



### Usefulness of *E Yantra MEDO* for Academia White Paper

The academic version of *E Yantra MEDO* is called as *E Yantra MDG (Machine Design Guru)*. Of all the courses included in the curriculum for mechanical engineering students, it is the mechanical engineering design course which is their first exposure to professional / practical engineering in any industry. Professional engineering is concerned with obtaining solutions to real life practical problems. The mechanical engineering design is a major segment of engineering. It deals with conception, design and development, refinement and application of machines as well as mechanical apparatus of all kinds. The basic concern is creativity and intelligent application of all related sciences to real life situations. Moreover, the engineering process of solving problems often highlights an area of particular importance for more intensive scientific research. It emphasizes design and synthesis as well as an analysis.

The machine design course presents mechanical engineering students with design challenges rather than a set of routine problems. Normally the type of design addressed in this course is that of a detailed design which is only one part of the entire design process spectrum. In detailed design, the general concept, application and even general shape of the required device are typically known at the outset. It should be emphasized here that only limited information is available in a practical industrial problem and the designer's experience, creativity and matured decision-making process are essential to solve the problems. Moreover, multiple solutions exist that meet all requirements in such a situation. However, the determination of the best or optimum solution is tedious. Iterations or cut-and-dry techniques among the fundamental elements of the design process are the establishment of the objectives and criteria, synthesis, analysis, construction, testing and evaluation.

It is important that rational method of design is understood by engineers to enable them to manage their task

when confronted with vast input information. Therefore, it is important to introduce to engineering students of design, professional studies which integrate tools and sciences in the accomplishment of an engineering objective. The pressures upon undergraduate curricula today require that it must be done in an efficient manner with available time. Studies in mechanical design seem to be the most effective method of starting a student in the practice of mechanical engineering.

A traditional approach to teaching of the machine design course in all universities and colleges has been to emphasize design of individual machine parts or elements such as gears, springs, shafts, bearings etc. One criticism that is directed at this approach is that it can become a collection of disparate topics and does not prepare a student to solve different varieties of problems. Teachers may routinely cover various elements in the time available giving mundane details. Such an approach may do disservice to students because it does not necessarily develop fundamental understanding of practical application of underlying theories of design problems. Classroom and textbook problems invariably provide parametric information, leaving a student to find out one missing quantity in equations of design.

Although the design process requires all possible modes of failures to be studied and to be accounted for safety in design, these problems do consider only one mode at a time and not all modes comprehensively in the same design problem. A student is thus unaware of decisions made to get those other parameters in problems and has no scope for creativity. Moreover, time available in the crowded engineering curriculum for more practice is limited. A real way to learn the design therefore appears to be to do design many times. Whenever possible, an actual experience in designing should be supplemented by regular lectures. There are many practical laboratories in engineering colleges and universities for strength of materials, fluid mechanics, thermal sciences, work shops, etc., but none for the design engineering. This is a major lacuna in the engineering education planning. Many CEOs and managers lament unavailability of good design engineers. A substantial amount of training is required to be imparted to fresh graduates for which they have no time. No wonder in many industries, research and development activities lag behind the state-of-the-art designs, which remain proprietary items of industries from developed countries. Even colleges and universities find it difficult to get good design teachers. One should provide for self-reliance on the part of students to learn design independently. It should not be taught as a dry subject, but rather provide more scope for student to practice and develop creativity.

The commonality of the analytical approaches needed to design a wide variety of elements must be noted and the use of computer-aided-engineering as an approach to design and analysis must be emphasized. An access to personal computers or to programmable calculators is now very important in mechanical design studies as they make it possible to solve many problems quickly using numerical methods and to perform easily repetitive computations. It is possible to develop specific program for all the above purposes. It is noteworthy that almost all universities and colleges have installed large number of networking computers,

which are accessible to students in computer labs. These resources can be advantageously used for teaching design courses taking advantages of professional **E Learning Tools** or software for design engineering.

**E Yantra MDG**, developed indigenously by **M/s FEAST Software Pvt Ltd**, is one such product that is useful for the above purposes.

Few benefits that accrue to the users of **E Yantra MDG** are listed below.

- **E Yantra MDG** is unique, excellent and indigenous software developed by a premier institution. It serves as an e-learning tool for students and graduate trainees both in academic institutions and industries.
- **E Yantra MDG** encourages creativity. Being a ready menu driven design calculator, iterative computations are performed expeditiously.
- The voice-over flash information saves the time of the teacher spent on explaining basics of machine design to the students and students can therefore concentrate on teaching more practical complex and intricate details of design engineering. This will greatly benefit students and graduate trainees.
- The voice-over flash information enables the student to learn more outside the classroom on a fast track learning process at their convenience.
- Information on failures together with visuals enables students and engineers to identify failures in the field and also to know the causative factors.
- Questionnaire on every item of design enable students and graduate trainees for self-evaluation of understanding of the subject. A provision is made for adding more questions to increase range and versatility.
- An excellent data bank on various materials is provided. There is a provision to add more material information to the data bank.
- All formulae used in design approach are presented in accompanying manual. Further, “on-line” help has been provided for ease in understanding basic concepts.
- **E Yantra MDG** is in international SI units and GUI based menu driven software, easy to use by anyone with engineering background.
- Just on the lines of a language laboratory, **E Yantra MDG** can be utilized as machine design laboratory in engineering colleges and universities.
- Realizing the importance of **E Learning Tools**, academic regulatory authorities have made it mandatory for engineering colleges to acquire such tools for accreditation purpose as found

in a recent announcement in TIMES OF INDIA newspaper.

- **E Yantra MDG** has a provision for sketcher for two-dimensional drawing of the designed component in IGES and DXF file formats compatible with commercial drafting packages like AutoCAD, Pro-E etc.
- **E Yantra MDG** is an advanced version where cost estimate is also possible.
- **E Yantra MDG** is reasonably priced and is an excellent value addition to any engineering college or industry.

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