

Dated: 11<sup>th</sup> April, 2012

To,

**Sub: Response to Mechanical Engineering diploma programme questionnaire.**

Dear friend,

Gujarat Technological University is re-designing the curricula of its diploma engineering programmes to match with the needs of the industries. For this purpose, we have collaborated with National Institute of Technical Teachers' Training and Research Bhopal (NITTTR Bhopal) who have the expertise in developing the curricula for technical educational programmes at national level.

It has been decided by NITTTR Bhopal and GTU to design the curricula on the outcome/competency-based approach so that pass outs are not only theoretically knowledgeable, but are also able to perform well in the industry at the time of joining the industry from the polytechnic system. Once this curriculum is developed it would guide efforts of teachers and students to achieve the identified competencies.

For development of such a scientific curriculum, identification of the competencies to meet the requirements of the industry is the first step.

For the project, this questionnaire is jointly developed by GTU and NITTTR , which is designed to identify the entry-level competencies expected of Mechanical engineering diploma holders required to perform their jobs independently in an industry to avoid the present long-term training given to freshly recruited engineering diploma holders.

We would be thankful if the person, who is actually taking work from the Mechanical Engineering Diploma pass outs, responds to this questionnaire. Your response is voluntary and would be used only for academic purposes and would not be shared with any other agency. Only the collated responses of all the industries would be used for decision making.

Thank you very much for your valuable responses.

Yours sincerely,

Dr. Akshai Aggarwal

**Curriculum Development Project**  
**Identification of Competencies Required of**  
**Mechanical Engineering Diploma Holders**

**Terms of Reference for this Project**

‘**Competency**’ is what you expect a fresh engineering diploma holder to do at the entry level, i.e. *‘a statement which describes the integrated demonstration of a cluster of related skills and attitudes that are observable and measurable necessary to perform a **job** independently at the workplace, at a prescribed proficiency level’.*

While a ‘**job**’ is that which you will call upon your engineering diploma holder to do i.e. *‘a complete activity having a definite beginning point and an ending point, which can be performed over a short period of time independent of other works resulting in a product, service or decision’.*

The ‘**prescribed proficiency level**’ is the ‘*threshold level*’ at the end of three years of study at the polytechnic.

With these *terms of reference* in the background, your opinion of the competencies concerning a **fresh** engineering diploma passouts are listed here. Against each, you are required to **state your opinion** by ticking (✓) in the most appropriate box in the enclosed **one sheet** questionnaire.

1.Name of the Industry.....  
 2. Main Products.....  
 3.Address of the industry .....  
 .....  
 .....

4.Approximate number of engineering diploma holders employed in your industry:  
 a) Mechanical Engineering Diploma Holders .....Nos.

**Table – 1**

Preferably this questionnaire needs to be filled up by **those who take work from Mechanical engineering diploma holders**

**Use =Detail knowledge ( concept, working principle/laws, controls, operative parameters, classification, construction, features ,specifications, safety precautions, maintenance, calibration, performance characteristics, inputs, defects identification, ) of equipments, machineries and processes along with tools and materials.**

SR.NO.	TECHNICAL COMPETENCIES <ul style="list-style-type: none"> <li>▪ <i>Essential</i> means it is core competency and used frequently</li> <li>▪ <i>Not applicable</i> means not required in your industry at all.</li> </ul>	<i>Essential</i>	<i>Desirable</i>	<i>Rarely used</i>	<i>Not applicable</i>
T1	Prepare engineering drawings using codes, norms and standards manually as well as through CAD software.(2D)				
T2	Prepare simple jobs correctly according to given specification using various tools, measuring instruments and machines for different operations in fitting, smithy, carpentry, pipefitting and metal joining shop.				
T3	Use various measuring (linear, area, volume, angular, gear, thread, roughness, straightness, squareness, flatness, roundness, pressure, temperature, flow, etc) and gauging instruments-Analog and digital based.				
T4	Use coordinate Measuring Machines (CMM).				
T5	Use destructive and nondestructive testing methods.				
T6	Use foundry materials and simple equipments to cast ferrous and non ferrous materials using material technology and strength of material.				
T7	Use arc, gas and spot welding and cutting processes to prepare simple jobs.				
T8	Use SAW,TIG, MIG,CO <sub>2</sub> ,LASER,PLASMA, Water Jet, and other advance welding and cutting processes to prepare simple jobs.				
T9	Use hot and cold working equipments for rolling and forging processes to produce parts using material technology and strength of material.				

SR.NO.	<b>TECHNICAL COMPETENCIES</b> <ul style="list-style-type: none"> <li>▪ <i>Essential</i> means it is core competency and used frequently</li> <li>▪ <i>Not applicable</i> means not required in your industry at all.</li> </ul>	<i>Essential</i>	<i>Desirable</i>	<i>Rarely used</i>	<i>Not applicable</i>
T10	Use conventional machine tools. (lathe, Milling, Shaper, Drilling, Slotting, Planning, Capstans and Turrets, Automates, Grinding, Broaching, Jig boring, Gear hobbing, Gear shaping, Special Purpose Machine tools, etc.)				
T11	Prepare CNC part programme, simulate them and use Computerized Numerical Control (CNC) machines to make simple jobs.				
T12	Use presses and press tools.				
T13	Use Nonconventional machine tools. (ECM, EDM,USM ,ECG, PLASMA, LASER, AJM, etc)				
T14	Use heat treatment processes.				
T15	Use surface coating and protection methods.				
T16	Use conventional machine tools. (lathe, Milling, Shaper, Drilling, Slotting, Planning, Capstans and Turrets, Automates, Grinding, Broaching, Jig boring, Gear hobbing, Gear shaping, Special Purpose Machine tools, etc.)				
T17	Use presses and press tools.				
T18	Use Nonconventional machine tools. (ECM, EDM,USM, ECG,PLASMA, LASER, AJM, etc)				
T19	Use software like AutoCAD, Pro/E, SolidEdge, etc to prepare and analyze solid models.				
T20	Apply concepts of Group Technology, Just in Time, Robotics, Networking, Industrial Engineering and Concurrent engineering to develop advance manufacturing systems (Like Cellular manufacturing, Flexible manufacturing system, Computer Integrated manufacturing,etc).				
T21	Integrate use of Data Base Management Systems / ERP (software based) for planning/scheduling, monitoring and controlling of resources.(mainly material, man, money and machines.)				
T22	Use electrical and electronic elements/systems to actuate mechanical mechanism.				
T23	Use boilers, steam turbines, air compressors, IC engines, refrigeration and HVAC systems/equipments.				
T24	Use power plant equipments (high pressure boilers, Turbines-gas, steam, water, nuclear power plant equipments, etc) related systems and controls.				
T25	Use various instruments to measure heat/air related parameters.				
T26	Use energy conservation and saving methods.				

SR.NO.	TECHNICAL COMPETENCIES <ul style="list-style-type: none"> <li>▪ <i>Essential</i> means it is core competency and used frequently</li> <li>▪ <i>Not applicable</i> means not required in your industry at all.</li> </ul>	<i>Essential</i>	<i>Desirable</i>	<i>Rarely used</i>	<i>Not applicable</i>
T27	Use hydraulic equipments comprising of hydraulic elements(pumps, motors, valves, cylinders, etc).				
T28	Use pneumatic equipments comprising of pneumatic elements (pumps, motors, valves, cylinders, etc).				
T29	Design, select elements and assemble/dismantle simple hydraulic and pneumatic systems.				
T30	Assemble, dismantle and align mechanisms in sequential order.				
T31	Carry out plant maintenance using tribology, corrosion, preventive maintenance, safety, reconditioning, retrofitting, installation and commissioning, etc.				
T32	Design and modify simple machine elements like links/link mechanisms, fasteners, knuckle joint, cotter joint, riveted joints, levers, etc.				
T33	Design and modify simple machine elements like shafts, springs, thick/thin cylinders, etc.				
T34	Use antifriction bearings.				
T35	Design and modify machine elements like gears, clutches, brakes, connecting rod using C++.				
T36	Use cutting tools for machines and machine tools.				
T37	Design and prepare simple jigs, fixtures, pattern, mould and press tools for production purposes.				
T38	Dismantle and assemble various automotive systems.				
T39	Identify and rectify simple and common troubles in automotive vehicles.				
T40	Estimation and costing of production cost for budgeting and analysis.				
T41	Use cost reduction techniques.				
T42	Prepare contract for purchase and sales.				
T43	Prepare process plan for given part.				
T44	Carry out work measurement and method study to improve productivity.				
T45	Select and use quality assurance (Quality control, SQC, Acceptance sampling, TQM,TQC,ISO standards, etc) techniques.				
T 46	Use industrial engineering concepts to improve productivity and quality.(JIT, Reengineering, Value engineering, QFD,etc)				
T47	Use entrepreneurship abilities to start any venture successfully.				
T48	Plan, use and control resources optimally and economically.(Man,Machine,Material,Method, Money,Moment,Messege-information)				
T49	Interpret factory acts and laws, relevant social laws.				

SR.NO.	TECHNICAL COMPETENCIES <ul style="list-style-type: none"> <li>▪ <i>Essential</i> means it is core competency and used frequently</li> <li>▪ <i>Not applicable</i> means not required in your industry at all.</li> </ul>	<i>Essential</i>	<i>Desirable</i>	<i>Rarely used</i>	<i>Not applicable</i>
T50	Generate the questions related to Productivity, Quality, Cost reduction, Safety, Ecology, Innovation and humanity for the process/product for the purpose of further improvement.				
T51	Use innovative and creative approaches and skills for defining and improving/solving industry/institute/ real life problems.				
T52	Use concepts of operations management to improve/optimize performance (linear programming, transportation techniques, assignment techniques, replacement theories, sequencing problems, inventory management, synchronous manufacturing, waste management, cost control, etc.)				
T53					
T54					
T54					
T55					
T56					
T57					
T58					

**Table – 2**

Some generic *competencies* required by a diploma holder from any branch of engineering are also listed below. Kindly rate them by placing a tick in the appropriate column.

	GENERIC COMPETENCIES <ul style="list-style-type: none"> <li>▪ <i>Essential</i> means it is core competency and used frequently</li> <li>▪ <i>Not applicable</i> means not required in your industry at all.</li> </ul>	<i>Essential</i>	<i>Desirable</i>	<i>Rarely used</i>	<i>Not applicable</i>
G1	Identify the problem and apply innovative, creative and logical approach for problem solving.				
G2	Develop the life long learning attitude.				
G3	Use techniques to deal effectively with people in the direction of organizational goals.				
G4	Maintain values, positive attitude and interpersonal relations.				
G5	Communicate effectively orally and in writing.				
G6	Express views precisely, effectively and positively.				
G7	Able to develop guidance & negotiation skills				
G8	Able to manage time for a given work –				
G9	Able to work under constraints				
G10	Able to develop conflict resolution skills.				
G11	Able to exert high levels of effort.				
G12	Able to develop qualities of Emotional Intelligence -				
G13	Able to use the skills of giving and receiving Feedback for improving performance				
G14	Encourage the subordinates to ask the questions.				

<b>GENERIC COMPETENCIES</b>		<i>Essential</i>	<i>Desirable</i>	<i>Rarely used</i>	<i>Not applicable</i>
	<ul style="list-style-type: none"> <li>▪ <i>Essential</i> means it is core competency and used frequently</li> <li>▪ <i>Not applicable</i> means not required in your industry at all.</li> </ul>				
	Any other (Please specify)				
G15					
G16					
G17					
G18					
G19					

**State the job functions of engineering diploma holders in the initial five years after joining your organization from the polytechnic**

- |        |         |
|--------|---------|
| 1..... | 7.....  |
| 2..... | 8.....  |
| 3..... | 9.....  |
| 4..... | 10..... |
| 5..... | 11..... |
| 6..... | 12..... |

**Table – 3**

List the major Mechanical engineering equipment used in your industry

S. No.	Name of the equipment/Instrument	Broad type/rating/specifications
1		
2		
3		
4		
5		
6		
7		

**Table - 4**

State the career growth opportunity for an average engineering diploma holder

<b>Designation</b>	<i>Example:</i> Junior Engineer (or Technician)					
<b>Years of Experience required to reach the position</b>	at Entry Level	After 3 years	After 6 years	After 10 years	After 15 years	After 20 years

Do you think that industrial training must be provided to the students as an integral part of the curriculum? Yes / No.

a) If yes, for how many months? One/ Two/ Three/ Six  
Months.....

b) If yes, in which semester/s the industrial practical training need to be included?

Signature:.....

Name & Designation of person responding:.....

Phone:

Mobile

Email:

Thank you very much for your valuable responses.

Dr. Akshai Aggarwal  
Vice Chancellor  
Gujarat Technological University