

Challenges in Teaching Industrial Engineering Courses in Online Mode during COVID Times

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Abstract

I first enumerate courses that are taught in first year to M TECH students in our Industrial and Management Engineering department at IIT Kanpur India. I cluster them according to qualitative and quantitative domains, and address problems and issues encountered one by one.

(a): Operations Research and Probability & Statistics. These courses are theoretical in nature and require extensive solving of numerical. Here one can share the screen and derive central limit theorem or strong duality theorem; no problems. One can easily solve a numerical on the screen.

However a following problem can be posed. A numerical is given to class so that they so solve it in class time, and as they are solving it in class, in pre Covid times, the instructor goes near each student to give him tailor made attention to point out where he is struggling or where he has gone wrong and how it can be corrected. And during this by keeping the tone of his voice low, it is ensured that other students do not know that he has made a simple error and avoid his humiliation. Other thing is student looks at the solution of his neighbor and learns from him also. I feel this issue needs to be addressed and software tools need to be developed to implement such a functionality.

(b): Computer Programming. Here I suppose that it is possible to look at computer program of each student during compilation and run time and tell him how the compilation error can be corrected or tell a student why his program has gone into an infinite loop.

(c): Accounting and Finance. It is a fairly structured course. Each accounting entry can be broken down into debit and credit and various accounting policies and principles can be easily discussed. I see no problem in this.

(d): Operations Management, Inventory Management, Scheduling, Aggregate Planning etc. These are fairly structured courses, and the related problems are discussed already under (a).

(e): Human Resources Management, Marketing, Strategic Management and the like. In these soft sciences based courses, one follows a mix of instruction methods (1): Lecture and question and answers: I see no problem in online delivery here (2): Case Method: Conducting group discussion online in a class of 80 students is a challenge. In pre Covid times, a student talks to his neighbor to get a doubt clarified: I do not know if this can be implemented by currently available software tools for online teaching. I am myself teaching a course on STRATEGIC MANAGEMENT and currently I am at a loss to bring out this richness in online conduct of cases. This is an opportunity for software product developers in the educational field to address this problem and develop necessary tools. (3): There is a glaring issue of copyright violation. If cases have to be purchased from HBS at USD 8 per case per student, then for 20 cases (in a course) the cost is USD 160 per student per course. For 4 courses cost shoots up to additional USD 650 per semester. If case discussions are run on publically available information, then it is an unbounded problem given that one has only 70 min in a class and very easily focus is lost. (4): Doing in class exercises: In pre Covid times one could give a case to 3 groups of 4 students each (in the event of students coming to class without reading a

case). They discuss it among themselves in groups of 4 and present to the class in turns, thereby bringing out many issues that forms the basis of further class discussions. I do hope a software will be available in near future for teaching cases in this manner. (5) Similar problem as in (4) will arise when students collectively (or in groups) attempt to do TERM PAPER ASSIGNMENTS.

(f): Books that are very expensive or rare (and have gone out of print) cannot be given to students as it would lead to copyright violation. One needs to digitize knowledge (accelerate this process) in library so that students can access it via VPN from remote places.

(g): According to an old Sanskrit saying, (1) student learns 25% from self study, (2) 25% from his colleagues (3) 25% from instructor and (4) 25% from the ambience of the institute. In Covid times (2) and (4) will take a hit. However student will learn on his own the maximum and we will have many 'Eklavya' students who will learn without a teacher. With so much knowledge available in open access journals and internet resources, education (and research) to some extent will become more cost effective.

(h): In teaching traditional industrial engineering courses such as ergonomics, one needs to create virtual labs. This is a yet another challenge.

(i): In organization behavior, there is a popular form of organization called VIRTUAL TEAMS (VTs). It is well known that it is required to give training to participants so that one is able to control the phenomenon of 'shouting' that frequently results in such situations. As we gain more experience in online teaching, one must devise guidelines for operating in online mode and train participants (both students and instructors) for continuous improvement in the knowledge transfer in online mode.

(j): Guiding PhD and MS theses online and maintain good quality standard is a yet another burning issue. The problem is compounded when research is lab based & I suppose virtual lab is not going to help here.

Biography

RRK Sharma is BE (mechanical engineering) from VNIT Nagpur India and Ph.D. in management from I.I.M., Ahmedabad, INDIA. He has nearly 3 years of experience in automotive companies in India (Tata Motors and TVS-Suzuki). Now he has 32 years of teaching and research experience at the Department of Industrial and Management Engineering, I.I.T., Kanpur, 208016 INDIA. To date he has written 1101 papers (peer reviewed (362) /under review (14) / working papers 725 (not referred)). He has developed over 10 software products. Till date he has guided 62 M TECH and 21 Ph D theses at IIT Kanpur. He has been Sanjay Mittal Chair Professor at IIT KANPUR (15.09.2015 to 14.09.2018); and is currently HAG scale professor at IIT Kanpur. In 2015, he received "Membership Award" given by IABE USA (International Academy of Business and Economics). In 2016 he received "Distinguished Educator Award" from IEOM (Industrial Engineering and Operations Management) Society, USA. In 2019 and 2020 he was invited by Ministry of Human Resources Department, India to participate in NIRF rankings survey for management schools in India. In 2019, he was invited to participate in QS ranking exercise for ranking management schools in South Asia.