Skills for Forensic Science

UNIT GUIDE: 2007/2008

UNIT LEADER Dr A. D. Clark

UNIT SFO-1-552:

SKILLS for FORENSIC SCIENCE

Unit Leader: Dr A. D. Clark

Session 2007-8

This unit guide is designed to help you to structure your learning by providing an indicative structure and content for the unit. It is a guide and not a definitive statement of what you will be taught. We will try to follow this published schedule as far as possible, but there may be some variation as the unit develops and as we try to match the pace of our teaching to student needs.

Faculty of Engineering, Science and the Built Environment

Department of Applied Science

LONDON SOUTH BANK UNIVERSITY

UNIT SFO –1-552, SKILLS for FORENSIC SCIENCE

Basic data

Level:	1	***Subject area:***	SAS1
Credit value	1	***Semester***	1
Class contact hours	63	***Student managed study hours***	87
Pre-requisites			
Unit leader	Dr A. D. Clark	*Room:E231*	*Tel:0207-815-7917*
			E-mail:clarkad@lsbu.ac.uk
Other teachers	Dr M .P. Maclenan	*Room:E228A*	*Tel: 0207-815-8105*
			E-mail:maclenmp@lsbu
	Dr C. H. Steele	*Room:E240*	*Tel:0207-815-7989*
			E-mail:steelech@lsbu
	Ms Sophie Lugar-Mawson	*Room E228A*	*Tel:0207-815-7964*
			E-mail:lugarmas@lsbu
	Dr L. Richmond	*Room:M308*	*Tel:0207-815-6229*
			E-mail:richmol@lsbu
	Dr D. Ojinnaka	*Room:E229*	*Tel:0207-815-6255*
			E-mail:ojinnad@lsbu
	Dr A. N. Beeby	*Room:E227*	*Tel:0207-815-7912*
			E-mail:beebyan@lsbu
	Dr K. Spears	*Room:B326B*	*Tel:0207-815-8140*
			E-mailspearsk@lsbu

Assessment

Element	*Description*	*Requirement*
Chemistry Laboratory	2 full reports (See separate instructions) & lab book marks	Attend ALL sessions. Achieve PASS on both reports and achieve overall PASS on lab book marks
Microscopy laboratory	Lab book marks	Attend ALL sessions. Achieve overall PASS on lab book marks
Computing Tests	2 tests on *Word & Excel*	PASS both tests

Short introduction to the unit

This Unit centres on the basic skills that all scientists need to be conversant with. The two components of the Unit are the laboratory work which gives practical experience in chemistry and microscopy, and the Computing Workshops which deal with the use of e-mail and the Internet, the use of word processing and spreadsheet packages.

In this unit guide we spell out the aims and outcomes (what you should be able to do by the completion of the unit) in fine detail.

Note that the complete documentation for this unit consists of:

Unit Guide;

Chemistry Laboratory Schedules;

Chemistry Laboratory Results Notebook;

Microscopy Laboratory Schedules and Results Notebook;

Computer laboratory Workbook;

You should make sure that you obtain a copy of each of these documents.

Aims of the Unit

- To provide an environment which encourages an inquiring, investigative approach and which develops competence and confidence.

- To consolidate your knowledge of safe laboratory practice and to encourage you to develop competence in specific basic laboratory techniques.

- To enable you to use correctly analytical methods and procedures appropriate to the subject area material.

Learning Outcomes

On completion of this unit you should be able to:

- **Laboratory Skills**

1 routinely apply health and safety precautions in the laboratory

2 work effectively, both individually and in a group, to follow a schedule

3 demonstrate accurate and reliable technique in gravimetric and titrimetric methods of analysis.

4 set up an optical microscope for maximum resolution and draw tissue plans of biological material.

5 use the microscope to determine the size of cells and to count the number of cells in a given volume.

6 Select the appropriate type of microscope for a given sample.

- **Computing and Quantitative Skills**

7 use electronic mail and the internet

8 use word processing packages and spreadsheets to produce simple documents

9 use hand calculators effectively and reliably

10 express results of calculations to the required accuracy

11 use the SI units of measurement and be able to convert between these units and other units of weight, volume, temperature and pressure

12 apply mathematical techniques to the analysis of data generated in the laboratory

Key & Cognitive Skills

Of the desirable undergraduate skills highlighted by the Quality Assurance Agency, those which you will have the opportunity to learn and develop on this unit include communication skills, numeracy skills, use of information technology, and learning how to learn. Further details are given in the following section of the Unit Guide.

Indicative content

- **Laboratory Skills (60 % of unit time)**

Safety in the laboratory

School laboratory safety regulations. Clothing and protective wear. Working with gases, liquids, chemicals. Accident and emergency procedures.

Clearing away at the end of the session, reset or store apparatus, dispose of waste products.

Follow and apply instructions. Work individually and in small groups. Record results accurately.

Elementary analytical procedures.

Gravimetric and titrimetric analysis, pH measurements. Measurement of temperature, pressure, flow, mass and volume. SI units, molarity, Avogadro's number, balancing chemical equations.

Reporting results

Structure of a laboratory report and presentation of data. Scientific expressions and format.

Optical microscopy

Design and component parts of an optical microscope. Calculation of resolution and magnification. Micrometry. Preparation of slides of food or biological material.

Drawing and photographic techniques to record images. Introduction to image analysis.

Safe disposal, disinfection and sterilisation, safety cabinets, prevention of aerosols.

- **Computing and Quantitative Skills (40% of unit time)**

Computing

Use of email and word processing packages. Load software or access from the system. Type a report, save and print a properly laid out report using Microsoft *Word*.

Use of spreadsheets (*Excel*) and their use in recording, presenting and analysing data.

All of the above will enhance a student's personal development plan.

Teaching Method

The class contact time for this unit will be used for computing workshops and laboratory practical classes. These will be organised as follows:

Laboratory work	one 3 hour session per week
Computing workshops	one 3-hour session per week for 9 weeks

The remaining 87 hours of the unit are allocated for private study time.

Single Honours students: Laboratory classes

Chemistry, weeks 1-6, Tuesdays 2-5 in J301
Staff are Clive Steele & Sophie Lugar-Mawson.

Microscopy, weeks 5-9 Fridays 10-1 in J302
Staff are Larry Richmond & Alan Beeby.

Computing workshops: weeks 1-9, Fridays 2-5 in E250
Staff are Malcolm Maclenan and Ken Spears

Combined Honours students Laboratory classes:

Chemistry, weeks 1-6, Fridays 2-5 in J301
Staff : Delia Ojinnaka

Microscopy, weeks 7-11, Fridays 2-5 in J302
Staff: Larry Richmond

Computing workshops: Weeks 1-9, Mondays 10-1 in E250
Staff : Larry Richmond

Please note that you are required to attend <u>all</u> of your classes for this unit. Failure to attend any of these classes could result in your failing this unit.

Laboratory Work Programme

All of the laboratory sessions for this unit start promptly either at 10.00 or at 14.00. You **must** be in the lab and ready to start work on time.

You will <u>not</u> be permitted to enter if you are late!

You **must** attend all of the laboratory sessions. If you are unable to attend your time-tabled session you should ask the lecturer in charge of one of the other sessions that week if you may attend their class. You will normally be allowed to attend another class unless the lecturer in charge considers that your presence will result in over-crowding.

You are required to wear a laboratory coat and you must not bring other coats or bags into the lab. All personal belongings must be stored in your locker. You must not eat or drink in the lab. You are expected to comply with the School safety policy so make sure that you read the safety booklets. One of the learning outcomes for this unit is that you "*routinely apply health and safety precautions in the laboratory*". You must demonstrate that you have achieved this learning outcome in order to pass this element of the unit.

You will work at various times both individually and in groups. You will be assessed on your laboratory work skills as well as on your ability to interpret data, discuss results and to write a full laboratory report.

You will be issued with a laboratory book containing the aims of the laboratory sessions and the schedules. You will also be issued with a Results Notebook containing instructions for the preparation work and in which to record your results. The lecturer in charge of the laboratory session will mark this notebook.

You will be required to write up two of the chemistry laboratory experiments as full reports. One of these reports (week 4) **must be word-processed**. The lecturer in charge of the laboratory session will mark these reports.

Further information on the marking scheme that will be applied to your laboratory work is given in your laboratory notebook.

All laboratory sessions will take place in the third floor laboratories in the Joseph Lancaster building. (J block)

<u>Weeks 1-6: Chemical Analysis</u> (in J301)

These laboratory sessions are designed to introduce you to chemical methods of analysis such as gravimetric and titrimetric analysis and measurement of pH. You will get lots of practice at working out concentrations, balancing equations and interpreting data. You will be asked to write up two of the practical experiments as formal reports.

Weeks 7 -11: Microscopy (in J302) **(Single Honours Weeks 5-9)**

The microscope is a powerful tool in microbiology and analysis - but only when it is set up correctly. You will be instructed in how to set up a microscope for maximum resolution and will then use the microscope to look at examples of plant and animal tissue. You will also calibrate the microscope so that you can measure the size of yeast cells, bacterial cells and animal tissue.

You will undertake a series of 5 laboratory sessions designed to introduce you to some of the basic techniques used in the preparation and examination of samples using the light microscope.

The first four sessions will consist of a mixture of demonstrations, videos and hands-on practical work. In the final session, the students will use the techniques learnt in the previous weeks to identify a series of unknown specimens.

Week 7. – Introduction to the microscope. (Single Honours Week 5)

- Video: - basics of light microscopy (15 mins.)
- Set up and use the laboratory compound microscope
- Examination of specimens at x10 and x40 magnification
- Make a drawing of a specimen at both x10 and x40 magnification
- Use of the oil immersion objective
- Use of stereo microscope to examine specimens.

Week 8. – Micrometry. (Single Honours Week 6)

- Calibration of eyepiece graticule using stage micrometer at x10, x40 and x100
- Measurement of a range of samples (length and/or diameter)
- Measurement using stereo microscope
- Demo of methods of area measurement
- Demo of image analysis software for counting and area measurements.

Week 9. – Haemocytometry and other enumeration methods. (Single Honours Week 7)

- Use of haemocytometer to count cells
- Use of Sedwick-Rafter cell
- Introduction to sample preparation – fixation, embedding
- Demonstration of microtome

Week 10. – Other microscopy techniques. (Single Honours Week 8)

- Video: - Fluorescent microscopy (25 mins.)
- Visit to EM unit (if possible)
- Demos of various microscopes – fluorescent, polarizing, inverted, phase contrast
- Use of simple staining techniques.
- There will be time available in this session for students to catch up with anything they have not completed from previous weeks.

Week 11– Examination of unknown specimens. (Single Honours Week 9)

- A range of samples will be presented as evidence collected after a number of crimes. Students to select appropriate techniques to examine each sample and decide whether it could be used as evidence in a trial.

Computing Workshop Programme

The main aim of the Computer Workshops is to ensure that everyone is able to use the University's email system, can use the internet, and reaches a minimum satisfactory standard in the use of the software packages *Word* & *Excel*. Many of you may already have had experience of using one or both of the software packages involved here, and - provided you can demonstrate to us that you are indeed competent - there is no need for you to attend the workshops concerned with the particular software program. However, you are still free to use the computers during the scheduled workshop sessions if you wish to.

Everyone will be required to demonstrate competence in the use of these packages by passing a Test Paper in each – a total of *two* tests. You are free to take the tests whenever you wish once the corresponding workshop has commenced. The first test (for use of email and *Word*) can be attempted in Week 2 or any time later. The conditions for taking the tests are as follows:

- You must pass both tests before being credited with a pass in the computing element of your Study Skills Unit.
- You must sit each test using one of the PCs in E250 during scheduled computer workshops.
- Each test result must be emailed as an attached *Word* (or *Excel*) file for marking to an email address that will be given to you by your demonstrator. Your marked work and results will be returned to you via email. Anyone failing a test will be invited to attend the relevant workshops and to try again. You will also be given feedback on the literary merits of your work.

Computer Workshop Teaching Team

Malcolm Maclenan	E 228A	ext 8105	maclenmp@lsbu.ac.uk
Larry Richmond	M308	ext 6229	richmol@lsbu.ac.uk
Ken Spears	B326B	ext 8140	spearsk@lsbu.ac.uk

Computer Workshop Programme

Classes take place in E250 on various day and times depending on which student group to which you have been allotted. Although staff are generally only available for the first two hours of each Workshop session, the computer rooms are reserved for our use for the full three hours for those who want more time at the terminals.

Week Number	**Description of Session**
1	For absolute beginners only *(attendance is completely voluntary)* Introducing Windows; file operations, formatting floppy disks etc
2	Use of Internet and email Health & Safety issues Introducing *Word* A first opportunity to take the *Word* test
3	*Word* workshop
4	*Word* workshop
5	*Excel* Workshop A first opportunity to take the *Excel* test
6	*Excel* workshop
7	*Excel* workshop
8	*Excel* workshop
9	*Excel* workshop

Summary of Computing Skills Required

General

Formatting disks
Backing up work
Virus awareness
Health & Safety awareness
Data protection, security awareness

Email

Logging on to the NT network
Sending and receiving email messages
Managing messages (keep, discard etc)
Creating a signature
Appending files

Word

Choose fonts, font sizes, bold, italic, justification, obtaining Greek letters
Tailor control bars, superscripts, subscripts, underline (once, twice)
Text boxes, tables, word count, spell check
Headers, footers, page numbers
Use of proofing tools (spell-check, Thesaurus, search & replace)
Use of equation editor
Working with different versions of documents

Excel

Inputting data; writing equations
Copying and moving data; copying formulae
Use of functions (sum, count etc)
Using named constants
Graphical presentation of data
Producing best-fit straight lines
Linking data; exporting *Excel* objects into *Word*

Other Computing Resources

The University has a suite of packages called *Seminar-On-A-Disk*© which include excellent self-paced tutorials for both *Word* and *Excel*. You can access them via the LRC and LIS homepages or directly at http://www.lisa.lsbu.ac.uk/training. Do not select the assessments unless you want to test your progress in using one of the packages. When you are asked for your name and a number, we suggest you use your date of birth or any other number you won't forget – the system remembers where you got to in the seminar last time you used it!

Assessment

This Unit has ***three*** elements of assessment. They are

- laboratory work – Chemistry

This element of assessment tests numbers 1, 2 and 3 of the learning outcomes of this unit

- laboratory work – Microscopy

This element of assessment tests numbers 1, 2, and 4, 5 & 6 of the learning outcomes of this unit

- computer workshop

This element of assessment tests numbers 7 to 12 of the learning outcomes of this unit

In order to PASS the Unit every element must be passed.

As this is a skills unit, numerical marks are not awarded but only grades of PASS or FAIL.

The precise requirements in each category are:

- Laboratory skills: You are required to produce reports of your work in your Laboratory Results Notebook which you are issued with at the beginning of the semester. The member of staff in charge of the laboratory sessions will assess the notebook. You must pass all of the microscopy labs and you must have achieved a pass mark in at least five of the chemical analysis labs. Two of the chemistry experiments in week 2 and week 4 must also be written up in full for submission seven days after the experiment is performed and be of a satisfactory standard. Details of the required format are in the laboratory schedules book.

- Computing and Quantitative Skills: You are required to pass two tests, one using email and *Word*, and the second using the spreadsheet programme *Excel*. You must achieve an overall satisfactory standard in all tests. The member of staff in charge of the workshops will carry out the assessment of this element.

If you fail to achieve a satisfactory standard in one of these three elements you may be given extra time to make good the failure. If you fail to achieve a satisfactory standard in two or more elements you will be failed or referred in the normal way. However, there really is no good reason for anyone to fail this Unit. If you are experiencing problems at any time it is your responsibility to tell us, and it is our responsibility then to make every effort to help you to resolve the difficulty.

Coursework deadlines

Practicals . These reports should be submitted to the Faculty Office T313 within **one week** after completion of class

Note that the University rules on submission of coursework apply. These entail strict penalties for unauthorised late submissions.

Recommended reading Core Reading list

The core text for this unit is:

> Reed, R., Holmes, D., Weyers, J. and Jones, A., *Practical Skills in Biomolecular Sciences*, Longman (1998)

You should consider buying this book. The current cost is £17.99. The library does have a few copies. It also holds several earlier editions (with similar titles and authors' names in a different order!) which are very similar and contain almost all the material you will need; the library reference number is 570.28. You will need to study sections of this book to support the work that you do in the laboratory work section of the unit in particular, although it also has useful sections on writing up reports, using microcomputers and on giving presentations.

You may also find it useful to buy the following:

> Northedge, A., Thomas J., Lane A. and Peasgood A. *The Sciences Good Study Guide*, The Open University (1997).

This book is about 400 pages long, with 100 pages given over to "Maths Help". The remainder of the book covers topics such as how to read effectively, making useful notes, writing assignments, working with numbers and symbols, studying with a computer, tackling exams. The current cost is about £10.

Most of the other texts for this unit are pamphlets and booklets that will be supplied as part of the induction pack or during the delivery of the unit. These include the following:

> Godwin P. and Britton A. (1998) *Study Skills Survival Guide*, South Bank University.

> Learning and Information Services *The Library Guide*, South Bank University (1997).

> School of Applied Science *What you should know about the COSHH Regulations*, South Bank University (1994).

> School of Applied Science *What you should know about lab safety*, South Bank University (1995).

> School of Applied Science *Health and Safety Document*, South Bank University (1995).

Background Reading

The background reading list is deliberately long and lists books with similar titles. You are not required to buy these books, nor are you expected to read them all. You should consult these books when you want or need further help on a particular topic. If you find other books that help you, please let me know so that I can add them to the list.

- **Laboratory Work/Report Writing Support**

Barnard, C., Gilbert, F. and McGregor, P., *Asking questions in biology: Design, analysis & presentation in practical work,* Longman Scientific & Technical (1993).

Bradbury,S., *Introduction to the optical microscope (2nd edition),* Oxford University Press (1989).

Shortland, M. and Gregory, J., *Communicating Science A Handbook,* Longman Scientific and Technical (1991).

- **Computing**

Liengme, B.V (1997), *A Guide to Microsoft Excel for Scientists and Engineers*, Arnold