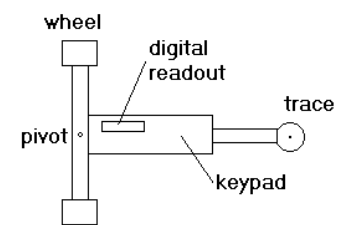
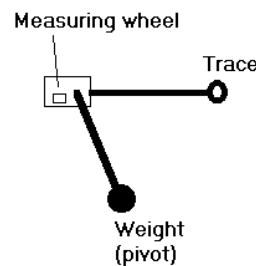
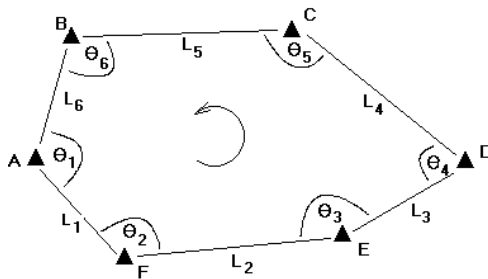
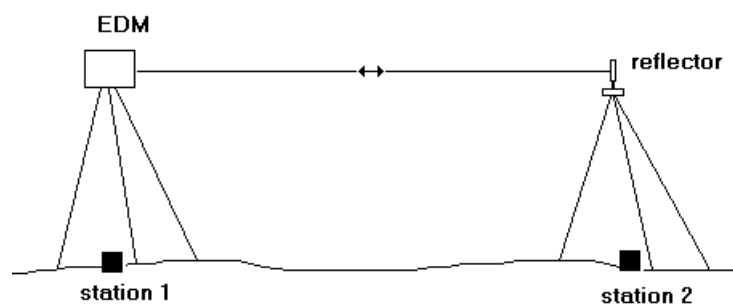




MONASH UNIVERSITY

DEPARTMENT OF CIVIL ENGINEERING

CIV2202 SURVEYING STUDY GUIDE



Old

New



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CIV2202: STUDY GUIDE

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CIV2202: INTRODUCTION

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SUBJECT COORDINATOR



Subject Coordinator:

Phillip Meinhardt Licensed Surveyor, BSc
(Photogrammetric Engineering)

Formerly survey manager and photogrammetrist in a multi-disciplinary consulting engineering firm. Responsible for surveys and mapping for engineering projects, government and private sector client.

Contact details

The best time for face to face contact is in classes. This time is dedicated to you and you should therefore make full use of it. Contact outside class times is limited by large class sizes, and other responsibilities. Appointments are encouraged, as is the use of email for queries

Phone: Clayton, 1st Semester 9905 5404
Fax: 99054944
Email: Phillip.Meinhardt@eng.monash.edu.au

INTRODUCTION TO THE SUBJECT.

Welcome to CIV2202. This section of the Study Guide gives you an outline of the subject, objectives of the subject, and the way in which the subject will be run. Surveying encompasses methods for gathering and processing information about the physical Earth. The course covers: Plane surveying, measurement of distance and angles, using the theodolite - instrumental errors and adjustment; electronic distance measurement; levelling; areas and volumes; topographic surveying, tacheometry; design and setting out of circular, transition and vertical curves and survey drafting.

SUBJECT OBJECTIVES

By the end of this course you should be familiar with common surveying instruments, their application, and adjustment. You should also understand common surveying methods, the errors that occur, and how you can reveal and isolate them, or adjust them. These are essential skills for a civil engineer. You should also gain an increased understanding of what civil engineering is all about.

TEACHING STYLE

A Problem-oriented approach to learning

In many of your subjects, you've been sitting in lectures and absorbing a lot of facts and skills. In tutorials you're asked to practice these skills. There isn't much opportunity for you to **contribute your ideas**. Most of us find learning in this style rather boring.

What's an alternative? A **problem-oriented approach** starts with the problem, rather than the solution. In this subject, there will be one major problem, which you will work on during the practical classes. You'll work in **groups**. In fact, group work is essential to this approach, because you encourage each other, and help solve each other's problems. There will be steps or milestones along the way, each contributing to the solution of the problem.

Engineers need a range of skills, which can be grouped under 4 headings: (i) technical competence, (ii) communication skills, (iii) leadership skills, and (iv) innovation and initiative. The traditional teaching process is moderately successful at promoting (i), but does little for points (ii), (iii), and (iv). A problem-base approach using group teamwork, develops communication skills with each other (verbal skills), and with the assessor (written and graphical skills), leaderships skills (as you each get turns to lead the group), and (iv) innovation and initiative (because you accept more of the responsibility for getting the job done). This approach is also useful in developing your self-confidence. That doesn't mean to say that you will be abandoned! You will have room to show your real abilities.

But, you ask, how do I learn the material? Many students think that they have to sit in lectures to learn what to do. In fact, most of us like to go off and discover things for ourselves. We've been doing that since we were born. This way we feel as if it's our own personal discovery, and we feel some ownership over the ideas. If you work in groups, you can help each other to make discoveries. These notes plus the text book can shorten the discovery time. You may even develop a better method than any of those explained here.

So, what's the lecturer for? Just as your group will be working as a team, the class as a whole is working as a larger team to solve everyone's problems. The Lecturer is part of that team. These sessions are not traditional lectures. They are for discussion of what problems you're having, and how to go about solving them. Hopefully, everyone will feel able to contribute to the discussion. (You can submit **questions in writing** before the session if you wish, although active participation is preferred). The lecturer's role is then as a **facilitator** who guides the discussion and learning process. You should be deciding what you need to learn, and how to go about it. The lecturer provides the information you have found you need, both in a lecture format and in tutorials.

Much of your learning will occur in the Practical classes. The pracs will be based around a **single large task** which you will work on throughout the semester. Each part of that task is coordinated with a body of material which is covered in these notes. It is essential that you read the notes and attend the discussion session **before** the Prac class. If you do not, you will simply require many more classes to complete the task. It is possible to complete the task in as few as 6 prac classes if you know what you are doing, and make no mistakes.

Remember that you're at the prac class to learn, so if you don't make the most of the opportunity, you only have yourself to blame. Likewise, don't distract others from their own learning experience!

Also important are the **exercises** that are suggested throughout these notes. You can discuss any problems with these exercises with the lecturer or with your prac supervisor. Solutions will become available on the web during the semester. The text is another valuable source of information for learning this subject. You should buy a copy.

WHAT ARE THE RESPONSIBILITIES INVOLVED?

It is up to you to be responsible for your learning¹. It is vitally important to give yourself the best chance to learn by actively participating in all classes. Practical class attendance is compulsory. You are responsible for submitting work that is well presented, well considered and on time. You are also expected to develop the correct professional attitudes towards your colleagues and your work.

My responsibility is to bring together and summarise the material from many sources including text books, papers and personal experience. You will be provided you with feedback for each submission in a timely manner. We will endeavour to provide you with as much material as possible so you don't waste time writing instead of listening but ***please note that this material in itself will not be adequate.***

¹ See also the Monash University Education Policy. Extracts are given on pages 10-11 of the Dept. Civil Engineering Undergraduate Handbook.

SUBJECT OVERVIEW AND SYLLABUS

CIV2202 is broken into 13 Topics within this Study Guide. These are outlined below.

SUMMARY OF TOPICS

Introduction	What is surveying?
Levelling	Principles; Procedures; Booking; Applications; Adjustment
Taping	Measuring with tapes; adjustments
Errors	Measurement errors; calculating errors in derived quantities
Theodolite	Purpose; Applications; Setting up; Booking; Adjustment
Tacheometry	Fast measurement; Stadia method; Booking
EDM	Electronic Distance Measurement. How they work; Errors
Survey methods	Working from the large to the small
Areas & Volumes	Methods of calculating areas & volumes
Adjustment	Levels; Theodolites
Setting out	Principles, Typical tasks
Curves	Horizontal curves, Transition curves, Vertical curves
Error Analysis	Analysis & adjustment of measurements
Surface Modelling	Photogrammetry Applications; Digital Terrain Models

PRACTICAL CLASSES

Assessment

A practical project will contribute 40% of the marks for this subject, and an examination at the end of semester, the remaining 60%.

Students are required to achieve at least 45% of the possible marks in each section. The pass mark is 50%. (*The minimum aggregate mark for the practical project is 18% and the minimum aggregate mark for the examination is 27%. The sum of the marks for both sections must be at least 50%.*)

Where a student fails to gain the minimum mark for either part of the assessment, the mark reported will be the lesser of:

- Examination mark * 100 / 60,
- Practical Project mark * 100 / 40.

Marks for each section of the practical project will generally be awarded on the following basis:

- Presentation 20%
- Accuracy of survey 40%
- Correctness and description of procedures, discussion 40%

Minimum accuracy requirements will be advised as tasks are identified. Attainment of these requirements, judged against surveys carried out by the tutor, will gain three quarters of the accuracy marks, the remaining quarter being awarded for higher accuracy achievement.

A group mark will be awarded for each progress report and these will be published progressively at the practical sessions. However the tutor may award additional marks to individuals where he considers that circumstances warrant it. Individual marks will not be published, but aggregated with examination results and published in the normal manner for examination results.

Practical Classes

Exemption from Practical Classes

Students who did not pass CIV2202 in previous years, and have achieved an aggregate mark of $\frac{24}{40}$ or more for practical projects may be exempted from repeating practical work, but will be required to complete an assignment which will involve:

- reduction of field survey records
- preparation of a feature plan with contours
- siting an earthworks design
- delineating earthworks.

Details and data for the assignment will be provided mid semester and the completed assignment is due 2.00 pm Friday, Week 13 of the semester. This assignment will contribute 25% towards the final mark for this subject.

Do not assume that you are exempted from practical classes. You must apply for the exemption on a form provided at the first lecture (and a few subsequent lectures). Part of this form will be returned to you. It will show whether or not you have been granted an exemption, and conditions concerning the assignment.

Groups for Practical Classes

Prac groups will consist of three students of your own choosing. There will be a maximum of six groups per session. The site and the amount of survey equipment available do not permit more than six groups. Your group must stay together for all the sessions and until you have completed the project. One member of each group must act as leader for each session, and be responsible for receiving and returning equipment and for group organisation to get the job done. The role of group leader must be rotated amongst the group members

Submitting Project Reports

The dates for submission of project reports will be as set out below. These dates have been selected to allow you to complete the practical work in the 12 sessions available. They may be varied where exceptional circumstances such as inclement weather, warrant it. **Reports are due at 2:00 pm on the nominated day.**

Report	Marks for Report	Results for Preliminary Assessment	Final Report
Progress Report No. 1	5	Friday, week 3	Wednesday, week 4
Progress Report No. 2	10	Friday, week 5	Wednesday, week 6
Progress Report No. 3	10	Friday, week 9	Wednesday, week 10
Final Report	15	Not required	Friday, week 13

As each phase of the work builds on those you have already completed, it is essential that your results are accurate enough to provide a basis for succeeding work. Your results must be submitted for assessment before writing up the report. Your preliminary results should be submitted to me via email to: phillip.meinhardt@eng.monash.edu.au

Each final report must be submitted with a face sheet as required by Department regulations. The group number should also be shown on the face sheet. This facilitates recording the receipt of your reports and awarding marks correctly, and will encourage the tutor to look upon you in a kindly manner! Final reports must be submitted in hard copy form in the subject box located outside the department office by 2:00 pm on the nominated day.

If a report is submitted late, students may be penalised by loss of 10% of the possible mark for each day that the report is overdue. This also applies to the Prac Exemption Assignment. If there are circumstances which may justify an extension of time for submitting a report, contact the tutor before the due date to discuss the matter. Requests made after the due date will not be looked upon so kindly.

Each group will record its basic data on field cards provided. You must show the names of the group members on each field card. The field cards must be initialled by the tutor at the end of each session, verifying that the data is recorded and that the group members actually attended. Data must not be recorded on other loose sheets of paper. **The original field card(s) must be attached to the group report at the end of the task. Marks will be deducted if the original field cards are not submitted.**

As part of your report the group must submit a plan showing the location of your work, together with tables of results, calculations, errors etc.

Your report must also include a clear statement of the purpose of the exercise and a discussion of methods, results, limitations of the method and skills required. The discussion of methods is an important aspect of the report. This does not mean a description of the method, which I know that you know, because I have witnessed you carrying out the work, and you know I know because I have done it all many times. You should concentrate why you do things in certain ways. The clues for this part of the report will come out of lectures and discussions.

You will be expected to produce plans and sections to a reasonable standard. A display of engineering survey drawings from industry will assist you in the style of presentation required.

The group members may be required to discuss their report with the tutor. This will be arranged and take place during tutorial time.

Materials

You will have to provide: clipboard, pencil (microlead preferred), short ruler (I hate messy freehand sketches), calculator with scientific functions. You will also need drawing instruments: scale rule, protractor (360°, approx. 100 mm diameter, graduated clockwise), compasses, and possibly French curves.

Location for Survey Practical Work and Issue of Survey Equipment

Practical sessions are held at the park around the lake or retarding basin north of the hockey turf.

Survey equipment will be issued and returned at the locations and times shown below:

Session	Issue Time	Issue Place	Return Time	Return Place
Monday 1	12:45 pm	Survey Store	3:00 pm	Prac Site
Monday 2	3:15 pm	Prac Site	5:30 pm	Survey Store
Tuesday	8:45 am	Survey Store	11:00 am	Survey Store
Wednesday 1	12:45 pm	Survey Store	3:00 pm	Prac Site
Wednesday 2	3:15 pm	Prac Site	5:30 pm	Survey Store

Dress

You must wear covered shoes to pracs. Those wearing thongs, etc. will not be permitted to take part. This is a simple safety requirement. In winter much of the area is muddy, and sturdy footwear is desirable. You should dress to suit the weather so that you will function efficiently

Weather

The program is tight, and we cannot abandon a prac session because of a few light showers. Last year we only missed one session, but we did get a bit wet.

If you are in any doubt if the pracs will run, assume that they will. The tutor will be there, and cancelling a session will be done at the issuing point after assessing the conditions there and giving every chance for the weather to improve. A wet day is a chance to ask questions, and do some calculation exercises. The roll will still be marked on such occasions.

Description of the Project

This semester you will be required to complete one project, submitting progress reports on milestone achievements along the way. The actual milestones will be decided on by the groups in consultation with the lecturer/tutor. The specification of the project and the lectures will suggest suitable milestones.

Your understanding of the following will be enhanced by reference to the sketch map issued, and by a site inspection we will carry out during the first prac session.

Scenario

You are required to design a new path along the southern side of the retarding basin. The present path would be flooded if the level in the retarding basin were to rise because of heavy rain. Your new path will be above the flood level. The location will be a compromise of minimising cut and fill, avoiding major trees and maintaining a safe and sensible alignment. It will end at the south west corner of the park, to join with the foot path of Ring Road East. It will be a totally new path alignment, and will not make use of any portions of existing paths.

The centreline of the new path is to be defined by a series of straights and circular curves. The centreline must be calculated to fit with your control survey, and it will be set out on the ground by you.

Project Documentation

Your design documentation is to include the following:

- A plan of the site showing the alignment of the new path and other details of the proposed construction, against a background of the existing features and contours.
- Longitudinal and cross sections of the path.
- A report setting out design considerations and including a statement of earthworks quantities.

To facilitate the approval process, your design must show the position of the structure by MISFIT² coordinates, and levels must be to MHD³

Your initial task is to plan how you will achieve the requirements given above. The lectures and tutorials will assist you in this task.

² MISFIT - Monash Integrated System of Facilities Information Technology

³ MHD - Monash Height Datum

Why do pracs?

The Pracs are for your benefit, so make the most of them. They will be your most important means for learning this subject. **Ask plenty of questions** if you don't understand what you are doing. Take an active part.

The Prac sessions are also the most convenient time to raise other questions about the course (eg. tutorial questions).

EQUIPMENT

During the Prac classes you will be using expensive equipment. For example, a theodolite costs about \$5,000 to replace. Please bear this in mind. You will also be issued with small items such as plumb-bobs and staff bubbles. Keep them in your pockets. It is very difficult to find them in long grass. The items will be checked out of the store, and you will have to return each one at the end of the session. The group leader is responsible for the return of all equipment at the end of the session.

TEXTS

Prescribed texts

Muskett, John "Site Surveying", 2ed Blackwell Science, Oxford, 1995.

This is an easy to read book that has been well received by the students for the last two years. Extensive reference will be made to this text. I will expect that by the end of the course you will have read most of it. Hence, I recommend that you buy a copy, since there are very few copies in the Hargrave Library. You'll notice that it is a very recent text, and I feel it is the most appropriate for this course. You can probably buy a copy second hand from last year's students.

Recommended texts

Fryer, J.G., Elfick, M.H., Brinker, R.C. & Wolf, P.R. "Elementary Surveying" (S.I. Adaptation), Harper & Row, Sydney, 1987.

Bannister & Raymond, "Surveying", Pitman, London, 1984.

THE STRUCTURE OF THE STUDY GUIDE

The Study Guide is the central reference in the subject as it guides you through the text and the other major learning resources. It is divided into 13 topics. Each of the topics contains the following components to help you organise your study.

Table of Contents

Each topic has a detailed Table of Contents list on the first page. This list describes the sequence of the information.

Preview

Which contains:

Introduction

The introduction describes what will be covered in the topic and relates it to other topics.

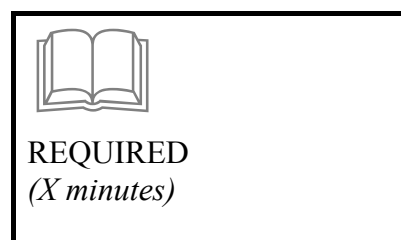
Objectives

A set of objectives for each topic is included in the Study Guide. These objectives fulfil a dual role. First, they have been used to plan the topics. Second, they have been designed to help you decide whether you have understood important points presented in the topic. If you are not convinced that you can achieve each objective after studying the materials, you should re-read the relevant parts of the Study Guide and associated reading.

Readings

This summarises the readings for the topic.

Required reading : must be done in order to complete the topic. It is shown by the symbol



Suggested reading : Readings to aid your understanding of the topic or to provide further information to those interested. These could be shown in the text as footnotes pointing to specific pages or by the symbol below. Sometimes the entire chapter is listed under ‘readings’ at the start of the topic if it is of general interest.



Text

Information guiding you through the topic. Important points and activities are included in the text to assist the reader in assimilating the information presented. You should do the activities as you come to them wherever possible. Don't leave them to the end of the topic.

Important points are shown in a box like this :

Make sure you do all the required readings.

Activities are shown like this :



Activity 0.1 *What is the difference between required and suggested reading?*

Summary

A summary of the main points of the topic is provided at the end of the text.

Key Concepts & Definitions

A list of key concepts and definitions is provided at the end of the text.

References

Full details of references to papers and books mentioned in the text (other than required readings) will be provided.

Review Questions

A variety of questions, discussion starters, activities and problems have been included in each topic. They are designed to reinforce and test your understanding of the topic. You should write answers to these questions, and revise the text where necessary, before proceeding to the next topic.

Suggested Answers

These provide you with *brief* answers to the exercises included in the topic. This allows you to check on how well you have understood or recalled the material in the exercises. *These answers are not meant to be comprehensive!*


Supplementary Pages

Papers covering extra material specific to particular studies.

SUGGESTIONS ON HOW TO USE THE STUDY GUIDE

The material in this study guide is arranged sequentially, leading from basic concepts to more advanced study. The order of topics is arranged to allow you to appreciate *why* we do certain things in design before *how* they are done is discussed. This also helps you to understand and complete the major project.

Ideally, the way to use the study guide is as follows. For each topic:

- Keep up to date during the semester – this is really important; if you don't, the lectures will not be as valuable and you will risk falling behind in the project. Remember, the face to face hours have been deliberately reduced to give you more time to assist you with this.
- Ensure you have the required readings to hand and if necessary the suggested readings (you may wish to do this at the start of the semester).
- Read the preview to set the scene.
- Read the topic objectives to familiarise yourself with exactly what you will need to get from the topic.
- Start working through the topic. As required, make notes as you go. Do the readings at the  symbol as directed. As necessary, refer to the 'key concepts and definitions' section at the end of each topic if you don't know what something means.
- The activities are designed to reinforce your understanding of things you have just covered. If possible, do them where indicated. This won't be always be practical as they require you to observe something, so you can always do these ones later.
- When you have finished the readings and writing any notes you need to make, go back to the objectives and ask yourself if you are confident that you have achieved them. Very few people would be able to say (honestly) that they have after only reading through once. Often you'll need to go back and read some sections again.

This is perfectly normal and part of the learning process. A good way of reviewing your understanding is to treat each objective as a question and see if you can jot down a brief answer to it!

- Do the review questions when you have completed the topic. Try not to look at the answers until you have finished unless you really get stuck.
- Write a list of things that you want further explanation for and ask questions of fellow students, your lecturer and tutors until you do understand. You are not the only one with questions.

The author will very much value feedback on how you use the guide so it can be continually improved.

STUDY GUIDELINES

Now that you have your Study Guide, and can do some detailed planning, it is worth briefly reviewing some of the key points in studying in a flexible learning style.

Although the learning style in this subject is not purely distance education and you will have weekly contact, many of the principles of distance education study apply. You should practice these, or develop your own learning style and schedule to make the most of the flexibility this subject offers.

You may have developed your own study techniques during your previous studies and will have refined your reading and comprehension skills. However, studying in this style and perhaps in an unfamiliar academic discipline will require you to re-appraise those skills and adapt them to the new situation. To study successfully on your own you will need to:

- make time to study regularly,
- set your study goals,
- become an active learner not just a passive reader, and
- learn how to tap the many resources available to you.

Scheduling Your Study Program

You are the one that has to provide both the motivation and scheduling that traditional weekly subject lectures provide. No matter how keen you are to complete the program, your study will always be competing with other pressures and distractions. Preparing a detailed timetable of all your activities not only helps in identifying free timeslots for study but also provides its own pressures to balance the outside ones. You may find it helpful to keep a diary of your actual time spent for a week or two to help in identifying the best study periods before establishing a regular weekly program.

Study Goals

You must set your own goals or objectives, outlining material to be completed before other major commitments such as deadlines in other subjects. Set targets for the week and most importantly, specific goals for each study session. The goals help in providing motivation by giving you targets to be achieved, and in addition will enable you to study more efficiently by fitting tasks to available timeslots. The Study Guide will assist you by providing exercises, activities and specific blocks of reading that you can use in planning study sessions.

Active Learning

Effective learners are active learners:

- When reading, they make notes, highlight words, jot down ideas and create mindmaps
- <http://cleo.eng.monash.edu.au/teaching/subjects/learning/strategy/mindmaps.html> (<http://cleo.eng.monash.edu.au/teaching/subjects/learning/bridging/logbooks.html>) in order to understand what they are reading and to see its relevance.
- They do the exercises and activities listed in these notes.
- They participate in scheduled classes and actively participate in class discussion.
- When asked to do work between classes, they read the recommended reading as well as the essential reading. They seek additional information via the library, the Internet and other professional sources available to them.
- They actively participate in groupwork.
- They keep a logbook⁴ which documents their progress through this subject.

Active learning involves *doing* something while you are studying, so that you avoid reading aimlessly without taking anything in. The techniques that you can utilise are similar to those people use while reading correspondence and reports at work - highlighting, making notes of things to be clarified or followed up, and jotting down your initial responses to the issues raised. Summarising material in point form is another tool for making sure you have grasped the ideas and gives you practice at recalling them. The summary also provides a quick review at the end of the session.

The other most important part of active learning is to do the activities and discussion questions provided in the Study Guide. You should write answers to discussion questions rather than just make a few mental notes.

Resources

The resources you need include not only the material ones such as books and journals but also the 'people' resources, ie. friends to encourage you in times of low motivation, librarians to locate information for you, experts to turn to for advice, and fellow participants to share problems with.

Study Teams and Networks

⁴ <http://cleo.eng.monash.edu.au/teaching/subjects/learning/bridging/logbooks.html>

Other students in the class and your team can be used to form study networks. These networks can be very helpful; a quick phone call can often overcome a trouble spot.

If you decide to set up a study team, you should consider applying the basic rules of good meeting procedure. The more formal your team, the more you will need to choose individuals to organise meetings and chair the discussion. A brief outline for each meeting is important, no matter how informal the meeting is, as it establishes the purpose of the session, allows participants to prepare, and should provide some structure to help get the discussion going.

WEB PAGE

A web page has been set up for this subject for you to access from Monash or home at:

<http://cleo.eng.monash.edu.au/>

This page will contain all the latest announcements for the subject, files to download, frequently asked questions (FAQ) and a discussion page for academic material.

You can mail questions, answers, comments or perhaps tips for other students to this page. Staff in the subject will answer specific questions and if there is a general need, additional explanations or reference material may be placed for your access.

WHAT'S NEXT?

The remainder of this document discusses each topic in turn. You can now start to familiarise yourself with the style of learning and perhaps follow some of the links on the web page. Have a chat to your fellow students and maybe set up a study team. When you are ready you can start on Topic 1.

All the best with your learning.