

CONTINUING EDUCATION NEEDS OF WORKING MECHANICAL DIPLOMA ENGINEERS WITH REFERENCE TO ELECTRONICS AND COMPUTER APPLICATIONS

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SYNOPSIS

This study conducted to determine continuing education needs of working diploma engineers in mechanical engineering with specific reference to Electronics and Computer applications at work places. The study has revealed useful information from industry and working diploma holders for bridging the gap and making such diploma holders more useful to the industry.

1. INTRODUCTION :

Over the years, engineering industries in the country have registered a phenomenal growth to generate a strong base in a wide range of heavy and light engineering industries covering a broad spectrum of capital goods and consumer durable products. The machine tool industry which manufactures mother machines for use in engineering industry is the backbone of the entire industrial engineering sector. During the last three and half decades, the machine tool industry has achieved an impressive growth and established a sound base for the manufacture and supply of machine tools to the engineering and other industries. Some of the major manufacturers have now developed CNC machines, machine tools such as machining cen-

tres, milling machines, turning machines etc. with their know-how, by sustained R &D efforts.

In spite of allround industrial development during past four and a half decades, we have host of serious problems. In a study conducted by Mittal and Sainy (1991), majority of Indian industries are facing host of problems arising out of obsolescence of existing technologies in terms of equipment, processes and materials; inadequate research and development efforts; low productivity; poor quality and high price range of products; absence of favourable work ethos.

According to Bijlani (1991) "our share in the world trade has steadily eroded and we have seen our Asian neighbours overtaking us. Today, we do

not account for even 0.4% of the world trade".

Economic compulsions have now awakened us and it is expected that new industrial policy will bring the Indian Economy back on the rails for opening up new growth opportunities.

The competency profile of future technical manpower will have to be correspondingly enhanced by incorporating changes in the technical education system at all levels. The existing technical manpower will also need extensive reorientation to meet these requirements.

A review of mechanical engineering curriculum offered in the states of northern region reveals that before 1990, there were hardly any courses providing basic knowledge in electronics and computer application. This implies that there is huge stock of working diploma holders who need enhancement of knowledge and skills in the above areas. No systematic effort has been made to determine the continuing education needs of such personnel with specific reference to electronic and computer applications. Hence this study.

2. OBJECTIVES OF THE STUDY :

In the light of above, the objectives of this study were :

- (a) to assess the continuing education needs of mechanical engineering technician engineers in large and medium manufacturing industry with specific reference to electronics and computer applications,
- (b) to analyze identified needs in terms of knowledge, skills to be imparted to develop the desired competen-

cies in the working technician engineers,

- (c) to derive curriculum areas and the detailed contents in order to bridge the gap, and
- (d) to work out possible strategy for enhanced knowledge and skills of such personnel.

3. RESEARCH METHODOLOGY

3.1. Research Design :

Survey research design has been used collecting information from industrial executives and working technician engineers from manufacturing industries. After obtaining necessary data, regarding continuing education needs of competencies desired in terms of knowledge and skills to be developed for bridging the gap have been identified. This formed the basis of arriving curriculum areas and further deciding about the contents for each curriculum area.

3.2 Sample :

40 industries in and around Chandigarh (16 large and 24 medium scale) were randomly selected for mailing the questionnaire and obtaining written responses. Further, out of these 40 industries, 4 large scale and 8 medium scale were randomly selected for holding interviews with industrial executives and working technician engineers. In total, 24 industrial executives (2 each from large and medium scale industries) and 80 technicians (12 from large and 4 from medium industries) were interviewed.

3.3 Data Analysis :

Statistical analysis was carried out

by calculating percentage responses for various categories of information obtained through questionnaire and interviews with industrial executives and working technicians.

4. FINDINGS :

4.1 The Activities Where Technician Engineers Need the Knowledge and Skills in Electronics and Computer applications.

Table below shows activities for which industry perceives that knowledge and skills of electronic and computer applications are required :

Sr. No.	Activities	Percentage Responses
1.	Reading and interpreting Schematic diagrams, logic diagrams, electronic circuit diagrams and wiring diagrams	65
2.	Making use of testing and measuring electronics devices and equipment like : (a) Resistances, Inductances, Capacitor, Diode, Zener Diode, Transistors like PNP, NPN Uni- junction, Field Effect. Triac, Diac, Silicon Controlled Rectifier, Integrated Circuits, Printed Circuit Board. (b) Multimeters, Digital Multimeter, D.C. Regulator Power Supply, Pulse Generator, Cathode Ray Oscilloscope (Single beam/Double beam), Soldering Station, Inductance, Capacitance and Resistance (RLC) measuring Bridge.	50
3.	Making use of computers for information processing	85
4.	Undertaking computer programming	52
5.	Guiding workers in the use-programming of CNC machines	85
6.	Making use Programmable systems like : microprocessor, micro computer and PLC	62
7.	Making use of auto CAD	71
8.	Installation of Control Panels	38
9.	Trouble shooting of electronics devices and system	40

4.2 Competency Profile :

Industrial executive and working technician engineers have identified following competency profile for upgrading knowledge and skill of diploma holders in mechanical engineering :

- (1) Development of basic knowledge and associated skills regarding Semi-conductor devices like : diodes, transistors, thyristors etc. for understanding working principles and applications of various electronic circuits and systems.
- (2) Development of basic knowledge and related skill regarding transducers, non-linear and linear circuits, analog test and measuring equipment and other circuits techniques for the operation of analog electronic equipment.
- (3) Development of basic knowledge and associated skills regarding number system, logic families logic, gates, combinational and sequential digital circuits, Boolean algebra, digital codes and TTL and CMOS devices and digital conditioning for understanding working principles and application of digital systems.
- (4) Development of basic knowledge and associated skills regarding microcomputer organisation, microprocessor architecture, memory and memory organisation, assembly language programming, input and output operations and I/O devices; interfacing the microprocessor with memory, I/O devices and ADC/DAC devices for proper understanding and programming of computerised machines and other

equipment having microprocessors.

- (5) Development of competencies in making use of computers for various applications like information storage and retrieval, business calculations and computations, word processing, pictorial data handling.
- (6) Development of simple programming skills to handle programmable machines and solve mechanical engineering problems in different functional areas.
- (7) Development of competencies in handling CNC machines to perform various cutting, drilling and milling operations and using robots for material handling in automation environment.

4.3 Identification of subjects for Bridging the Gap :

Based on above competency profiles following courses have been identified :

- i) Basic applied electronics
- ii) Analog electronic instrumentation
- iii) Digital electronic instrumentation
- iv) Microprocessors
- v) Computer and computer applications
- vi) Introduction to computer languages
- vii) CNC machines and robotics

It is beyond the scope of this paper to provide detailed contents for each of above curriculum areas.

4.4 Time Required for Bridging the Gap :

Keeping in view the feedback re-

ceived from industry, majority of the respondents (60%) have indicated their willingness of taking advantage from such a course, provided the courses are conducted on part-time basis. The total time for bridging the gap works out to be four hundred and eighty (480) hours of instruction. Therefore, the study and evaluation scheme has been planned on the basis of 15 hours per week of instruction, that is, at the rate of 3 hours per day for five days a week, spread over two semesters.

5. CONCLUSIONS :

Keeping in view the importance and urgency of upgrading knowledge and skills of working diploma holders with specific reference to Electronics and Computer applications, it is proposed that selected institutions, particularly situated in industrial belts should offer a post diploma course in Mechatronics and Industrial Automation on part time basis at the rate of 3 hours per day for five days a week, spread over two semesters.

6. REFERENCES :

1. Bijlani, SK (1991) : Implication of New Industrial Policy on Manpower Development in Industry. Newsletter TTTI,
2. George, P. J. (1993) : Continuing Engineering Education Concepts and Practices. Teh. Indian Journal of Technical Education, New Delhi.
3. Mittal, LN (1992) : Interactive networking for Polytechnic Industry interface - a system's design; Phd. Thesis, BITS Pilani.
4. Malhotra, et al (1993) : Determining the Manpower Spectrum of Technician engineers in Public / Private Sector Industry, TTTI, Chandigarh.
5. Mittal, LN & Saini, JS (1991) : Technicians in Industry - A research study. Journal of Engineering Education, Vol. IV, No. 4, Pune.
6. Raina, KB and Gahlot, PS (1991) : Continuing Education - paper read in ISTE convention, Madras.
7. Towards Excellence in Polytechnic Education (1993) - perspective for the year 2000 and beyond submitted to the planning commission.

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