

Employers Guidelines

API Bursary Students Vacation Placements

Engineering Training of Students

Anecdotal evidence suggests that vacation assignments are the most valuable part of the bursary program – both for introducing the students to power engineering practice and for introducing the host companies to individual students. This paper is intended to provide guidance for sponsor companies in providing high quality vacation employment experiences for the bursary holders.

Power Engineering Degree Courses

Bursary students undertake one of the following degrees:

- Electrical Engineering
- Mechanical Engineering
- Mechatronics (a mix of electrical and mechanical topics)
- Infomechatronics (a mix of IT, electrical and mechanical topics)

Note: Many universities have a common 1st year and students don't specialise into their stream of engineering until the 2nd year.

Vacation Assignment Guidelines

Broad Description of Suitable Vacation Assignments

Table 1 provides an overview of appropriate vacation assignments. This should be treated as a menu from which sponsor companies can develop particular assignments. There is no suggestion that an assignment should cover all of the areas listed.

Table 1 uses the terms “Basic”, “Intermediate” and “Advanced” in referring to various activities such as report writing, power system analysis, design, project management etc. Different companies may interpret these qualifiers in different ways that reflect the nature of their businesses. These terms are simply used here to reflect an expectation of increasing maturity of the students as they progress through their course.

Specific Assignments Suggested for Particular Power Engineering Groups

Some bursary sponsors have provided more detailed descriptions of the types of assignment they provide. They are listed in the Attachments for the information of other sponsors:

- Attachment 1 – Generation Company
- Attachment 2 – Distribution Company
- Attachment 3 – Consulting Company

Allocation of projects

The vacation development period is typically 10 to 12 weeks. As students are often dedicating a substantial portion of their work time to individual projects, they will generally complete projects in a shorter time.

If 2nd/3rd year students are placed, sponsors are encouraged to consider placements for 1st year students (some member companies have made placements of 2 first year students for 6 weeks each).

There may be opportunities for the vacation students to rotate into another business area so that the student can gain appreciation of another part of the business.

To assist the student to fully understand the context of the activity or project they will be working on, you are requested to provide a "API STUDENT WORK SCOPE/BRIEF" Summary to the student covering the context, available resources, deliverables, timeframes and student learning objectives/outcomes from the work experience undertaken. See Appendix A for an example Template.

Other Work or Development Related Activities

Not all work given to students needs be project based. Involvement in routine workplace activities can add value to both the student and the workplace. Following are examples of some suitable work and development related activities:

- Provide an appropriate level of supervision/mentoring and opportunities for students to be involved in day to day workplace activities.
- Invite students to any graduate engineers meetings to meet other young engineers and find out their experiences with the business.
- Assist students' learning in the following areas:
 - How to interact appropriately within a corporate culture;
 - how to manage/run projects on a day to day basis and how to interact with their supervisor in this regard, e.g. setting daily targets and reporting on progress;
 - how to run and organise meetings with supervisors and peers to report on progress and how to make decisions;
 - how to document the work by keeping a diary/blog or writing reports on projects.
- Organise field and site visits, such as control centres, substations, power plants to help students learn about and identify various assets.
- Discuss and possibly identify industry based final year thesis projects.
- Consider opportunities to provide part time employment throughout the final year.

Table 1 Power Engineering – Undergraduate Vacation Assignment Suggestions

End of Year	Generic Description of Assignments	Generation Examples (*)	Transmission & Distribution Examples (*)	Manufacturing & Process Engineering Examples (*)	Consulting Examples (*)
1	Assisting Tradespeople including use of tools where permitted	Practical trade experience - maintenance, operations, fault finding	Maintenance, operations	Manufacture, test & inspection Maintenance, operations	Construction & projects
1	Assisting Engineers & Paraprofessionals	Research, data collection & analysis	Data collection & analysis	Data collection & analysis	Data collection & analysis
1	Assisting Engineers & Paraprofessionals	Basic design & implementation			
1	Assisting Engineers & Paraprofessionals	Basic report writing	Basic report writing	Basic report writing	Basic report writing
2	Assisting Tradespeople including use of tools where permitted	Practical trade experience - Maintenance, operations, fault finding & investigations	Maintenance, operations	Manufacture, test & inspection Maintenance, operations	Construction & projects
2	Assisting Engineers & Paraprofessionals	Research, data collection & analysis	Data collection & analysis	Data collection & analysis	Data collection & analysis
2	Assisting Engineers & Paraprofessionals	Basic systems analysis (mechanical or electrical)	Basic power systems analysis	Basic power systems analysis	Basic power systems analysis
2	Assisting Engineers & Paraprofessionals	Basic design projects	Basic design projects	Basic design projects	Basic design projects
2	Assisting Engineers & Paraprofessionals	Basic project management	Basic project management	Basic project management	Basic project management
2	Assisting Engineers & Paraprofessionals	Intermediate report writing	Intermediate report writing	Intermediate report writing	Intermediate report writing
3	Assisting Engineers & Paraprofessionals	Maintenance procedure review & development	Maintenance, operations	Manufacture, test & inspection Maintenance, operations	Construction & projects
3	Assisting Engineers & Paraprofessionals	Intermediate systems analysis	Intermediate power systems analysis	Intermediate power systems analysis	Intermediate power systems analysis
3	Assisting Engineers & Paraprofessionals	Intermediate design projects	Intermediate design projects	Intermediate design projects	Intermediate design projects
3	Assisting Engineers & Paraprofessionals	Intermediate project management	Intermediate project management	Intermediate project management	Intermediate project management
3	Assisting Engineers & Paraprofessionals	Detailed plant investigations			
3	Assisting Engineers & Paraprofessionals	Intermediate report writing	Intermediate report writing	Intermediate report writing	Intermediate report writing
4	Assisting Engineers & Paraprofessionals	Typically we do not have 4 th years, and would attempt to tailor experience to their need	Maintenance, operations	Manufacture, test & inspection Maintenance, operations	Construction & projects
4	Assisting Engineers & Paraprofessionals		Advanced power systems analysis	Advanced power systems analysis	Advanced power systems analysis
4	Assisting Engineers & Paraprofessionals		Advanced design projects	Advanced design projects	Advanced design projects
4	Assisting Engineers & Paraprofessionals		Advanced project management	Advanced project management	Advanced project management
4	Assisting Engineers & Paraprofessionals		Advanced report writing	Advanced report writing	Advanced report writing

(*) Note: The terms “Basic”, “Intermediate” and “Advanced” may have different interpretations in different companies. They are used here only to recognise an increasing maturity as the undergraduates proceed through their course.

Attachment 1 – Generation Company

It is important to place 1st and 2nd year undergraduates in a situation where they assist tradesmen or technicians 'on the tools' or 'in the field'. This is one of the few opportunities young engineers get to experience the shop floor environment and to gain respect for the capabilities and work environment of our technicians and tradesmen. The university space is largely theoretical. This is the opportunity to get some hands on. It is therefore important to give undergraduates the opportunity to get their hands dirty.

Undergraduates are not normally employed in Engineering Office / Consultancy type environments until 3rd year at the earliest. Doing so not only deprives them of the opportunities described above, but also means they struggle to contribute meaningfully because of the early extent of their studies. That said, we do try to give 1st and 2nd years several weeks or so in the engineering office to give them an appreciation of the types of work performed by power station engineers.

Students who have completed 1st year

- Basic project research and investigation – e.g. VVVF filter technologies, belt scraper and clamp industry review
- Basic design and implementation – e.g. administration area lighting replacement, turbine shipping container design
- Development and interrogation of plant databases – e.g. LV and HV motor database, Plant Performance Historian
- Practical trade experience – e.g. secondment to maintenance teams

Students who have completed 2nd and 3rd years

Activities listed above for 1st year students plus the following:

- Fault studies - using EDSA load flow software
- Manage minor projects –e.g. office metering implementation, Gland seal water modification
- Running load flows - using EDSA load flow software
- Detailed plant investigations – e.g. ATP maintenance strategy
- Development of maintenance plans and procedures – e.g. RMU operation, rigging and lifting procedures
- Plant testing – assisting with performance and routine testing of plant

Attachment 2 – Transmission and Distribution Companies

Students who have completed 1st year

- Basic planning and risk studies
- Development of planning tools
- Basic research and investigation into new or existing technologies, equipment and products
- Simple designs – e.g. detail design of overhead lines and substations, distribution system design, street lighting
- Development of design programs
- Drafting and design

Students who have completed 2nd and 3rd years

Activities listed above for 1st year students plus the following:

- Reliability analysis
- Power quality studies and analysis
- Running load flows
- Detailed planning studies
- Introduction of new products
- Analysis of the power network
- Analysis of equipment and component failures
- Development of maintenance plans
- Manage minor projects

Note: The distribution area of industry is hazardous and new staff or students need to gain the necessary electrical safety awareness. Consequently, it is recommended that only students who have completed 2nd year (and higher) are allowed to work with tradespeople in the distribution area.

Attachment 3 – Consulting Company

In assessing the sorts of activities and tasks that are planned for a vacation placement student we have found it essential to meet with the student at least a month prior to the placement in order to gauge their areas of interest, their preferences and their areas of study so far.

Activities that a 1st year student might undertake may include:

- Data collation and basic analysis
- Basic power system analysis
- Assisting Senior Engineers with load forecasting
- Assisting Senior Engineers with the assessment of generator performance
- Basic risk analysis
- Researching and comparing wholesale and retail market concepts
- Basic model diagram updates
- Basic automation tasks

Activities that a 2nd or 3rd year student might undertake may include:

- Power System Operations Performance analysis
- Generator performance analysis and studies
- Market event studies
- Assisting with load forecasting
- Writing and updating production constraints
- Assisting with system outage management
- Power system analysis
- Wholesale and Retail Market analysis and event analysis
- Application of Power systems theory in solving power system problems
- Dynamic power system simulations using PSSE
- Market modelling
- Translating power system models
- Analysing new energy technologies
- Network modelling and analysis
- Forced outage calculations
- Small signal analysis
- Model diagram updates

Appendix A

API BURSARY STUDENT WORK SCOPE/BRIEF (Project Brief Template)

Work/Project Title

Project Supervisor

Department

Date of Commencement

Background – What is the business context of this project? How has the project arisen?

Project Scope

Objective – What is the aim of the project?

Inclusions – What is to be covered? High level step by step plan/activities

Exclusions – What is not to be covered?

Resources

Team Resources and Contacts:

Other Useful Resources:

Deliverables – What are the outputs required? What is the level of detail/quality/analysis required?
Are there any other criteria that need to be met?

Timetable – What are the due dates of the deliverables? Are there key milestone dates that must be met?

Student Learning Objectives/outcomes – What are the learnings/competencies the student should Gain from undertaking this work?