University Undergraduate and Postgraduate Handbooks, and are encouraged to seek advice from academic staff whenever necessary to ensure they avoid plagiarism in all its forms.

The Learning Centre website is the central University online resource for staff and student information on plagiarism and academic honesty. It can be located at:
www.lc.unsw.edu.au/plagiarism

The Learning Centre also provides substantial educational written materials, workshops, and tutorials to aid students, for example, in:

- correct referencing practices;
- paraphrasing, summarising, essay writing, and time management;
- appropriate use of, and attribution for, a range of materials including text, images, formulae and concepts.

Individual assistance is available on request from The Learning Centre.

Students are also reminded that careful time management is an important part of study and one of the identified causes of plagiarism is poor time management. Students should allow sufficient time for research, drafting, and the proper referencing of sources in preparing all assessment items.

* Based on that proposed to the University of Newcastle by the St James Ethics Centre. Used with kind permission from the University of Newcastle
† Adapted with kind permission from the University of Melbourne.