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.

Due to recently experienced difficulty in providing vacation placements for 1st year students, sponsors are encouraged to consider a shared placement for two 1st year students, 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.
Power Engineering Undergraduate Vacation Employment Salary Rates

This table provides indicative student salary rates based on the APESMA guidelines on remuneration for undergraduate engineers (for 2011). Many workplaces will have EBA’s or similar, which will dictate pay rates.

Engineering Students
Salary based on level of studies completed*

<table>
<thead>
<tr>
<th>Year of course completed</th>
<th>% of current market rate for entry level graduate</th>
<th>Weekly*</th>
<th>Ordinary hourly rate</th>
<th>Casual hourly rate (inc 25% loading)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completed 1st year</td>
<td>50%</td>
<td>$538.46</td>
<td>$14.17</td>
<td>$17.71</td>
</tr>
<tr>
<td>Completed 2nd year</td>
<td>60%</td>
<td>$664.15</td>
<td>$17.00</td>
<td>$21.26</td>
</tr>
<tr>
<td>Completed 3rd year</td>
<td>70%</td>
<td>$753.85</td>
<td>$19.84</td>
<td>$24.80</td>
</tr>
<tr>
<td>Completed 4th year</td>
<td>80%</td>
<td>$861.54</td>
<td>$22.67</td>
<td>$28.34</td>
</tr>
<tr>
<td>12 week industrial experience</td>
<td>90%</td>
<td>$969.23</td>
<td>$25.51</td>
<td>$31.88</td>
</tr>
</tbody>
</table>
## Table 1 Power Engineering – Undergraduate Vacation Assignment Suggestions

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

(*) 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 1\textsuperscript{st} 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 2\textsuperscript{nd} and 3\textsuperscript{rd} years
Activities listed above for 1\textsuperscript{st} 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

\textbf{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 2\textsuperscript{nd} 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 1\textsuperscript{st} 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 2\textsuperscript{nd} or 3\textsuperscript{rd} 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?