Computational Methods for Mechanical Engineers

The aim of the course is to equip an engineer with skills to develop mathematical models: It is an art of applying mathematics to complex real-world problems. The course combines mathematical theory, practical engineering and scientific computing to address today's technological challenges. It facilitates conversion of scientific statements into a form Engineers understand.

Unlike undergraduate studies, students at post graduate level are expected to be able to develop mathematical models of physical systems and obtain the most realistic solutions. The equations describing a physical phenomenon may be a differential equation, a linear algebraic equation, an integral equation or of any other form. Students must be able to adapt an appropriate mathematical formulation and solve it analytically or numerically. This would require students to develop an understanding of various formulation and solution techniques. Hence, the course has been designed with following objectives:

1. Review fundamentals of engineering mathematics learnt at undergraduate level.
2. Apply these fundamentals for mathematical modelling of mechanical systems.
3. Introduce analytical and numerical techniques of analysis.
4. Learn statistical techniques, techniques for data interpolation and interpretation useful for dissertation.

Application of Engineering Mathematics ranges, from predicting vibration response of components to intricate profile generated by different machine tools, from designing next generation Formula One cars to working at the cutting edge of robotics, from predicting behaviour of flows to estimation of heat transfer in complex scenarios.

In the Second Year, of ME programmes student will have the opportunity to consolidate their modelling skills in an extensive individual dissertation. A dissertation focuses on a genuine scientific, technological or industrial problem. Application of Advanced Engineering Mathematics would often lead to papers in scientific and engineering journals. It would also help students to purse their research work further.

We hope the objectives of the course are now clarified. We also intend that the course should be engaged by Mechanical Engineering faculty members rather than that of Mathematics Department. We also request teachers to refer to Preface of the book "Advanced Engineering Mathematics by Erwin Kreyszing", which was mainly used to design this course.

- *Syllabus Committee Members for ME Courses of Mechanical Engineering*