



UNIVERSITY OF PRETORIA

School of Engineering  
*Department of Industrial and Systems Engineering*

INDUSTRY GUIDELINES FOR PRACTICAL TRAINING

## Guidelines for Practical Training of Industrial Engineers

### 1. Introduction

Exposure to the industry forms an important and integral part of engineering students' undergraduate studies. The Department is grateful to businesses that make a contribution in this regard and will gladly provide support, guidance and evaluation of such training. Please refer to: *Guidelines for Practical Training in Industrial Engineering (S0100E03)* for the formal guidelines. The fact that each business and industry has its own unique character and often plans and executes unique student training programmes, is accepted and acknowledged. It is accepted that complete adherence to the requirements as stipulated in the suggestions, is not always possible. Such discrepancies are acceptable to the Department as long as actions strive towards fulfilling the guidelines and students should work under the guidance of responsible persons with sufficient expertise.

### 2. Training Requirements

All engineering students must complete practical training at an approved organisation, during or at the end of their second and third study years. This entails a six week (30 working days) period per year of study with a total of twelve weeks. The Dean of the Faculty and of the Head of the Department can approve a shorter period if motivation is provided.

On completion of each training period the student must submit a report to be evaluated by the university in terms of standard, quality, quantity and field of application for the student's field of study. Please refer to: *Guidelines for Practical Training Reports (S0101E04)* for detailed requirements. A report must be accompanied by a signed/verified *Employers Report* stating the nature of work and number of days completed.

### 3. Purpose of Industry Training

Industry training has been established to provide students with an overview of industries and to expose them to different aspects of a business, all under the guidance of skilled and experienced persons within the organization. This exposure should include all or most of the following aspects of business: management- and personnel policy, financial-, marketing- and purchasing functions, legal and social aspects, operations and technical activities. These goals can be achieved through the following forms of interaction:

- Introduction to the organizational policy and -culture
- Cognizance of the structure and hierarchy of personnel within the organization
- Liaison with employees at different levels.

- Liaison and cooperation with other engineering disciplines.
- Meaningful work programs or projects done from planning to completion and reporting.
- Exposure to management programmes- and systems, effective administration methods and documentation.

The total training of the student as an engineer, but also as a person and employee, is advised. Contact with management and the moral support of training personnel from the induction phase to the end of his industry training period is encouraged. This contact, which can take place at a formal as well as an informal level, requires open communication channels.

#### **4. Projects for Industrial Engineering Students**

The training that industrial engineering students undergo at the University of Pretoria, enables them to complete various specialist tasks and is aimed at the analysis, planning, design and operation of integrated systems where resources such as labour, material, capital, equipment and information are optimally utilized to increase productivity. The field of engineering, especially industrial engineering, is wide and an undergraduate practical training program will necessarily not be able to cover all aspects. As much of each field as possible should be covered, without transforming the training into mere observation.

A list of study fields and subjects under each, serving as examples of possible projects or tasks to be meaningfully executed by the student during industry training, is as follows:

##### ***1. Production systems and -processes***

- product development
- process planning and choice of equipment
- design and installation of quality engineering and -analytical systems
- investigations regarding mechanization, automation and robotics
- computer-supported production systems

##### ***2. Work study***

- method study
- activity sampling and determination of time standards and labour/machine costs
- development and implementation of wage incentive schemes, work performance measures and task/process evaluation systems
- determination of human resource requirements occupational safety and health
- productivity measurement

##### ***3. Quality assurance***

- Quality assurance techniques, e.g. application of statistical process control techniques, control charts, inspection methods, measurement techniques, sampling for quality control and metrology
- Implementation of ISO 9000 quality management systems
- Creation of a quality culture and total quality management

##### ***4. Reliability***

- evaluation of component- and system reliability and performance

##### ***5. Industrial analysis***

- operational research, including mathematical analysis, linear programming, dynamic programming,
- decisionmaking theory and experimental design
- software design
- simulation modelling
- forecasting

### ***6. Production planning and -control***

- stock- and purchasing management
- design and implementation of production planning- and control systems
- distribution planning
- capacity planning
- material requirements planning
- production scheduling
- development and implementation of maintenance planning systems

### ***7. Facilities planning***

- facility planning surveys with consideration of the potential market, availability of raw materials and labour, financing, incentive schemes and taxes
- layout planning and implementation through determination of area requirements and flow of material, equipment, information, services and people through the facility
- material handling

### ***8. Project management***

- project planning, -organizing and -control
- scheduling and network planning
- resource allocation
- work division

### ***9. Information management***

- design and implementation of management information systems and data warehousing and processing systems

### ***10. Systems integration***

- systems engineering/-integration
- configuration management
- supply chain and logistics analysis and integration

### ***11. Economic analysis***

- viability-/feasibility studies with consideration of the potential market, availability and cost of material en manpower, equipment and facilities required, financing, operating- and maintenance costs, required output, taxes and risk
- cash flow analysis
- determination of product cost and estimates
- production economy
- techno-economic investigations

### ***12. General management***

- strategic planning
- organizational planning and structuring labour relations
- office systems, procedures and policy

- marketing management and market research
- financial planning

Depending on the scope of projects or tasks, the student's exposure will range from primary responsibility to mere introduction to a specific task/subject. Where possible, planning, self-activity, coordination and problem solving and –evaluation should be emphasized. Projects should be clearly defined with clear guidelines and chosen to be meaningfully completed during the training period.

***Project work should preferably include the following:***

1. Problem definition and -description
2. Specification of required output and planning of project
3. Data gathering and literature study if required
4. Creation/development of conceptual solutions and discussions with group leaders
5. Decide on concept and follow systematic solution- and analyzing methods for detail
6. Finalizing of solution/recommendation in report form with relevant documentation
7. Implementation of suggestions, layout or system
8. Evaluation together with met colleagues and group leader, with adjustments if required

## **5. Mentorship and Evaluation**

It is essential that students are continuously occupied with meaningful work during training. The work planning must provide clear evidence of an increase in productivity during the period. Each student should be assigned to a specific mentor or leader that monitors and evaluates his work to ensure that the planned work is executed correctly as formulated in the problem statement.

Mentors or group leaders should be readily available to students for assistance and enquiries, while regular appointments (at least 3 times per week) is advised to formally monitor the following:

- i) Technical progress
- ii) Task progress against planned schedule
- iii) Recording- and documentation system
- iv) Planning and progression of formal documentation (report)
- v) Planning and preparation for delivery of report/paper if applicable

The evaluation-procedure should be discussed and clarified with the student beforehand and will typically contain the following elements:

- i) Formulation of problem statement and project aim
- ii) Project approach to analyse problems/requirements and develop solutions
- iii) Best practice research and expert knowledge revealed with problem solving
- v) Formulation and evaluation of proposed solutions
- vi) Preparation and method of presentation of technical/management reports
- vi) Method of presentating the findings and project report or paper

The preparation and presentation of the reports/papers to senior personnel is strongly advised.

## 6. Periods of Availability

Practical training or industry exposure will normally be done during the December/January university recess period, but considering plant closures, some companies might in consultation with students or bursary holders prefer to accommodate part of the training during the shorter June/July recess or even during April. The availability of students during these periods will depend on specific examinations and supplementary exam dates, but the majority should be available during the periods as indicated below:

### University Recess Periods for possible Practical Training (2013)

| Recess Period    | Date (from - to) | Duration (weeks) |
|------------------|------------------|------------------|
| April            | 21/03 - 01/04    | 1                |
| June/July        | 25/06 - 21/07    | 4                |
| December/January | 02/12 - 31/01    | 9                |

## 7. Proposed Remuneration

The remuneration of students during practical training depends on the policy of the specific company and possible other benefits provided during such practical exposure. Some compensation to cover at least the travel and subsistence costs of students is strongly advised. Experience indicates that reasonable remuneration for employment during such a limited period ensures engineering students to be positively engaged and motivated. Industry partners committed financially are typically also better organised to allocate mentors and define and scope meaningful projects with clear benefit to the company to ensure a return on investment of the direct costs. For the same reason, several companies opt to pay higher rates to attract top students and to ensure full commitment.

The following hourly rates are provided as a rough guideline for the remuneration of industrial engineering students during periods of practical training engagements:

### Guideline Hourly Rates for Temporary Employment of Industrial Engineering Students during Practical Training (2013)

| Year of Study Completed | Hourly Rate (R/hour) |
|-------------------------|----------------------|
| 1                       | R44.25               |
| 2                       | R44.25               |
| 3                       | R57.15               |
| 4                       | R64.65               |

The above rates are in line with current remuneration (2013) of temporary employment of students by the University of Pretoria and approximate the same at some large listed companies.