



Paper Type: Research Paper



New Course in Industrial Engineering Education Curriculum

Prabhakar Deshpande\*

Sant Ramdas Road, Mulund East, Mumbai 400081 India; prabdesh@gmail.com.

Citation:



Deshpande, P. (2023). New course in industrial engineering education curriculum. *International journal of research in industrial engineering*, 12(1), 1-6.

Received: 16/11/2022

Reviewed: 12/12/2022

Revised: 23/12/2022

Accepted: 22/01/2023

Abstract

Industrial engineering degree curriculum has many courses, supply chain management, production planning and so on. However there is need to introduce new course in industrial engineering degree curriculum, creative industrial engineering. This course will apply industrial engineering in a creative way. At the end of day, industrial engineering is about optimisation and optimisation can be done in a creative way. Such an Industrial Engineering is also Down to Earth. Such an Industrial Engineering is creative. In that it generates ideas that have not been thought before. Creativity is defined as generating something new and original. This course will be designed by industrial engineering teachers who have taken extensive and intensive training in creative thinking, design thinking, lateral thinking etc. They will apply the principles learnt in creative thinking, design thinking and lateral thinking to the problems of industrial engineering.

**Keywords:** Industrial engineering, Creativity, Education.

1 | Introduction

Licensee  
International Journal of Research in Industrial Engineering. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0>).

The author has submitted several papers to sister journal of this publication - Industrial Engineering. However since this paper, which related to Industrial Engineering is related to Education, hence is being submitted to Education Journal.

In the papers submitted to Industrial Engineering journal, the author has suggested a Revolution in Industrial Engineering. The author has suggested that Industrial Engineering has to become more down to earth and commonsensical.

Author has also suggested that Industrial Engineering has to be viewed as a mindset - a way of thinking - instead of as a methodology - set of methods. Author has also suggested that Industrial Engineering has to become more creative with elements of lateral thinking, divergent thinking, brainstorming, right brain thinking, out of box thinking and so on.

This paper taking off from the papers submitted to Industrial engineering journal would like to introduce a new course in Industrial Engineering education curriculum.

## 2 | What is Industrial Engineering?

Here is definition of engineering. Engineering is application of science and mathematical models to the innovation, design, construction and maintenance of structures, machines, materials, devices, systems, processes and organisations. And here is definition of industrial engineering.

Industrial engineering is optimisation of complex processes, systems and organisations by developing, improving and implementing systems of people, money, knowledge, information and equipment [1]-[7].

Basically, industrial engineering seems to be some sort of specialisation in engineering with focus on optimisation. And optimisation means making best use of something.

Industrial engineering is thus a set of mathematical and scientific methods geared for optimisation through improving and implementing money, machine and material [8]-[15].

In most industrial engineering education curriculum, apart from general courses there are various subjects such as:

- I. Work system design.
- II. Quality engineering and management.
- III. Supply chain management.
- IV. Facilities and layout planning.
- V. Procurement and materials management.
- VI. Operations research.
- VII. Human factor engineering.
- VIII. Project management.

## 3 | Creative Industrial Engineering

However there is need to introduce a new course in industrial engineering curriculum. It will be called creative industrial engineering. This course will apply industrial engineering in a creative way. After all let us go back to that definition of industrial engineering. At the end of day, industrial engineering is about optimisation. And optimisation can be done in a creative way. After all the easiest example one can think of for optimisation in a common sense way is Traffic Jam Solution. Obviously if you replace cars by buses then 90% of traffic space will be reduce. That is common sense industrial engineering.

Such an Industrial Engineering is also Down to Earth. Meaning this branch of industrial engineering applies itself to situations for common people and not necessarily multinational technological corporates. These could be issues of reducing congestion in crowded trains in Mumbai by say reducing number of seats and thus increasing standing space.

Such an industrial engineering is creative. In that it generates ideas that have not been thought before. Creativity is defined as generating something new and original. Such an industrial engineering also operates through divergent thinking. This means generating as many ideas as possible in free thinking way rather than conditioned way.

Again this sort of industrial engineering steps down from Ivory Tower of Academic World and applies itself to ordinary situation in an ordinary way. Again this sort of industrial engineering steps out of comfort zone of factory, office and retain and applies itself to ordinary situations.

## 4 | National Institute of Training in Industrial Engineering

Let us discuss the above idea in a greater detail. While other nations have engineering colleges, medical colleges, management colleges. India has an entire college devoted to industrial engineering. It is called National Institute of Training in Industrial Engineering (NITIE).

As is obvious from the name the institute is dedicated and devoted to education and research and development in area of Industrial Engineering. The institute takes students at post graduate level and has three major programs:

- I. Post Graduate Diploma in Industrial Management (PGDIM).
- II. Post Graduate Diploma in Systems Management (PGDSM) and finally the diploma program in industrial engineering.
- III. Post Graduate Diploma in Industrial Engineering (PGDIE).

The post graduate diploma in industrial engineering course has four components:

- *Institute core.*
- *Program core.*
- *Program electives.*
- *Institute electives.*

Institute core consist of following courses:

- I. Industrial engineering and productivity management.
- II. Operations management.
- III. Managerial economics.
- IV. Marketing management.
- V. Business communication.
- VI. Quantitative techniques.
- VII. Managerial accounting.
- VIII. Organisation behaviour.
- IX. Information systems and artificial intelligence.
- X. Technology and innovation management.
- XI. Sustainable development for business.
- XII. Legal and ethical aspect for business.

The program electives have following courses in various modules such as:

1. Industrial engineering and manufacturing systems module which has following courses:

- *Manufacturing planning and control.*
- *Computer integrated manufacturing.*
- *Flexible manufacturing systems.*
- *Fuzzy logic industrial engineering.*
- *Global and collaborative manufacturing.*
- *Lean manufacturing.*
- *Maintenance management.*
- *Manufacturing strategy.*
- *Manufacturing system design.*
- *Manufacturing system and service.*
- *Additive manufacturing.*
- *Ergonomics assessment tools.*

- *Ergonomics in manufacturing.*
- *Simulation modeling and analysis.*
- *Systems modeling.*
- *Intelligent optimization.*
- *Reliability engineering.*

Other modules are:

- *Operations and supply chain management.*
- *Decisions science and information system.*
- *Engineering technology and project management.*

Each of these modules has several courses; but it is not within scope of this paper to discuss them. Apart from this there are institute electives. The program also has considerable project work and research component to it. One intends to introduce another core course in Institute core course. This course will be called creative industrial engineering.

## 5 | Detailed Look at Creative Industrial Engineering

This program will have several components follow as:

### **Out of box thinking**

Thinking out of box means to think differently, from a new perspective and unconventionally. Industrial engineering should adopt creative thinking approach and step out of the box, or the edges to be able to think differently. Usually humans are trained within what they assume to be constraints and boundaries. However it is possible that a more optimum solution to a problem exists outside the boundaries.

Einstein said that "insanity means doing same thing over and over again expecting different results". That is starting point of out of box thinking. Instead of doing same thing why not step outside the familiar and view the problem in different light. Industrial engineering must adopt out of box thinking.

### **Lateral thinking**

Linear thinking means thinking where designers approach the problem by using reasoning that is disruptive and not immediately obvious. Lateral thinking is also called horizontal thinking. Most problems are approach through Linear thinking also called vertical thinking through mathematical and analytical and scientific and structured step by step approach.

Industrial engineering as it exists today operates from linear thinking or vertical thinking, which is mathematical, scientific and analytical. Industrial engineering has to think in a lateral fashion in a way that is creative, innovative and disruptive, which is also described as horizontal thinking.

### **Right brain thinking**

There is a thought process that believes that Right Brain is creative, intuitive, artistic, imaginative, musical and emotional. Whereas left brain is logical, analytical, mathematical, verbal, sequential and factual. This comes from work of Roger Sperry who was awarded Nobel Prize.

Now conventional Industrial Engineering it should be obvious operates out of Left Brain, in that it is full of logical attitudes and mathematical procedures. However Industrial Engineering must start to be more right brained and have intuitive, imaginative, artistic component to it.

### **Divergent thinking**

Divergent thinking is a method used to generate creative ideas by exploring many solutions. It occurs in a free flowing, spontaneous and non linear manner. Convergent thinking occurs where there is single solution arrived at by established procedure.

Industrial engineering as it stands today operates out of convergent thinking. There is need to explore if industrial engineering can operate out of divergent thinking by generating many possible solutions.

### **Creative thinking**

Creative thinking is intentionally generating new ideas from existing information. Creative thinking involves thinking in a different way and examining information from different points of view. Industrial engineering needs to explore creative thinking for it to become more effective and applicable to wider variety of situations.

Thus industrial engineering needs to explore divergent thinking, out of box thinking, creative thinking, lateral thinking and right brain thinking for it to become more effective and comprehensive.

### **Brain storming industrial engineering**

Brain storming is a group creativity technique by which efforts are made to find conclusion to a problem by gathering a list of ideas spontaneously contributed to by members. Brainstorming is a situation where a group of people meet to generate ideas and solution around a specific domain by removing inhibitions. People are allowed to think freely and suggest as many new ideas as possible. These ideas are noted without criticism and after brain storming ideas are evaluated.

## **6 | Examples of Creative Industrial Engineering**

Let us examine some instances of Creative industrial engineering. Take the case of Crowded Trains in Mumbai. How do we optimise the crowd in trains so that journey becomes comfortable?

Here are some ideas on how to apply optimisation:

- I. Move offices to other side of town.
- II. Make peak hour travel expensive.
- III. Redesign seating spaces in trains.
- IV. Work from home.
- V. Rotate holidays.
- VI. Flexible timings.
- VII. Double decker trains.

This is one application of creative industrial engineering.

Let us now apply Brain Storming industrial engineering to academics. How does one optimise stress levels in academic system? How does one reduce learning hours in an academic year? How does one maximize learning? Many ideas from creative industrial engineering come to mind. Such as:

- I. Have 4 days holidays before each exam. So that stress moves to 1 month of exams rather than entire semester.
- II. Do not have Mid Semester exams. Instead have a quiz at end of every lecture. So that you can have continuous evaluation without associated stress.
- III. Require students to summarize a text book. This will add to learning without adding to exam stress.

This is good example of creative industrial engineering applied to academics. Such approach can be applied to political campaigning too.

Can we make political campaigning more efficient and optimum? Here are some ideas:

- I. Don't have political speeches. Anyway they reach barely 1% of population.
- II. Have press conferences. Newspapers are read by 100% of audience.
- III. Use Whatsapp and social media.
- IV. Have honest politicians for a change.
- V. Use reduced election expenditure as a proof of honesty and goodness.

## 7 | Conclusion

This course will be designed by industrial engineering teachers who have taken extensive and intensive training in creative thinking, design thinking, lateral thinking etc. They will apply the principles learnt in creative thinking, design thinking and lateral thinking to the problems of industrial engineering.

It is high time we introduce creative industrial engineering so that industrial engineering can apply itself to problems not conventionally considered as part of industrial engineering.

This will make industrial engineering step out of its comfort zone and get into down to earth commonsense problems faced by every one and provide solutions that require lateral thinking, creative thinking, out of box thinking, divergent thinking, right brain thinking etc.

The course content can differ from each institute to another teaching industrial engineering. There has to be a greater discussion among academicians of the feasibility of this course, since its need is without doubt unquestionable.

## References

- [1] Prabhakar, D. (2022). Common sense industrial engineering. *International journal for advances in engineering and management*, 4(7), 505-507. DOI: [10.35629/5252-0407505507](https://doi.org/10.35629/5252-0407505507)
- [2] Prabhakar, D. (2022). Down to earth industrial engineering. *Proceedings of SARC international conference*, New Delhi.
- [3] Khan, M. I. (2004). *Industrial engineering* (2<sup>nd</sup>). New Age International Publishers.
- [4] Telsang, M. T. (2006). *Industrial engineering and production management*. S Chand & Co Ltd.
- [5] Anmol, B. (2014). *Industrial engineering and operations management*. SK Kataria and Sons. [https://www.skkatariaandsons.com/view\\_book.aspx?productid=8283](https://www.skkatariaandsons.com/view_book.aspx?productid=8283)
- [6] Sharma, S. C., & Banga, T. R. (2017). *Industrial engineering and management*. Khanna Publishing.
- [7] Khanna, O. P. (2018). *Industrial engineering and management*. Dhanpat Rai Publications.
- [8] Reddy, C. N. M. (2007). *Industrial engineering and management*. New Age International.
- [9] Arun, V. (2015). *Industrial engineering and management*. Scitech Publications.
- [10] Simant, K. (2012). *Industrial engineering*. New Age International Publishers.
- [11] Vijay, N. (2020). *Industrial engineering and management*. Tech Neo Publications.
- [12] Khan, M. D. I., & Siddaqui, N. A. (2018). *Industrial engineering and management*. New Age International Publishers.
- [13] Sarkar, P. (2021). *Industrial engineering digest*. Online Clothing Study.
- [14] Chatterjee, A. (2012). *Industrial engineering and management*. Vayu Education of India.
- [15] Gadhave, S. (2021). *Industrial engineering*. Technical Publications.