

GLENDALE TECHNOLOGY HIGH SCHOOL



INDUSTRIAL ARTS and COMPUTING FACULTY

ENGINEERING STUDIES

STUDY TIPS & EXAMINATION TECHNIQUE

A Guide for Preliminary and HSC students and their parents.



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SOME BACKGROUND INFORMATION ABOUT ENGINEERING STUDIES

Engineering Studies is designed to be a relevant study to the 21st century world of engineering as well as engineering as a career. It is directed towards the application and advancement of skills associated with mathematics, science and technology and is integrated with business and management.

Generally speaking, Engineering Studies is designed to provide students with skills, knowledge and understanding associated with a study of engineering, its practices and associated methodologies. The subject promotes environmental, economic and global-awareness, problem-solving ability, engagement and information technology, self-directed learning, communication, management and skills in working as a team.

Furthermore, the subject is unique in that it develops knowledge and understanding of the profession of engineering. It also provides an opportunity to integrate the science and mathematics disciplines with societal development and change. By undertaking to study Engineering Studies, students will have the opportunity to follow a number of pathways. These include tertiary, vocational education and training as well as the world of work. For those who choose to follow the pathway of further study, their prior knowledge will be beneficial towards the insight and experience associated with a continuing study of engineering. If students intend moving into a work related path, the experience gained from an understanding in what engineers do will provide many benefits as the work of engineers affects all of society.

HOW TO STUDY ENGINEERING STUDIES

No matter what subjects you are studying for the HSC, they all have a common factor in success at the HSC examination and that is.....

THOROUGH PREPARATION

By thoroughly preparing yourself, you will not only maximise your mark but also ensure that your mental attitude is spot on because you will feel prepared and ready. You will also feel a high degree of confidence in knowing that your success in the HSC will allow you to choose the career or job you want rather than being forced into something you didn't really want to do.

To be successful in any examination, you must have a plan. You can't really achieve anything unless you know what you are setting out to achieve. Set yourself realistic study goals and work persistently (and consistently!) towards achieving them. What may seem to be a lifetime away – the “dreaded” HSC – is closer than you think and will be over before you know it.

Start early – don't leave everything until the last minute because you think you have plenty of time. The time will pass very quickly and it is very good advice to start early. Seek the advice of your teachers on subject specific matters or your Year Adviser on general issues to do with school and/or study. You may also benefit from using simple strategies like these ones listed below:

These strategies are effective:

- ✓ Develop well-structured summaries of each topic within each of the modules as you complete them in class. By doing this you are clarifying all of the basic and relevant facts in your own mind very soon after your teacher delivers them to you in class. This way you will have a complete and synthesised ready-reference available as assessable tasks or examination time draws near – no more last minute panics to summarise multiple topics!
- ✓ Use clearly labelled diagrams with colour coding to jog your memory: “*a picture tells a thousand words*” and enables you to explain something clearly and easily without the hassle of writing a mini-essay.
- ✓ Do plenty of sample problems in the electricity and electronics as well as the mechanics and hydraulics sections within each of the modules. Try to focus particularly on topics that are applicable to more than just one module.
- ✓ Do past Engineering Studies HSC papers because, by doing so, it will provide familiarity with the examination format as well as question structure. Remember the old saying: “*Practice makes perfect*”.
- ✓ Some tips in specific areas that could prove useful:

| | |
|---|--|
| HISTORICAL & SOCIETAL INFLUENCES | <ul style="list-style-type: none"> ☛ Be able to link historical development → engineering innovation → materials development → impact of engineering on people’s lives → the environment ☛ Link: construction methods → materials availability → materials processing → environmental effects |
| MECHANICS & HYDRAULICS | <ul style="list-style-type: none"> ☛ Units and their conversion ☛ Using Space diagrams, Free Body diagrams and Bow’s Notation ☛ Formulae: how and where to use them. ☛ Link: the required solution → formulae → units ☛ Principles and their practical applications. e.g.: Archimedes’s principle and Bernoulli’s principle. |
| MATERIALS | <ul style="list-style-type: none"> ☛ Link: properties → structures → manufacturing processes → service properties |
| ELECTRICITY & ELECTRONICS | <ul style="list-style-type: none"> ☛ Safety and OH&S issues ☛ Describe basic concepts ☛ Link: power generation → power distribution methods ☛ Electronics principles and their practical applications ☛ The role and practical application of digital control technology |
| COMMUNICATIONS | <ul style="list-style-type: none"> ☛ Know how to write a concise Engineering report according to the structure and headings taught in class. ☛ Be comfortable with writing only in the 3rd person and not in the 1st person. ☛ Know freehand drawing principles as well as the principles of 3rd angle orthogonal/orthographic projection. |

This list is not exhaustive by any means and you would be best to talk through some of the specific points with your teacher.

You now need to be aware of the structure of the HSC exam in Engineering Studies so you can develop an understanding of what you have to prepare for.

HSC External Examination Specifications

The written examination in Engineering Studies will consist of an examination paper of 3 hours duration (plus 5 minutes reading time).

The written paper is divided into **THREE** sections:

Section I (10 marks):

- All questions are compulsory
- There will be TEN multiple-choice questions
- These questions will be based on application modules

Section II (70 marks):

- All questions are compulsory
- There will be SIX questions
- Each question will consist of a number of parts requiring short structured responses There will be one question, worth 10 marks, based on historical and societal influence and the scope of the profession
- There will be THREE questions, worth 10 marks each, based on application modules
- There will be TWO questions, worth 15 marks each, based on focus modules

Section III (20 marks):

All questions are compulsory

Each question will consist of a number of parts requiring short structured responses There will be TWO questions, worth 10 marks each, based on all modules and Engineering Reports.

[Engineering Studies Stage 6 Syllabus, p52]

Before you begin your home revision program in Engineering Studies, it might be wise to see what some of your attitudes towards study generally really are.

Complete the “self diagnosis” starting on the following page to see where “you are currently at”:



MY STUDY HABITS – A SELF DIAGNOSIS

Use the ratings below to rank your self in each area: (Be honest with your responses!)

- 1. = never
- 2. = occasionally
- 3. = less than half the time
- 4. = more than half the time
- 5. = almost always

| REVISION ACTIVITY | MY RANKING |
|---|------------|
| Work Preview: | |
| 1. Do you read over the table of contents of a book before you begin reading the book? | |
| 2. Before studying a book (text or novel) in detail, do you make use of any of the clues in the book such as headings, illustrations and summaries? | |
| Reading: | |
| 3. Do you try to find meanings for any new, important or unknown words you encounter as you read? | |
| 4. As you read while studying, do you have in your mind any questions related to the topic you want answered? | |
| 5. Do you look for the main ideas in what you read? | |
| 6. Do you read without saying each word to yourself? | |
| 7. Do you read around your required subjects by looking at material other than required texts? eg: Do you use the internet as a research tool? | |
| Note taking while reading to study: | |
| 8. Do you make brief notes as you read your textbook? | |
| 9. Do you review your notes as soon as you can at home after taking them down in class? | |
| Remembering: | |
| 10. Do you try to find genuine interest in all your subjects? | |
| 11. Do you make an effort to thoroughly understand all material that you should remember? | |
| 12. Do you summarise all material to be remembered so you can easily recall it later? | |
| 13. Do you distribute the study of lengthy topics over several short but productive revision sessions? | |
| 14. Do you try to associate what you are learning in one subject with what you are learning in others where appropriate? | |
| Engineering Report and Assignment Writing: | |
| 15. Before writing up a report or an assignment, do you collect information by doing research in the library or obtaining information from other sources? | |
| 16. Before writing up a report or assignment, do you make an outline or plan then follow your pre-prepared plan when you actually write it up? | |
| 17. In writing your report or assignment, do you clearly indicate the main ideas of each paragraph? | |

| REVISION ACTIVITY | MY RANKING |
|--|------------|
| Listening and taking class notes: | |
| 18. Do you take notes in class, searching for main ideas as you listen to the teacher or whoever the speaker is? | |
| 19. Do you revise your notes as soon after the class as you are able to by reading them, developing revision summaries or recall? | |
| Preparing for tests and examinations: | |
| 20. Before an examination, do you review the important facts and basic principles and concepts? | |
| 21. Do you combine important notes from your textbook and class notes into a master outline? | |
| 22. Do you make up your own examination questions then attempt to answer them as well as questions from past papers? | |
| 23. To prepare for examinations, do you follow a well-organised study timetable covering all subjects as well as time for your weaker subjects? | |
| Time and Planning: | |
| 24. Do you use a diary to write down when assignments are due so you can hand them in on time? | |
| 25. Do you have all of your subject assessment schedules pinned up in a prominent place and do you set them out on a chart for easy reference? | |
| 26. Do you have a revision plan you use for studying each day clearly displayed above your home study centre? | |
| 27. Do you provide for rest breaks, family activities and leisure time in your study plan? | |
| Doing examinations: | |
| 28. When you begin an examination, do you use the reading time provided to carefully read the directions and questions? | |
| 29. Do you allocate time for each question according to a "marks-per-question" formula? | |
| 30. If you finish the exam before time is up, do you go back and check that all required questions are answered and that your answers are correct? | |
| Study Environment: | |
| 31. Do you study in a quiet, well-organised place, which is free from distractions and interruptions? | |
| 32. Does the space on your study desk provide you with enough room to work and keep all your study requisites neat and ready to find and use? | |
| 33. When you sit down to study, do you have all the equipment and materials you need? | |
| 34. Is your school timetable and study schedule placed on a board near your desk so you can refer to them at any time? | |

How do you rate?

- ☞ **165→150:** Don't change anything you are doing! You're doing practically right. Keep it up until your exams are finished and you should achieve to your best.

 - ☞ **150→100:** There are some areas of your study technique that need close examination. You need to be applying yourself in all areas more than half the time. You had better look at this and do something about it soon.

 - ☞ **70→:** You have some urgent decisions to make about what you really want to do. Success in your schoolwork will only come about as a result of good old-fashioned hard work. Talk to your teachers then give some thought to where your priorities are with regard to your study.
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By now, you will know something about the subject, the examination itself and your attitudes towards study. However, you now need to know how to actually “attack” the exam when the time comes for you sit down and do it.

ENGINEERING STUDIES EXAMINATION TECHNIQUE



If you have followed all the advice given previously, by the time the exam comes around you will have thoroughly prepared yourself and the so-called dreaded “exam-jitters” won't be as big a problem. The rest is really just common sense.

Don't miss the “big day”. As soon as you receive a copy of the final exam timetable (not the draft distributed for checking), mark your diary with the examination date, time and room where it is to be held.

Make every effort to do the following things:

- The day before the exam, check the details again then assess what you will need.
- Check your calculator, pens, pencils and drawing equipment.

- ✓ Arrive not too early but in good time so you can walk into the exam room unhurried and unflustered.
- ✓ Try to avoid discussion with your friends about what they have or haven't studied – such talk can be unsettling just prior to the exam.
- ✓ Be in a positive frame of mind that says, "*I am going to succeed!*"

A positive, confident and aggressive approach to the paper will provide you with maximum results. Attack each section of the paper in a planned, calculated and controlled manner using simple strategies like these ones listed below:

1. Use the 5 minutes of reading time provided to scan the whole paper. As you scan, mark those questions that you feel you can confidently attack first. Make sure you read the front pages carefully to check requirements such as compulsory questions or choices within questions.
2. Nothing succeeds like success: If you are able to complete those questions you know you can do first, it helps to build your confidence. Furthermore, these questions don't take as long and that then leaves you more time to tackle the more difficult questions.
3. Begin with the easy questions using the following strategies:
 - 3.1. Read the question carefully, highlighting key words or information.
 - 3.2. Check what it is you are actually being asked to do rather than what you *think* is being asked. If there are two parts such as *sketch and label* and you only complete a sketch, then you can only expect to receive half the total marks for the question if your answer is correct.
 - 3.3. Make sure you show all working as this will ensure the marker can give maximum marks.
 - 3.4. Remember the "HSC Glossary of Terms" and the words which identify questions which require higher order thinking skills thus giving more marks.
 - 3.5. The amount of marks allocated may provide a guide as to how much is expected in an answer and how much time you should be spending:
 - ☞ Time given to complete the paper is 3 hours: this means 180 minutes for a total of 100 marks.
 - ☞ This equals 1.8 minutes per mark. Thus:
 - ▶ 4 marks = 7.2 minutes;
 - ▶ 8 marks = 14.4 minutes, and so on.
4. A well organised approach will give you confidence during the exam because you do not have to worry about running out of time. There is plenty of evidence to indicate a calm and relaxed student will perform more efficiently during examinations than one who is stressed.
5. **If you have any time remaining after you feel you have finished all questions, DO NOT leave the exam room early under any circumstances.** Use this valuable time you have remaining to go back and check your answers. Above all, make a special check that you have answered all questions required.

ANSWERING SPECIFIC AREAS OF THE PAPER:

◆ Historical and Societal Influences:

- It is important in this section to be able to connect technological developments in engineering materials and their application to everyday engineering systems such as those titled in the modules you have studied.
- Structure your response to the question so that you can relate the history of technological change within the module being examined as well as its impact on society. Don't be frightened of using a clearly labelled graphical time line method to help illustrate your answer: Remember...*"a picture is worth a thousand words"*.
- Avoid the use of vague terms such as "cost", "economy" or "economical". These are overused and convey very little concise or factual information.
- Be prepared to identify the development of design features over time within the area of engineering being examined and link them to the developing availability of new materials as well as engineering innovation.
- New or emerging technologies should be mentioned where applicable.
- Be able to link all of the above to their impact on the environment.

◆ Engineering Mechanics and Hydraulics: (and Electricity & Electronics)

- Remove and use the formula sheet provided.
- Always use Free-Body Diagrams to illustrate your understanding of the problem.
- Write out all the known and unknown data pertaining to the problem.
- Write down the formula you have available to use.
- It is good practice to show all working in a logical and ordered fashion.
- Use neat, concise sketches and symbols to show electrical circuit diagrams.
- Show the answer in the space provided. If units are specified for the answer, ensure that your answer is converted (if necessary) so it complies with the unit required.
- There is no need to present your answer to two or even three decimal places. The questions are designed to gauge your understanding not the precision of your calculator.
- Because diagrams are drawn to a suitable scale unless stated, a simple graphical solution (triangle of forces etc) may be used which will often save long, laborious calculations which equates to time.
- When no particular method of answering questions is specified, any logical approach to the problem is acceptable.
- If a question relates to a hydraulic principle such as Archimedes or Bernoulli's principle for example, a quick sketch illustrating the principle will illustrate to the examiner your understanding more quickly and easily.
- When you finally obtain an answer, ask yourself *"Is it sensible"?*

◆ Engineering Materials:

- The depth of answer required is usually indicated by the amount of marks allocated.

- If appropriate, jot related facts or sketches down the side of the page – if time runs out, your train of thought and knowledge is there for the marker to see.
- Where possible for the short answer response-type questions, write in clear point form rather than essay style. This will let you get the facts down quickly.
- Never “waffle-on” in your answer as your verbose response may contradict any correct information you have already given. Always try to be factual and avoid the use of slang-terms or colloquial language.
- A neat, labelled sketch will always say more in less time. Consider a written description of a microstructure as opposed to a *neatly drawn and labelled diagram* of the same microstructure. The diagram will take considerably less time as well as quickly and easily displaying your understanding to the examiner.

◆ **Communication:**

- Always ensure that drawings (and sketches) comply with the standard AS1100, particularly in orthogonal multi-view drawings.
- Before you begin a drawing as a solution, try to visualize the solution in your own mind. If necessary, make some quick freehand sketches on the side of the sheet, which will not only help you to “see the answer”, but it will also assist the examiner in following your analysis of the problem.
- When completing an engineering report-type solution, ensure that your response is structured in the same way you wrote engineering reports in class and that you answer in the 3rd person using an objective writing style.
- When completing your response, don’t forget to draw from your experience during collaborative class sessions as well as your library and Internet research.

GAINING MAXIMUM MARKS:

The paper will be positively marked. This means that marks are allocated on the basis of what has been correctly attempted rather than marks deducted for incorrect responses. This is important because it allows marks to be given for displaying knowledge and understanding rather than being deducted.

Various procedures are in place during the marking operation so as to ensure that everything is on your side. All you have to do is relax and show the markers what you know in such a way that your knowledge is displayed in clearly, well setout answers. This is an important key.

Some tips on gaining maximum marks in particular areas of the paper:

◆ **Historical and Societal Influences:** Marks allocated for:

- Clear demonstration of being able to link historical development
→ engineering innovation → materials development → impact of engineering on people’s lives → the environment
- Clear demonstration of being able to link construction methods → materials availability → materials processing → environmental effects
- Use of appropriate report writing structure and language (3rd person)

- ◆ Engineering Mechanics, Materials, Electricity and Electronics: Marks allocated for:
 - Use of Free-Body diagrams where appropriate;
 - Correct conversion of units;
 - Display and use of correct formulae;
 - Correct answer with correct unit (NB: wrong answer with no working = “0”)
 - Clearly written answers which display an understanding of the topic being examined;
 - Legible diagrams, sketches and microstructures.

- ◆ Communication:
 - Knowledge and correct use of Australian Drawing standards (AS1100);
 - Correct production of orthogonal drawings and relationship of views;
 - Referral to a wide variety of research methods such as library, CD-ROM and internet sources;
 - Ability to synthesize information gained from a variety of sources into a concise but factual engineering report.

ONE MORE THING NEEDS TO BE MENTIONED – NON-SERIOUS ATTEMPTS

You have three hours in which to display your knowledge and understanding in the Engineering Studies HSC examination. Keep in mind these points:

- ✗ Non-serious attempts by candidates are never treated lightly. Scribble or no attempt means marks cannot be allocated (remember: positive marking?) so they will get zero (“0”) marks.
- ✗ Offensive drawings, graffiti or “letters” addressed to the examiners, Board of Studies, your principal or teachers will be read by the person marking your paper.
- ✗ The markers have instructions to refer such “jottings” to their Supervisor of Marking which usually means that you may ultimately receive a “*please explain*”. This is then a very serious matter as your paper may be cancelled as the result of a moment of thoughtlessness or misguided anger. You are better than this. Your success is far more important than engaging in such pointless conduct.

Enough of the serious stuff!

***If you want to succeed in Engineering Studies, you can.
Prepare yourself well and anything is possible.***

BEST WISHES & GOOD LUCK!

Acknowledgements:

1. Institute of Industrial Arts Engineering Science Seminar booklets (1987/1991)
2. Stage 6 Syllabus, Engineering Studies
3. Assessment and Reporting Support Documents

