

**- STUDENT HANDBOOK -
SUPPLEMENTRY
DOCUMENT
SPECIFICALLY FOR
ENGINEERING STUDENTS**

1. School of Engineering Programme Educational Objectives (PEOs)

Graduates of APU Bachelor of Engineering in their respective programmes are expected within five years of graduation to attain the following programme educational objectives:

PEO	Electrical and Electronic Engineering (EEE)	Electronic Engineering with Information Technology (Eeit)	Mechatronic Engineering (ME)	Telecommunication Engineering (TE)	Petroleum Engineering (PE)
PEO1	Be a practicing engineer contributing to the development of Electrical or Electronic Engineering while demonstrating professionalism.	Be a practicing engineer contributing to the development of Electronic Engineering with Information Technology while demonstrating professionalism.	Be a practicing engineer contributing to the development of Mechatronic Engineering while demonstrating professionalism.	Be a practicing engineer contributing to the development of Telecommunication or Electronic Engineering while demonstrating professionalism.	Be a practicing engineer contributing to the development of Petroleum Engineering while demonstrating professionalism.
PEO2	Pursue engineering innovation via career advancement opportunities and/or advanced studies in Electrical or Electronic Engineering.	Pursue engineering innovation via career advancement opportunities and/or advanced studies in Electronic Engineering with Information Technology.	Pursue engineering innovation via career advancement opportunities and/or advanced studies in Mechatronic Engineering.	Pursue engineering innovation via career advancement opportunities and/or advanced studies in Telecommunication or Electronic Engineering.	Pursue engineering innovation via career advancement opportunities and/or advanced studies in Petroleum Engineering.

2. School of Engineering Programme Outcomes (PO's)

The following programme outcomes shall be attained by the time of your programme completion:

SNO	PO Number	APU-School of Engineering PO's
1	PO1	Ability to gain and apply principles of Mathematics, Science and Engineering.
2	PO2	Ability to identify engineering problems and apply engineering principles to solve them.
3	PO3	Ability to recognize and apply suitable tools and techniques for engineering practical applications.
4	PO4	Ability to investigate complex engineering problems using research techniques.
5	PO5	Ability to design innovative solutions for complex engineering problems.
6	PO6	Ability to communicate effectively and professionally.
7	PO7	Ability to comprehend and demonstrate current good practices of engineering for sustainable development and environmental considerations.
8	PO8	Ability to practice safety, health, social, cultural and legal responsibilities as an engineer.
9	PO9	Ability to execute the responsibilities of an Engineer professionally and ethically.
10	PO10	Ability to function effectively as a team leader or a member in a team.
11	PO11	Ability to recognize the need for, and be able to engage in independent and life-long learning towards continuous professional development.
12	PO12	Ability to demonstrate and apply the knowledge and understanding of engineering management and finance.

3. Outcome Based Education (OBE)

Outcome Based Education focuses on student learning by:

- Using learning outcome statements to make explicit what the student is expected to be able to know, understand or do;
- Providing learning activities which will help the student to reach these outcomes;
- Assessing the extent to which the student meets these outcomes through the use of explicit assessment criteria.
- It is objective and outcome driven, where every stated objective and outcomes can be assessed and evaluated.

3.1. Programme objectives

It addresses the graduate's attainment 5 years after graduation.

3.1.1 Evaluation of Achievement of PEOs and Improvement Strategies:

The achievement of the PEOs will be measured through the use of the following tools:

- a) Alumni survey
- b) Employer feedback

3.2. Programme outcomes

Consist of abilities to be attained by students by the time they graduate after the 4 years of studies. A summary of the process involved in assessing the POs:

- The data for assessing the POs are gathered from the continual assessment of the students through final exams, in-course assignments, class tests, laboratory reports, industrial training and final year projects.
- The achievements of POs by the students are measured using the Programme Outcome Assessment Report (POAR) at the end of each semester, in tandem with the Learning Outcome Assessment Report (LOAR) for each module in the semester.
- A student is said to have attained a particular PO, if he/she has obtained more than 50% marks in the assessment mapped to the PO measured.
- A compilation of POs achieved by each student is carried out by extracting the information from the POAR into the Cumulative Programme Outcome Achievement Report (CPOAR).
- For a student not attaining POs prescribed up to his level of study, the next opportunity of assessment is identified, which he is expected to attempt during the normal course of his programme. If none exists, an appropriate assessment is provided for the student to demonstrate him having acquired the required ability. Due counselling is provided in either eventuality.

4. APU Accreditation of Prior Certificated Learning Policy & Procedures

4.1. Background

APU is keen to promote the open entry admission system identified by MQA and believes that the accreditation of prior certificated learning is a method to widen the participation of individuals within higher education.

The benefits that can be gained by allowing students to apply for the accreditation of their prior learning can include, for example, providing a cohort of students with a wider range of experiences to discuss and investigate during tutorial sessions or group assignments.

4.2. Policy for Accreditation of Prior Certificated Learning (Engineering Degrees)

Students can apply for the review of their previous learning experiences provided that the following criteria are followed:

- A maximum of 30% of total credits hours can be applied for through the APCL process
- The student will need to provide evidence that their previous learning experience maps against the learning outcomes for any module being considered for accreditation of prior certificated learning
- The smallest unit which can be accredited is a module (i.e. students cannot request that they are exempted from one piece of assessment within a module)
- Exemption for an Internship and Final Year Project will not be considered.

4.3. Procedures for Application for Accreditation of Prior Certificated Learning

Students are requested to submit a claim for APCL at the earliest opportunity as in some cases external examiners may need to be consulted on the suitability of the previous experience.

i. When to apply for APCL

Students should ideally submit a request for APCL before a module commences, however, students may submit a request as follows:

Diploma/Foundation/Level 1 module – within 3 weeks of the module commencing

Level 2/Level 3/Masters module – within 2 weeks of the module commencing

ii. How to apply

Students should complete the application form and submit to the University Administrator with supporting documentation.

Incomplete forms or submissions lacking detailed evidence may result in responses being delayed.

iii. Responses

Students will receive confirmation of their application status within 10 working days of receipt of their submission.

Responses may be to accept the application, reject the application or to ask for further evidence to clarify specific areas of concern raised by the APCL panel.

iv. Review of responses

If a student's request for APCL is rejected and it is felt that a material error or irregularity has taken place or if further evidence can be produced then the student should submit their request for a further review of the evidence along with full details setting out the reasons why they consider an irregularity has taken place.

The request for a review will be submitted to the Dean of Quality Assurance and Partnerships, along with the appropriate Dean of Faculty, Head of School and Programme Leader.

The Dean of Quality Assurance & Partnerships will respond to the applicant within 15 working days of receiving the request.

5. Student Feedback

Student Feedback for each module taught is also obtained manually at the middle of each semester which is between week 7 and week 8 and collectively reported at the end of the module.

The student feedback is sought on both the module subject coverage and lecturer performance by the middle of their semester.

6. Final Year Project

The Final Year Project (FYP) is carried out during the 4th Year (last two semesters of the curriculum) of the programme. The implementation of this module is described in the Student Project Handbook. It is split into two phases.

In Phase One (Semester 1 of Year 4); investigation is carried out on the proposed project topic. This phase includes the introduction with appropriate background, research problems and questions, aim and objectives of the proposed project, justification of the research, followed by literature review and methodology formulation and selection of appropriate tools and techniques.

In Phase Two (Semester 2 of Year 4), the proposed plan is implemented by designing, simulating (if applicable), testing, analysing, and discussing the results and finally end up with conclusion of the project.

FYP Phase One is assessed using the Investigations Module Assessment Form for Engineering based on a written report and an oral presentation. FYP Phase Two is assessed using the Project Assessment Form for Engineering based on a written report and a viva presentation which includes a demonstration of the prototype.

6.1. Final Year Project process

Each student has the choice to select the final year project from the FYP bank (option 1) or can propose his/her own idea (option 2) and they are allowed to carry out their projects individually. The FYP bank will be provided to the student during the week 1 of semester 1 of year 4. The FYP process flow chart is shown in **Figure 1**

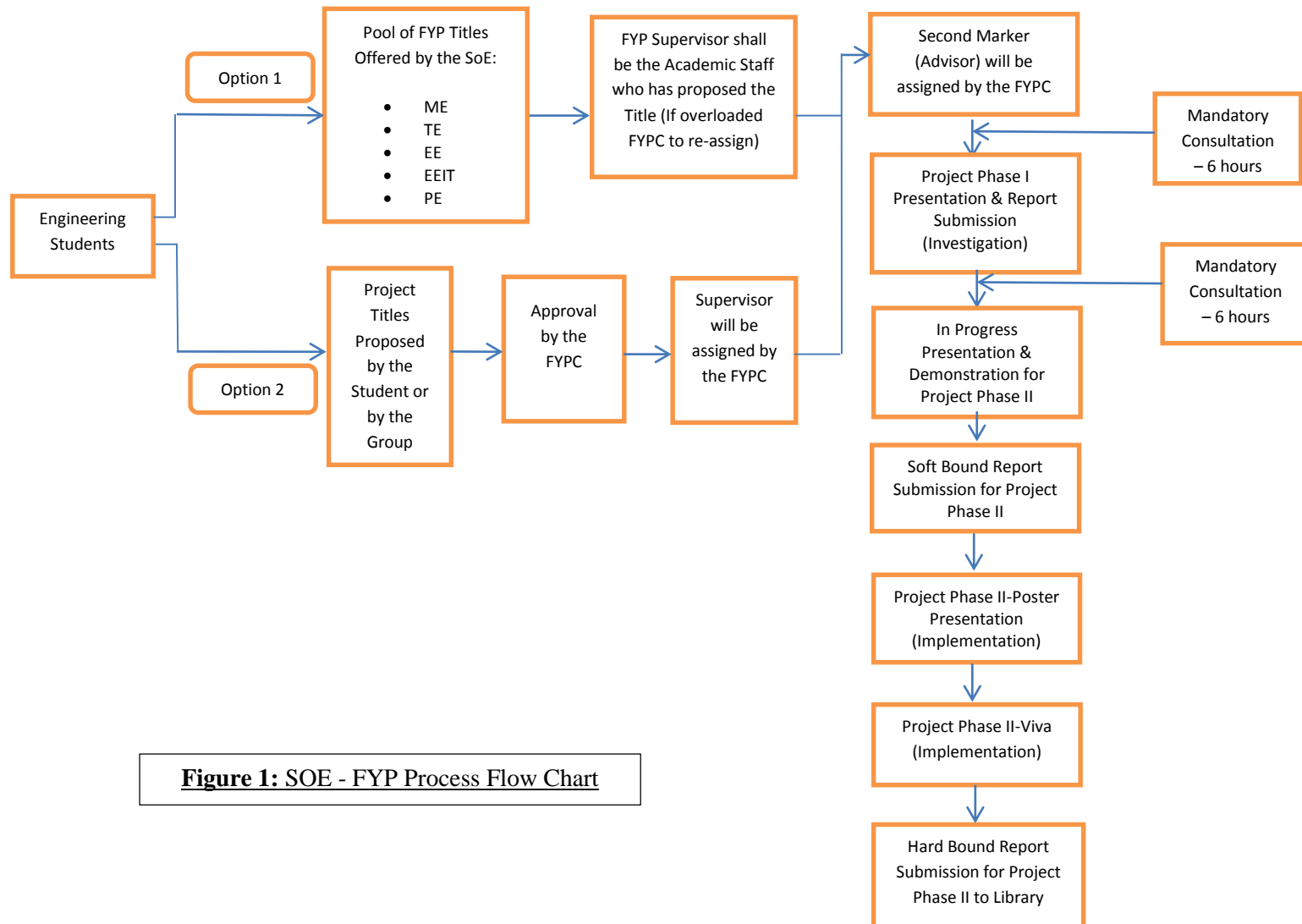


Figure 1: SOE - FYP Process Flow Chart

As far as **Option 1** is concerned each academic staff shall provide a collection of project titles, which will go into the FYP Bank/Pool according to the programmes after verification by the FYPC. Student can then choose one project from the FYP Bank/Pool offered by the SOE, and once selected that specific title will be removed from the Pool to ensure that no two students or groups attempt the same project. This option is provided to all the students based on the First in First out (FIFO) process. The academic staff who has proposed the project title shall be the FYP Supervisor and the FYPC will allocate the second marker (Advisor).

As far as **Option 2** is concerned each student as an individual can propose their own ideas/titles/projects. The FYPC will review their ideas/titles/projects for acceptance. Upon acceptance, FYPC will assign the FYP supervisor based on expertise/capabilities/loading and will allocate the second marker (Advisor).

Generally, each academic staff shall supervise a minimum of 4 students (Supervisor) and advice 4 students (Advisor or Second Marker). However, this might vary according to the number of students in each intake. Also, prototype completion shall be mandatory for the Mechatronics Programme while Prototype or Simulation based results are acceptable for Telecommunication, Electrical and Electronics, and Electronics with IT Specialism Programmes.

For further details on FYP, please refer to the **Engineering Final Year Project Handbook**

7. Engineering Industrial Placement

Exposure to professional engineering practice in the form of an Industrial Placement is compulsory for the students of Engineering. Industrial Placement provides an excellent opportunity for students to familiarise themselves with common engineering processes and to develop relevant technical and soft-skill sets within an actual working environment. While the short attachment duration may not allow students to fully acquire craft skills in engineering; having appreciation of the skills and practices involved in engineering would be deemed sufficient.

At the School of Engineering, Industrial Placement is conducted during the year-end break after Semester 6 in Year 3, for a minimum duration of 12 weeks. This means students can enrol to Semester 7 of Year 4 upon returning from the placement provided they have fulfilled all requirements of the Examination Board.

Students may opt for longer placement duration with understanding that they will be joining a later Year 4 intake. Industrial Placement is accorded a maximum of 6 credits for the 12 weeks duration. The credit for Industrial Placement will not be considered for GPA/CGPA calculation.

7.1. Process Flow of Industrial Placement

The process flow of Industrial Placement is illustrated in **Figure 2** and is summarised herein. Further detailed explanation of the processes involved can be found in the **Engineering Industrial Placement Handbook**.

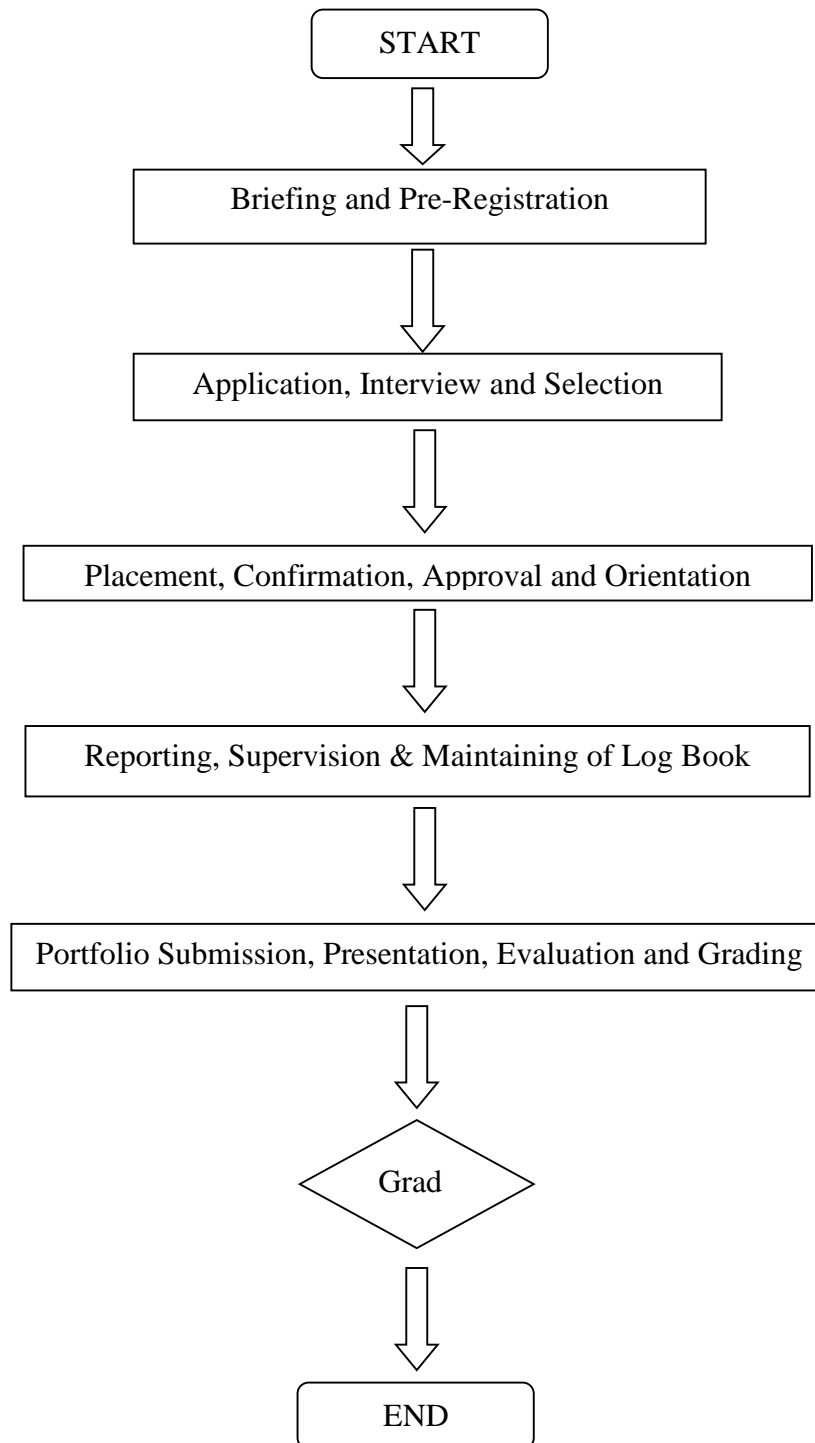


Figure 2: Process Flow of Industrial Placement

8. School of Engineering Laboratory Rules and Regulation

8.1. Analogue and Digital, Communication and Automation Laboratory

1. Students must keep the laboratory clean at all times.
2. All students should attend the laboratory sessions promptly and punctually.
3. Students must take care of their own belonging in the laboratory. School of Engineering will not be responsible for any loss or missing items in the laboratory.
4. Any students caught stealing any item from the lab will face disciplinary action.
5. Students are not allowed to bring food and /or drinks into the laboratory.
6. Students are required to dress appropriately. The use of slippers or sandals is not permitted. Students are advised to wear shoes which will provide high insulation from electric shocks.
7. Students are allowed to be in the laboratory only during lab sessions or with the approval from the concerned authority.
8. Students are not allowed to go out during lab hours without permission from the lecturer.
9. All equipment must be arranged properly after use.
10. No laboratory property can be taken out from the respective laboratory without approval from the lab technician or lecturer in charge.
11. Students are advised not to work when tired or under medication that causes drowsiness.
12. Do not work under poor or dim light conditions.
13. Do not work in damp areas or with wet shoes or clothing.
14. Avoid wearing rings, bracelets, chains around the neck when working with exposed electrical or electronic circuits.
15. Beware of laboratory items that are toxic (e.g. tantalum capacitor, solder lead fumes, etc.)
16. Students are required to work in a group of 2 as instructed by the lecturer.
17. Students are required to disconnect their circuit and switch off all the equipment after use e.g. (function generator, oscilloscope, DC supplies and digital multimeter).
18. Any malfunction of equipment must be referred to lab technician or lecturer in charge.

8.2. Power Laboratory

1. Be sure of the condition of the equipment and the dangers it can present **before** working on it. Many sportsmen are killed by supposedly unloaded guns; many technicians are killed by supposedly "dead" circuits.
2. **Never** rely on safety devices such as fuses, relays, and interlock systems to protect you. They may not be working and may fail to protect you when most needed.
3. **Never** remove the grounding prong of a three-wire plug. This eliminates the grounding feature of the equipment making it a potential shock hazard.
4. **Do not work on a cluttered bench.** A disorganized mess of connecting leads, components and tools only leads to careless thinking, short circuits, shocks, and accidents. Develop systemized and organized work habits.
5. **Do not work on wet floors.** Your contact resistance to ground is greatly reduced on a wet floor. Work on a rubber mat or an insulated floor.
6. **Do not work alone.** It is just good sense to have someone around to shut off the power, to give artificial respiration, or to call a doctor.
7. **Work with one hand behind you or in your pocket.** A current between two hands crosses your heart and can be more lethal than a current from hand to foot. A wise technician always works with one hand.
8. **Never talk to anyone while working.** Do not let yourself be distracted. Also, do not talk to someone who is working on dangerous equipments. Do not be the cause of an accident.
9. **Always move slowly** working around electrical circuits. Violent and rapid movements lead to accidental short circuits and shocks.

8.3. Microwave Laboratory

8.3.1. Lasers safety guidelines

1. **NEVER, EVER LOOK INTO ANY LASER BEAM**, no matter how low power or "eye safe" you may think it is.
2. Always wear safety goggles if instructed by your Instructor or Teaching Assistant.
3. The most common injury using lasers is an eye injury resulting from scattered laser light reflected off of mountings, sides of mirrors or from the "shiny" surface of an optical table. The best way to avoid these injuries is to always wear your goggles and **NEVER LOWER YOUR HEAD TO THE LEVEL OF THE LASER BEAM!** The laser beam should always be at or below chest level.
4. Always use "beam stops" to intercept laser beams. Never allow them to propagate into the laboratory.
5. If you suspect that you have suffered an eye injury, notify your instructor or teaching assistant **IMMEDIATELY!** Your ability to recover from an eye injury decreases the longer you wait for treatment.

8.3.2 Microwave safety guidelines

Even though there should be little danger from microwave radiation hazards in the lab, the following work habits are recommended whenever working with RF or microwave equipment:

1. Never look into the open end of a waveguide or transmission line that is connected to other equipment.
2. Do not place any part of your body against the open end of a waveguide or transmission line.
3. Turn off the microwave power source when assembling or disassembling components.

8.4. Workshop

1. Never work alone. At least two adults must be in the workshop when power tools are being used.
2. Never work when you are impaired. This includes when you are too tired, stressed or hurried to work.
3. If you cannot do a job safely in this shop, don't do it. There are limits to what we can build here.
4. Always wear closed-toe shoes in the shop. Tools, chips and fixtures are sharp, and often hot. Shoes will help protect your feet from injury. Leather shoes are preferred when welding.
5. Eye protection is essential. Always wear safety goggles when working or cleaning tools.
6. Remove or secure anything that might get caught in moving machinery. Rings, necklaces, long hair and loose clothes that get caught in tools can drag you along.
7. Keep your hands away from sharp tools. Make sure that nothing that you do will cause you to be cut.
8. Dust, chemicals and smoke can be dangerous – work in well-ventilated areas, minimize contamination and use appropriate protective equipment.
9. The safety equipment cabinet is on the patio. If you're unsure about the safe operation of a tool or any aspect of a job – ask for help!
10. Clean up the work area after usage. Before you leave the workshop each day all tools must be returned to the toolbox, the machines must be cleaned and wiped and the floor must be swept. Leave 10-15 minutes for clean-up.
11. Do not attempt to remove foreign objects from the eye or body. Report to the student health service for medical treatment. If chemicals get in the eye(s), wash eye(s) for 15 minutes in an open flow of water before proceeding for medical treatment. **Notify Lab instructor immediately.**
12. Avoid excessive use of compressed air to blow dirt or chips from machinery to avoid scattering chips. Never use compressed air guns to clean clothing, hair, or aim the gun at another person.
13. Machines must be shut off when cleaning, repairing, or oiling.
14. Hand protection in the form of suitable gloves should be used for handling hot objects, glass or sharp-edged items.
15. Wear appropriate clothing for the job (i.e. do not wear short sleeve shirts or short pants when welding).
16. Never indulge in horseplay in the workshop areas.
17. All machines must be operated with all required guards and shields in place.
18. A brush, hook, or special tool is preferred for removal of chips, shavings, etc. from the work area. Never use your hands to clean or clear the cutting– they are sharp!
19. Keep your fingers clear of the point of operation of machines by using special tools or devices, such as, push sticks, hooks, pliers, etc. Never use a rag near moving machinery.

20. A hard hammer should not be used to strike a hardened tool or any machine part.
Use a soft-faced hammer.
21. Before starting a machine, always check it for correct setup and always check for the operating manually, if possible.
22. Do not bring food or snacks into the shop.
23. If you have not worked with a particular material before, check the hazardous materials data sheets book for any specific precautions to be taken while working with the material. Also, ask the workshop personnel before cutting any unused material.
24. Heavy sanding and grinding should only be done in well-ventilated areas, preferably on the patio. Painting only to be done on the patio – make sure that the doors to the workshop are closed.
25. Follow all appropriate precautions when working with solvents, paints, adhesives or other chemicals.

8.5. Mechanical Laboratory

1. **BE PREPARED.** Read and fully comprehend the lab procedure as set forth in the lab manual before you begin any experiment. If you do not understand the procedure, see your instructor/TA.
2. **THINK SAFETY.** Work deliberately and carefully. No horseplay
3. **ALL LABORATORY STUDENTS MUST BE SUPERVISED** Never work alone
4. **KNOW THE HAZARDS OF ANY MATERIALS OR MACHINERY YOU ARE WORKING WITH.** The laboratory manual and/or instructor will review specific safety issues on individual experiments before you perform any tests.
5. **ALL STUDENTS MUST WEAR APPROPRIATE SAFETY EQUIPMENT.** Safety goggles must be worn anytime any laboratory experiment is being performed. Additional safety equipment must be utilized based on specific experiment requirements.
6. **ALL STUDENTS MUST WEAR APPROPRIATE LABORATORY ATTIRE.** No open toed shoes; no loose fitting clothing; Jewellery should be removed; long hair should be tied back.
7. **NO FOOD OR BEVERAGE IN THE LABORATORY.**
8. **KNOW EMERGENCY PROCEDURES.** Make note of fire escape routes and emergency phone locations.
9. **REPORT ANY PERCEIVED SAFETY HAZARDS.** Immediately report any spills, equipment malfunctions, injuries or other perceived safety hazards to your Instructor / TA / or staff member.
10. **KEEP YOUR WORK AREA CLEAN.**
11. **FAILURE TO CONFORM WITH ANY OF THE ABOVE RULES MAY RESULT IN NOT BEING ALLOWED TO PARTICIPATE IN THE LABORATORY EXPERIMENT.**

8.6. CAD/CAM Laboratory

1. Do not attempt to operate any machinery until you are sure you know how to use it.
2. Ensure that you know how to stop the machine before starting it.
3. Ensure that all appropriate guards are in position before starting the machine.
4. Check, where appropriate that the direction of rotation of the work-piece or cutter is correct.
5. Ensure that any feed mechanisms are in neutral before starting the machine.
6. Ensure that all tools, work-pieces, etc. are secure before starting the machine.
7. Do not walk away and leave the machine running.
8. Wear appropriate personal protection - safety glasses, shoes, etc.
9. Do not remove metal waste with bare hands - wear gloves and use a rake or brush.
10. Do not wear gloves near rotating machinery.
11. **IF any DOUBT ASK !!!**

Lathes CNC

1. Always remove the chuck key from the lathe chuck.
2. Do not use cracked or damaged tools.
3. Keep all tools sharp.
4. Do not touch revolving chucks or work-pieces.
5. Keep the lathe-bed clear: Do not allow a build-up of metal waste.
6. Always use the correct tools for the job.

Milling Machines

1. Ensure that the feed mechanism is disengaged before starting the machine.
2. Position guards to deflect chips to a safe area.
3. Do not use cracked or damaged cutters.
4. Do not attempt climb milling unless the machine is designed for that purpose.
5. Do not touch revolving cutters.
6. Do not attempt to clear metal waste from the cutter area while it is rotating.

8.7. Petroleum Geology Laboratory

1. Dress code and personal protective equipment (PPE)
 - a. While in the lab you must wear shoes.
 - b. You must wear goggles or safety glasses when directed to do so by the lab.
 - c. Remove watches, rings, and bracelets during lab activities.

2. When using 10% hydrochloric acid for rock and mineral identification, students should use only a very small drop of acid, and should use care so as not to get the acid on the lab table, their skin, clothes, or in their eyes, or on any other student.
 - a. Rocks and minerals must be rinsed off with tap water immediately after the acid test, and looted dry using paper towels.
 - b. Keep all table tops wiped or blotted dry.
 - c. Do not leave acid-covered specimens lying on the tables, and do not put acid-covered specimens back into the cardboard specimen trays.
 - d. If you suspect that you have acid on your hands, wash them immediately. Do not rub your eyes. Report any acid spills to the instructor immediately.

3. When conducting a mineral hardness test using a nail or pointed metal probe, students should be careful not to stick themselves or anyone else. **(DANGER OF TETANUS)**.
 - a. When conducting a mineral hardness test using a glass plate, the glass plate should be held flat against the table (rather than in the hand) to perform the test. The edges of the glass plate might be sharp. Students should take care not to cut themselves on the edges.
 - b. Inform the instructor immediately if a glass plate is broken so that the pieces can be disposed of safely.

4. When using microscopes and illuminators, students must use care not to trip over the electrical cords. Tripping on a cord can pull a microscope or illuminator into the floor causing considerable damage to the equipment, or cause injury to students.

5. **DO NOT:-**
 - a. Horse around or perform unauthorized experiments.
 - b. Eat or drink during laboratory sessions.
 - c. Bring the sample outside of laboratory.

6. Please keep the laboratory clean, hygiene and safe **ALL** the time.

7. Report and breakage, damage and/or spill to the laboratory instructor immediately.