

The Art and Science of Teaching Short Courses in Noise and Vibration Control

Raj Singh, Contributing Editor

These days you can find short courses or seminars (or even YouTube videos) on every conceivable topic. However, I will confine myself to noise and vibration control, dynamic measurements, dynamic models and related mechanical design subjects. Some of my statements are tongue in cheek, so some discretion by the reader is required. I have opted for a Q&A-style session that would allow me to communicate key points about the art and science of short courses.

Q: *Why do we need short courses in noise and vibration control?*

A: Very few institutions have regular academic courses in acoustics, vibration and digital signal processing, especially at the undergraduate level. Practicing engineers, though, often need to minimize noise and vibration as part of product, vehicle, and system design and manufacturing. Sometimes there are conflicting statements in the literature on a particular topic (such as adding or reducing damping), since prior researchers may have used alternate methods or solutions to solve the same problem.

Also, I am finding that most engineers (true for the population at large) do not want to read highly technical (boring, obtuse, mathematical or scholarly) articles written by someone like me (or most likely my colleagues in academia and in R&D organizations). Some people would rather see an oral presentation of the salient points and then pose questions of current and immediate interest to them (such as the role of manufacturing tolerances, effect of operating temperatures, amount of damping treatment needed and so on).

In many cases, instrumentation and simulation software companies offer short courses as a way to introduce their products and services and cover fundamentals in a very short time; these courses serve as useful training vehicles, especially when accompanied by some hands-on simulation or experimental exercises.

Q: *Are you an expert in organizing and teaching short courses?*

A: No. In fact, no one is an expert in this area, since courses are offered by professional societies, academic institutions, software and hardware companies and consultants. Many courses just come and go. Personally, I have taught at least 10 courses (including noncredit seminars meant for industry only) and according to my count over 3000 attendees (from more than 450 companies) have taken my courses in automotive NVH and gear noise areas over the last four decades. (I am not senile yet, unlike most of my colleagues.)

This simply implies that we have been successful in reaching out to a large segment of the worldwide engineering community.

Q: *What is the ideal duration of a short course? Also, what are attendees looking for?*

A: This would obviously depend on the subject and scope of a course, as well as the physical setting. Personally, I have taught courses from a half day (at a technical seminar or conference) to four consecutive days (on campus or at an industrial site).

In some cases, attendees may want to know the answers to just a few questions and the rest of the material is rather redundant or uninteresting to them. For instance, one attendee at our four-day course had only one question: Do we need to incorporate component X to solve the Y noise problem? He finally chased me down during the break and insisted upon a binary answer to his question – YES or NO, since “maybe” was unacceptable to his management. I gave him the answer (NO, in this case, based on the successful application of Murphy’s Laws to noise and vibration sources as *S&V* readers may fondly recall from some of my prior editorials). He said “thank you very much” and was then on his way back to personally deliver this invaluable information to his managers; he even left his course notes behind.

In the same manner, some people have called me on the phone saying that they do not need to confuse themselves with education (or unnecessary ideas), because they want simpler answers or solutions on the phone or a web conference. When I mention that they need to understand the context, learn generic design principles and follow an experimental or numerical case study, some of the hard core designers are not impressed.

Q: *Can you comment on the cultural and educational aspects of short courses?*

A: Well, I have taught courses in five continents, and sometimes I am amazed by the different reactions to the same material. For instance, jokes (American jokes, to be more precise) tend to fall flat in the international area. Even Murphy’s Laws (though I had thought that they are globally applicable) do seem to excite some international participants. Further, it seems that, the learning aptitudes/styles and cultural considerations are different, though the engineering curricula are somewhat similar in many countries. I have many anecdotes on this issue alone, but some of them may not be fit to print.

Q: *Ok, professor, give me an example of a successful short course?*

A: My Ohio State colleague (Don Houser) and I have taught the “Gear Noise” short course since 1979. Over the past 36 years, more than 1850 engineers and technicians from 360 companies have attended this course. Each year we have about 35 to 60 attendees from industry. (See www.nvhgear.org for more details.)

Q: *Are there any long-term benefits of a short course?*

A: Some of the benefits of the Gear Noise course (over the last three decades) have included the training of system designers and noise control engineers to better understand the mechanisms of gear noise generation, methods by which gear noise is measured and predicted, and techniques employed in gear noise and vibration reduction. This particular short course has acted as an incubator for fundamental and applied research in gear dynamics, noise, tribology, design, and measurement methods. It has led to successful research laboratories, such as the Gear Lab (www.gearlab.org) and the Acoustics & Dynamics Lab (www.autonvh.org), at Ohio State University, which provides world class research facilities along with a venue for educating graduate students in an area of significant demand. Therefore, this short course has benefited both industry and academia.

Q: *How much importance do you attach to the collection and analysis of course evaluations or surveys?*

A: I am somewhat old fashioned (though I do relate to students well, especially in terms of feeling their “pain” as former president Clinton used to claim). As a general rule, we do not collect surveys at the end of the course. Instead, we suggest that they could correspond with us afterward if they have questions, send us compliments or complaints but, more importantly, use the course material for engineering work and recommend the course to their colleagues. It has worked out very well for us.

Here are some comments from a recent course:

- “I wanted to note that I found the course very informative and helpful. All of the attendees I talked with felt it was a great course” – From a senior gear designer for a major vehicle manufacturer.
- “I already have several ideas for troubleshooting problems and some fresh thoughts on setting NVH sound quality metrics. Thank you very much for pulling together such a great class!” – From an NVH engineer responsible for electric vehicles.
- “It was a great privilege to meet you and attend the course last week. Many thanks

again for the course.” – From a researcher for a wind turbine company.

Q: *How long do you expect to keep teaching your courses?*

A: I have retired from regular teaching at Ohio State, so I can now focus more on short courses. Actually I enjoy interacting with a more mature and demanding audience, though we cover many topics at a breathtaking pace.

Additionally, attendees of these courses do not complain of the workload (no home-

work) and grading (no exams). This way we can focus more on physical mechanisms, simple calculation methods and design guidelines, without going over the derivations and esoteric mathematical details (no matter how much I like them).

Some of our undergraduate and graduate students have asked us to adopt the short course style (no homework or tests) for regular courses. Well, this suggests an innovative paradigm for future academic and short course educators.

Q: *Do you have a closing statement?*

A: I acknowledge the contributions of my colleagues and former/current students at Ohio State. Most importantly, Dr. Donald Houser is recognized for his immense efforts in organizing and co-teaching the Gear Noise course, and for displaying humor and humility under some difficult circumstances. I can be reached by e-mail via singh.3@osu.edu. if you would like to share your views; note that some of these may be published (in didactic form) in a future editorial. 