



THE HONG KONG
POLYTECHNIC UNIVERSITY
Industrial Centre

Manufacturing Project
Training Module Document

2001

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1. INTRODUCTION

- 1.1 Manufacturing and development projects of an increasingly high technology kind form an important and integral part in the working lives of all engineers at various stages in their careers.
- 1.2 The handling of such projects usually include different stages such as design, planning, costing, manufacture and assembling of components, testing, documentation, and final evaluation. A good engineer, particularly in the role of a project leader, must therefore have a sound appreciation of all of these elements.
- 1.3 All project works, whether done individually or in groups, will certainly involve other people. Thus, it will develop trainees' ability to co-operate, participate and discuss with others. In doing this, they will learn how to exercise tact and diplomacy. Abilities such as these become essential in the 'real world' when performing their 'professional activities'.
- 1.4 Manufacturing project work in the Industrial Centre is intended to emphasize, and give experience in, all of these project stages. The projects are so structured that participants can bring their previous practical and technical knowledge and experience together into one coherent activity. Also it also gives them a chance to work together as a team, and have the opportunity (when appointed as Group Leader) to exercise their managerial and decision making abilities.

Further more, the final analysis and presentation of such manufacturing project works will give trainees some confidence and competence to undertake industrial type work of the level their will operate at in the future.

2. GENERAL OBJECTIVES

- 2.1 The manufacturing project is designed specifically for you as an engineering student and it is based on the assumption that you have already successfully completed the designated training programme.
- 2.2 It is intended that through the undertaking of a project, you will:
- a. effectively apply your engineering knowledge and previous industrial training experience in carrying out the engineering design and drawing work using modern computer aids; the planning, costing, manufacture and quality control; and the final assembly, inspection, testing and evaluation of a product;
 - b. gain experience in project organisation and planning, engineering analysis and decision making, control and progress monitoring and finally logical presentation of results; and
 - c. gain experience of working as a member of a team, and a chance to develop personal and professional qualities such as leadership, communication skill and co-ordination ability; a co-operative attitude, as well as enthusiasm for and readiness to accept technical responsibility.
- 2.3 To achieve the objectives project groups will be formed having normally six team members in each group. The projects are all individual in nature and carefully chosen to require all team members to be involved in the various stages and aspects of the work throughout the six-week project period.
- 2.4 You will experience the pressure related to industrial work and the sense of accomplishment of achievement when successful in a manner similar to that normally found in industrial undertakings. This will require that you are not confined by any 'standard' length of working day or working hours, and if the progress is unsatisfactory, then you will have to work overtime in the evenings, or even on Sundays to achieve the planned target dates.

3. TRAINING MODULE CONTENT

3.1 The Manufacturing Project training module is formally presented in Training Module IC 1401 (Appendix 1). The projects are selected so as to ensure that the student team members are stretched intellectually and physically and the projects are such that they can, with sustained effort, be finished within the time allocated.

3.2 To implement the concept of the project having a definite engineering application, the projects are all of a 'real' work kind either to meet an existing demand or to meet an expected demand.

3.3 The project work is split into definite phases, brief descriptions of which are shown below:

a. Part A - Detailed Design, Drawing, Planning and Costing

Project teams are required to analyse the conceptual design, and from the given design and using CAD to finalise the design and prepare all required detailed drawings; analyse the design and prepare the type and order of manufacturing operations; prepare cost estimates; and prepare a flow chart for the manufacturing plan.

b. Part B - Manufacturing, Assembly, Testing and Evaluation

Teams will manufacture the parts required or working with IC technical supporting staff in the completion of the manufacturing stage, followed by the assembly and the testing of the product manufactured. Throughout the manufacturing stages and final assembly stage teams will be responsible for all QC activities. Teams should also evaluate the performance of the product, and make any necessary recommendations regarding the improvement of design, manufacturing methods, QC procedures, assembly, and testing of the product.

c. Part C - Documentation and Presentation

A final seminar will be held where the team members are required to explain to engineering staff their project and to present the results of their work, using suitable visual aids, diagrams, and charts. The documentation required includes a brief personal written report of the work undertaken during the project period as well as a more comprehensive group written report containing well presented drawings and technical descriptions of the work undertaken. The group report should also include

the relevant documents such as product specifications, operation manual, testing manual, and maintenance manual in the form typical for mechanical engineering products.

- 3.4 Project teams will be small in size and the supervising staff concerned will at the start of the project discuss with teams the general design and principles inherent in the project. This will be followed by the teams carrying out the work in accordance with Part A, B, and C above. The oral presentation session for all teams on their projects will be held on the last day of the manufacturing project scheduled dates.

Throughout the project, all technical decisions will normally be made by the project teams. Staff will act in a professional advisory guiding role only and they are not expected to give any directives as to a course of action other than where safety is concerned.

- 3.5 There will always be a certain amount of overlapping of the stages and decisions made at one stage may affect decisions made at an earlier or later stage. This is because one can never be really sure about how a project will develop. Both the supervising staff and team members should be prepared to alter decisions because of unforeseeable changes in circumstances occurring as the project develops.
- 3.6 For each separate project stage a leader is to be selected by the team from among the team members. The duty of a leader is to supervise the work of the team ensuring that the work progresses smoothly and scheduled dates are met. In cases of problems the leader is expected to take the necessary actions such as to hold meetings and discuss with his team members, and the staff concerned, the problems in order to find a solution. The leader is required to make a formal presentation as to progress to the supervising staff at the end of his period as leader. To ensure that each student gets supervisory and leadership experience, each member of the team will take a turn to be the leader.
- 3.7 A major value of this manufacturing project is that it is in all respects industrial with respect to the work, the environment, the pattern of attendance, and the procedures to be followed. During the project, team members are designated as IC Temporary Staff, an honorary title (ie no pay) implying the need for staff patterns of attendance and behaviour.

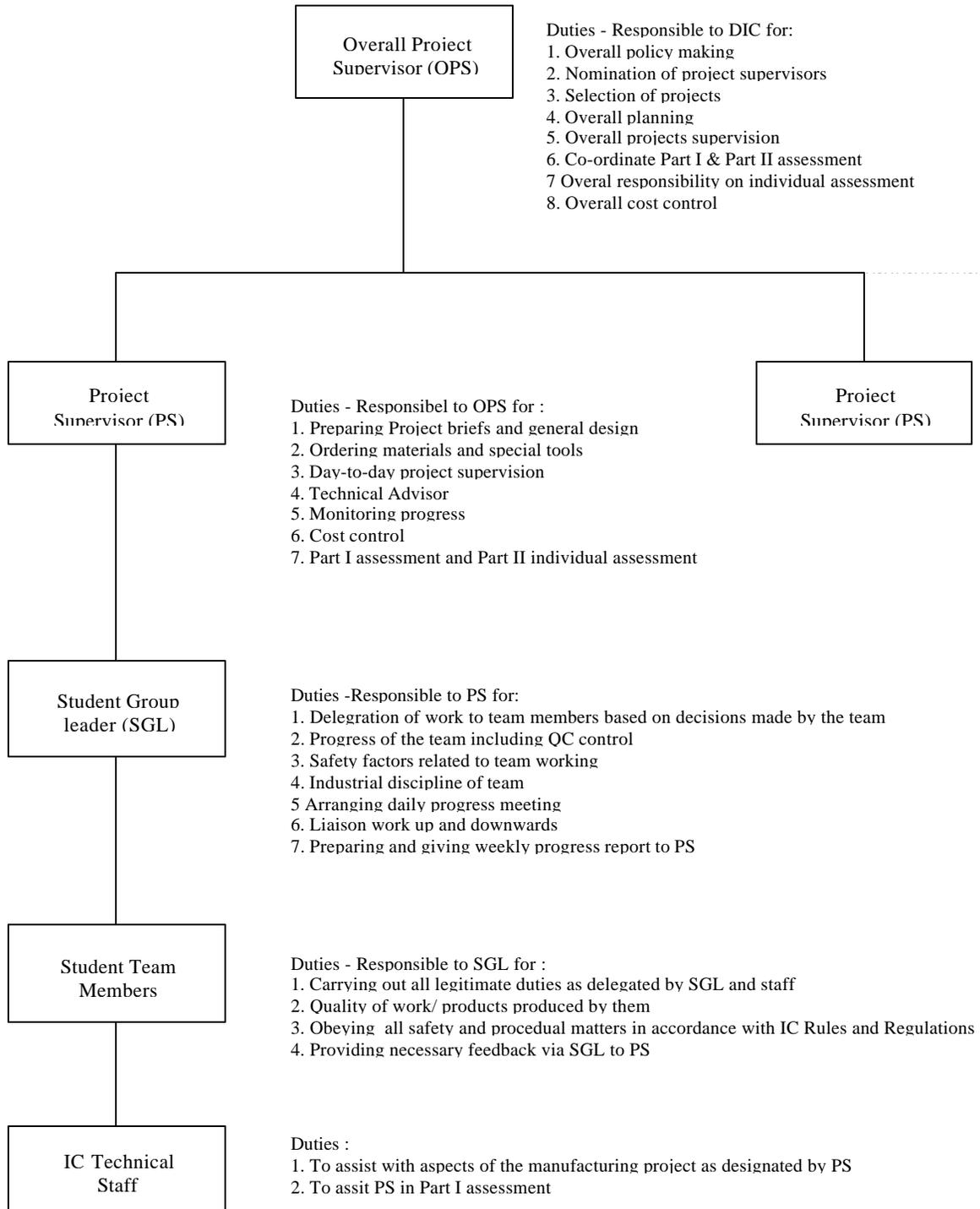
4. PROJECT TEAM ORGANIZATION

4.1 Grouping and Supervision of Students

The training programme is supervised by a Manufacturing Project Team whose main duty is to provide overall supervision of the student team members, give them general advice, technical guidance and where necessary instructions, to ensure that teams finish the projects safely and on time, and that team members have gained an appreciation of all the inter-related activities contained within the project programme.

In the Manufacturing Project Team there is an overall project supervisor ('Manager' level or above), together with several project supervisors ('Engineer' level or above) backed by other IC technical staff. As the project work will in general involve a variety of technical activities and at times require skilled expertise of a craft type in such activities as casting, welding, and precision machining; other expert IC staff can be called upon to give assistance to the Manufacturing Project Team on a sub-contracting basis.

4.2 Organisation Chart



5. ASSESSMENT

- 5.1 The assessment of this manufacturing project is for the most part a measure of each team member's individual technical, social, and managerial involvement. The assessment falls into two parts:

Part I is the assessment of each team member's technical performance from the start until the completion of the project, including leadership performance and the degree of effort made. This assessment is made by the Project Supervisors in conjunction with the Overall Project Supervisor and other staff involved. The Project Assessment Form is shown in Appendix 2-1.

Part II is the assessment of the oral presentation in terms of the team as well as for each team member; a final written team report; and an individual report from each team member covering the team member's actual involvement and activities over the period. The oral presentations - group and individual will be assessed by an IC staff team acting under the direction of the Overall Supervisor; the group written report will be assessed by the Overall Supervisor, and the individual written report will be assessed by the Project Supervisor. Appendix 2-2 shows the Project Presentation Assessment Form.

- 5.2 The Overall Assessment result is equal to:

$$\frac{\text{Part I assessment marks} + \text{Part II assessment marks}}{2}$$

In order to get a pass, each team member must obtain at least **50 marks** in each of Part I and in Part II.

The assessment mark will be given a weighting of 3 and it will then form part of the aggregate marks for all training modules from which the Overall Training Mark is derived.

The failure in any part of the assessment will automatically result in an Overall Manufacturing Project Failure, and the recommendations then made to the parent department by the IC will depend on which part was failed.

Code: IC 1401

Length: 3 units (6 weeks)

Module Title: MANUFACTURING PROJECT

INTRODUCTION

The main object of this module is to integrate all practical work that previous done by the students in the Industrial Centre. Student should be able to demonstrate his understanding in the cost implication of the product on any decision taken, the way to produce manufacturing drawings, production planning and control, operation of various manufacturing processes, the significance of choosing a particular kind of process, and the selection of materials and standard components.

Syllabus**Objectives**

- | | | |
|----|---|---|
| 1. | Analysis of the design from the general arrangement drawings and preparation of detailed drawings. | To provide students with experience in the use of CAD and engineering drawing technique in the analysis of the preliminary design and preparation of detailed drawings and specifications for issue to various manufacturing workshops. |
| 2. | Preparation of the required materials and tooling lists | To provide students with experience to extract from the drawings what materials and tooling that are required; and in making the associated approximate 'cost' estimate. |
| 3. | Preparation of operational charts giving the type and sequence of operations required for manufacture. | To provide students with experience in the design and planning of the operational sequence for manufacturing of the components. |
| 4. | Using bar charts or other planning tool to schedule for the entire project, from manufacture of components to final assembly. | To provide students with experience in the procedures that required to co-ordinate the manufacture in and through various workshops and processes. |
| 5. | Manufacture the components utilising the industrial type facilities in various workshops. | To enable students to advance and consolidate the experience gained in their previous training by producing a composite piece of equipment; and to provide students with an opportunity to learn by doing how all the components are planned and processed through various workshops in order to produce the complete article. |
| 6. | Fitting and assembling the component parts. Inspection and testing for delivery. | To provide students with understanding in the need for components to be produced in accordance with the required dimensional tolerance and specifications, and the care and attention when producing quality work. The student will also gain practical experience in assembling, testing, evaluating and preparing the article for despatch. |

THE HONG KONG POLYTECHNIC UNIVERSITY
INDUSTRIAL CENTRE

MANUFACTURING PROJECT ASSESSMENT FORM

Part I - PROJECT PERFORMANCE				Part II – REPORT			
		Max Marks	Marks Awarded	<i>Written Report</i>		Max Marks	Marks Awarded
Individual	Technical Competence	20		Individual	Technical Content	10	
	Professional Attitude	15			Discussion	10	
	Leadership Ability	10			Comment	5	
	Workmanship	5			Presentation	5	
	Involvement	5			Diagrams/Drawings	5	
	Initiative	5		Group	Layout and Integrity	5	
Group	Planning and Control	10			Continuity	5	
	Project Functionality	10			Overall Presentation	5	
	Project completeness	10		<i>Oral Presentation</i>			
	Cooperation	10		Individual	Refer to Project Presentation Assessment Form	35	
				Group		15	
Part I Marks		100		Part II Marks		100	

Remark:	

Student: _____

Marked by: _____

Class: _____

Signed: _____

Project: _____

Date: _____

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MANUFACTURING PROJECT PRESENTATION ASSESSMENT FORM

Project No: _____

Course: _____

Project Title: _____

Student Name	Items to be Assessed	Max Marks	Marks Awarded
	Technical Content Communication Ability Use and standard of Audio Visual Aids Appearance and Bearing	15 10 5 5	
	Technical Content Communication Ability Use and standard of Audio Visual Aids Appearance and Bearing	15 10 5 5	
	Technical Content Communication Ability Use and standard of Audio Visual Aids Appearance and Bearing	15 10 5 5	
	Technical Content Communication Ability Use and standard of Audio Visual Aids Appearance and Bearing	15 10 5 5	
	Technical Content Communication Ability Use and standard of Audio Visual Aids Appearance and Bearing	15 10 5 5	
	Technical Content Communication Ability Use and standard of Audio Visual Aids Appearance and Bearing	15 10 5 5	
	Technical Content Communication Ability Use and standard of Audio Visual Aids Appearance and Bearing	15 10 5 5	
	Technical Content Communication Ability Use and standard of Audio Visual Aids Appearance and Bearing	15 10 5 5	
Group Presentation	Was the presentation logically and clearly presented?	8	
	Was the responsibility of the individual team members well balanced?	7	

Marked By: _____

Date: _____

Signed: _____