A How-to for Teachers of Courses in an IIT

U. N. Gaitonde
IIT Bombay

Get a copy of *You and Your Students*, Prepared by a Faculty Committee at the Massachusetts Institute of Technology, Seventh Edition, July 1968, and published in India by D. B. Taraporewala & Co. Pvt Ltd, Bombay, 1970.

The following note is based on this book and my own experience at IIT Bombay.

Some Points from the Book

1. Be ready for hard individual work.
2. Gain knowledge of the subject.
3. Take an interest in students' progress and welfare.
4. Develop a desire to teach.
5. Keep experimenting – that will lead to your development.
6. Deliberately study the mechanism of teaching – do criticise yourself.
7. Develop the ability to transmit knowledge to students.
8. Behave like an inspired leader.
9. Be aware of the relations with other subjects and fields that lie at and across its borders.

Instructor Checklist for a Course

If you are reading this checklist with interest and are keen to do a good job as an instructor, then it means that

1. You have developed a desire to teach.
2. You have gained knowledge of the subject.
3. You are aware of the relations with other subjects and fields that lie at and across its borders.
4. You have developed an ability to transmit knowledge to students.

If not, it is never too late to begin!

A. When a Course is Assigned to You

This should happen, hopefully, a few months before instruction begins. At that time:

1. Revise your understanding of the subject.

2. In your free time, keep thinking about it and about teaching it. You may have been taught (and learnt) the subject, previously, as a student. Recall that experience. Who were the teachers? What were the good parts of their teaching? What were the bad or forgettable parts? Make mental and physical notes. You should learn from that experience. Take inspiration from the good parts - initially, a bit of imitation is acceptable. Try to keep away from the bad parts.

3. Get a copy of the ‘course content’ provided by your institute.

4. Prepare a list of topics that you plan to teach. This is based on the ‘course content’. Each topic may need about a week of instruction.

5. Prepare a list of books you would be recommending as textbooks and/or reference books.
   For undergraduate courses, it will be nice if a single book suffices. However, do provide a list of additional, similar books. A good book should have most of the topics in the course, but should also have some additional material. The extent of the book should be wider than that of the course. (Just as the extent of the subject is wider than that of a course on the subject.)
   For postgraduate courses, you may need more than one book.
   You may also include web resources, but do not go overboard in prescribing those.

6. Estimate the number of lectures (and tutorials) that would be required for each topic. This is where some optimisation is needed — your first list will invariably lead to the required number of lectures+tutorials far exceeding the total allocated for the course (typically around 45). Keep a buffer to accommodate unannounced holidays, etc.. While adjusting the number of lectures (+tutorials), consider the difficulty level and unease of understanding, and your own experience of the course (or a similar one) as a student. You may go wrong during the first year of teaching, and that is okay. Use that as feedback to prepare an improved schedule for the next year.

7. Prepare short notes for each topic. The notes should be for you, by you. They need not (and should not) have complete sentences, just keywords and phrases will do. Include equations, figures, sketches, etc.. Depending on your preparation, and your style, a lecture may need a couple of A4 pages to begin with. There is absolutely nothing wrong in referring to these during your lectures. Over the years, as you grow with the course, these should remain on the desk, and you should be able to do with an A7 card per lecture. You may still need to look at the A4 pages for details of a derivation, etc..

8. Prepare a set of exercises. If you are following a text, these could be marked out from the exercises in it, but it is always a good idea to modify (or at least rephrase) a few of them.

[Rather than say that “A mass *m* falls from a height *H*; determine its kinetic energy at the end of the fall, assuming …”, it is better to say something like: “You were walking towards your class when a brick fell from the top of the Lecture Halls Building, just missing you, …”.] Let the students feel they are doing something interesting, rather than just playing with symbols and numbers.
While preparing the exercises, list them in order of difficulty. As you progress through the course, increase the level of difficulty by creating/using exercises which need material from more than one topic. You may also add a few problems which require the use of material from a previous or parallel course. Remember that partitioning of material into courses is to some extent arbitrary.

These activities should be completed a week or two before ‘Instruction Begins’. If that is not possible (maybe because of a short notice!), then be sure that the preparation of a topic is completed two to three weeks before its expected day.

B. A Week or so Before the First Lecture

1. Create a handout for the course. This should include items which are mentioned later in this document. A typical content is:
    a. Course name, number, credits, timetable, divisions (if any).
    b. Instructor(s) and contact information.
       Information about TAs, if available at that time.
    c. Details of Moodle or any LMS used with the course.
    d. Textbooks and other reference material. You may include non-traditional material also. E.g. videos, websites, etc.
    e. Course outline: a list of topics in the expected order of learning.
    f. Something about exercises - whether from a book, or exercise sheets, etc.. The actual listing of the exercises should be in the LMS.
    g. Assessment details: how many examinations, what kind (quiz, test, mid-semester, semester-end), and the weight for each. (Students are likely to take great interest in this part.) If you have assignments or homework, mention whether these will be graded, and if so, what will be their weight in the final score.
    h. Instructions re: attendance requirement, examination rules (open book or otherwise, any other details). In particular, warn the students against copying and plagiarism.

   The handout should not be more than two pages (two sides of an A4 sheet). If you use an LMS, provide the handout therein, otherwise, hand over copies to students during the first meeting.

2. Determine the academic background expected of the students in your course. This is based on the prescribed prerequisites, and also of your experience (if any) of teaching the course. Include this in the course handout.

   You may conduct a small (~20 min) prerequisites quiz (PRQ) to check this out. Do not give any notice for this. At the end of the PRQ, provide details of the expected background. It is preferable to conduct the PRQ during the first

meeting. The PRQ should have zero weight; make an announcement about zero weight when you commence it.
Based on the performance of the class in the PRQ, you may decide to tweak the emphasis on the topics of the course, and/or the evaluation pattern.
If there are some students who seem to have a weak background, call them to meet you, and emphasise the prerequisites and suggest some material for study.

C. During the First Lecture

1. Introduce yourself.

2. Introduce the course using the handout.

3. Go through all the important points in the handout. In particular, point out the evaluation scheme (schedule, weights, grading policy, etc.).

4. Emphasise your stand on attendance, evaluation, missed tests, etc..

5. Take questions about all major issues.

6. It is a good idea to have ‘contact hours’ when you will be available in your office (or a pre-defined place) each week. Students can meet you for difficulties or matters related to the course.

7. Introduce the TAs, if already assigned. If not, introduce them at the first possible opportunity. If there are specific contact hours for the TAs, announce them.

8. Ask the students to choose class representatives (CRs). The number depends on the size of the class. One CR for about 50 students is a good number.

9. Conduct the PRQ. If time permits, discuss the answers to the PRQ.

10. By this time, you will be almost at the end-of-class. Mention what is going to happen in the next lecture.

D. During the Second Lecture

This is the lecture where the course really begins.

1. Provide an overview of the subject. Include a historical perspective and the current status. Provide your idea about what is going to happen in the future.

2. Provide an overview of the course, list out the main topics/themes, and the order in which they will be presented.

3. Emphasise the place of the course in the programme, and the place of the subject in the field.

4. Begin the main sequence of the course.

E. During Each Lecture in the Main Sequence

1. Plan for each lecture, or for a set of two or three lectures, depending on the topic under study.

2. As the class commences, write down some keywords at the edge of the board. The keywords will provide steps while developing the topic.

3. As you write down the keywords, say something about what happened during the previous lecture. Provide a backward link.

4. Strike out, or mark out, the keywords, as you progress through the lecture.

5. The list of keywords should actually extend beyond the lecture, so that when you come to the end of the lecture, some keywords are left over. This provides students with an idea of what comes next.

6. You may also ask the students a question or two, to check their understanding of the material taught in the previous lecture.

7. At any stage, do not hesitate to provide illustrations from real life.

8. Provide analogues from other subjects and fields. Illustrations of mundane things from everyday life are excellent!

9. Provide illustrative examples, however small.

10. A typical lecture is about 1 hour (approximately a microcentury). As far as possible, split it into two parts of about 25 to 30 minutes each. This may be planned, or you may decide it by the clock. Use the break of a few minutes for questions, attendance, etc..

11. Encourage students to ask questions. A good idea is to let the students raise hands, and you should take the question at the end of the sub-topic, in a few minutes, when the doubt is fresh in the mind of the student. You should take the question before you erase anything on the board. If there is no query for say 15 minutes, then pause at an appropriate stage and ask the students whether they have questions. If there are none, you may ask a question!

12. To check whether students are following your arguments, make a deliberate mistake. Some student should point it out almost immediately. If not, ‘discover’ your mistake in a few moments, and ask the students why they

missed it. [Warning: do not try this too often.]

13. At the end of the lecture, bring it to a close in a planned manner, if possible. Provide a forward link. In any case, say something about 'what comes next'. Example: "In the next lecture, we will complete the derivation using a vector identity", or "We will see how to apply these principles in practice, when we meet next". Good students should become curious about the next lecture.

14. If you use an LMS, then create a file in it, and provide a 'diary' of the proceedings. For each session, write a summary in about 20 words, maybe even less. This 'diary' should be available to the students.

15. If you have photos of the boardwork, upload them. Upload any slides used during the lecture.

16. Keep a personal diary, in which you should write something about each lecture. Did it go as planned? What were the questions asked? What will you do to improve it? This personal diary will be (and should be) very useful when you teach the course in the future (maybe as early as next year). This personal diary could also be on the LMS, but not available to the students. Make is available to your co-instructors and the TAs. [Remember: A TA today is likely to be a professor tomorrow.]

F. Board-work

Board-work, or e-board-work (slides, etc.) are an important part of your teaching.

1. You should get a clean board as you commence your lecture - it is your right. If you do not get one, inform the HoD. It is the duty of any teacher to wipe the board clean at the end of every session.

2. Plan what you will write on the board. In the first year of teaching, you may create 'board cards', writing on them material in the way you expect it to be written on the board.

3. Cultivate a clear writing style for your board-work. The way you write on paper, and the way you write on a board is different. Your handwriting will definitely look different. Your writing should be big enough for the last-bencher to see clearly.

4. Create a board-work discipline. It is not a good idea to write stuff at arbitrary locations, so that when the board gets filled up, there is no link between nearby items.

5. One way is to partition the board into two or three parts, left to write. The number of parts depends on the width of the board. Consider each part as a 'page', and as far as possible, write from the top left to the bottom right. When

you occupy the full board, erase the leftmost part completely, and begin writing on it.
However, this is not the only way to make good use of the board. You will have to develop your own style, which is non-confusing to the students.

6. Take special care to write equations (especially long ones) and sketch figures. Figures should be simple, but should have all essential features. Complicated or details figures and diagrams should be handed over before the lecture through the LMS.

7. Say something about the equation or figure as you write and sketch. The students should understand and learn the technique of writing that equation and sketching that figure. [The teacher who taught me 'thick cylinders' used to sketch the outer (larger) circle first and then the inner circle. We tried that, but gave it up as a bad idea!]

8. Do not go overboard with colours. Typically, you may have white chalk, and chalks of four different colours (red, green, yellow, blue, typically). Use just one colour (white) or at most two colours. Remember that the students may not have pencils/pens of so many different colours with them, and they tend to copy the figures in their notebooks.

9. Students have cameras. Allow them to take photographs of the board when it is full. It is a good idea to make the TAs take a snapshot of the board-work and upload it on the LMS.

10. At the end of the session, erase everything on the board. That is your duty. The next teacher should get a 'clean slate'!

About E-Board-Work

11. Keep your slides simple. Each slide should have just one figure, or some text. The text should not exceed 30 words, and the figure should be simple (see 6 above). There is absolutely no harm in using two slides instead of one, if that makes the reading clear from the last bench.

12. We (the creators) usually see a slide in front of us on the screen, but in a classroom the students see it from a distance. The font should be large enough for the back-benchers to see clearly. Test your slides by projecting and observing them from the last bench.

13. If you have two (or more) projectors and screens in the classroom, try to see whether you can project different slides on them. This will give you the facility of keeping a larger amount of material on display. Remember the sliding boards we have/had in some halls?

G. Tutorials

Tutorials, or practice sessions, are needed for the students to better assimilate the theory by solving associated quantitative problems and exercises. No new basic ideas are expected to be discussed during tutorials.

1. Plan for tutorials in advance, place them in the lecture plan (see A-6 and A-8).

2. For each tutorial, assign some exercises. Select such that there is not much repetition, each exercise should be different from the previous ones in some way. Also, the degree of difficulty should not decrease as one goes down the list.

3. You may assign the exercises at the beginning of the tutorial session, or assign them beforehand (through the LMS). In the latter case, be aware of the possibility that some students may obtain the solution beforehand by using the knowledge of others.

4. If possible, indicate why the assigned exercises were selected.

5. Ask the students to solve the problems during the tutorial session. Move around them to see whether they are proceeding well, or whether they are stuck somewhere. In the latter case, provide a clue or a hint to set them on their way.

6. If a student completes an exercise properly and in good time, you may ask her/him to come to the board and provide a quick overview of the solution. Note the identity of the student. This will encourage other students. (Everyone wants recognition!).

7. Use the tutorials to identify good problem-solvers from those who just follow others.

8. Good students who quickly and correctly solve the problems may be asked to help others. This provides recognition to good students.

9. Before major tests you may conduct a special tutorial/discussion session to handle students' difficulties and put them at ease.

H. Examinations

1. Announce the tentative assessment (for quizzes, tests, and major examinations, generally called tests) during the first lecture. It is possible that some major items (mid-semester and semester-end exams) are scheduled centrally.

2. Announce a firm date for a test at least a week (possibly two) in advance. The earlier you announce these, less is the chance of a clash with tests of other courses.

3. For each test, clearly announce the policy (re: open book or otherwise, etc.), if it differs from the default policy.

4. Announce whether the students can have access to specific tables or some other material.

5. Do not expect the students to remember mundane details of correlations, details of formulae, etc.. It may be a good idea to provide a standardised 'formulae sheet' or 'resource sheet'.

6. A week before (maybe even earlier for major tests), set the test paper.
    a. Keep the duration of the test in mind.
    b. Do not put the students under any time pressure. We are testing understanding, not the quickness of answering. A good student should be able to complete the test in about 75% of the time.
    c. Indicate the marks for each question, and the total marks and weight for the test.
    d. Arrange the questions in order of increasing difficulty and/or complexity.
    e. The test should be such that an average student should not have much difficulty in scoring more that the 'passing marks'.
    f. You may consider having a small question, or part of a question, which only the best students can answer. The weight for this should be small, maybe about 5% of the test total. This helps identify top students from the rest. (Useful in deciding on the A-graders!)
    g. At the top, provide any special instructions for that test.
    h. Prepare the 'specimen solution' for the test, and decide on a marking scheme.
    i. If possible, run the test on your TAs.

7. A few days before the examination:
    a. Typeset the test paper and check for any typos.
    b. Print the requisite number of copies.
    c. Keep them in a secure place. Your co-instructor and/or a senior TA should be able to retrieve them in case you are unable to fetch them just before the test.

8. Collect blank answer-books (appropriate size and number).

9. On the day of the test:
    a. The team (you, co-instructors if any, TAs, additional people as needed) should reach the test venue 10 to 15 minutes before the start of the test.
    b. Check that students are seated appropriately in assigned seats.

10. Follow the rules of your institute for conducting the test. In particular,

a. Mark the attendance of each student. Announce any absentees, so that no student is marked absent by mistake.
b. Tally the attendance with the number of students present.
c. At the end of the test, tally the number of collected answer-books with the number of students present.
d. If needed by your institute, store the answer-books for the specified period after the end of the semester.

11. Soon after the test, have a meeting with the TAs, and assign the workload of evaluation.

12. Evaluate the answer-books using the specimen solution and marking scheme. Do not be very rigid, some students may take a different (often scenic) route to the solution.

13. Enter the marks in a spreadsheet or database.

14. Display the specimen solution (with marking scheme) on the LMS. You may instead, display the best answer from among the students (Recognition!). Ask the student's permission, then scan it and upload it on the LMS.

15. Return the answer-books to students. This may be done during a class if the size is small. For large classes, students may pick them up during a meeting with the TAs (during their office hours).

16. Make an effort to return the answer-books as soon as possible. Quick feedback is important.

17. Provide each student with a tabulation of her/his marks. Do this halfway through the semester, and also at the end, just before the final exam. Set up a system by which a student receives only personal scores. Averages may be announced, but a full display of performance (a big table) is contraindicated. You may get into privacy issues.

18. During the semester, arrange a few 'crib sessions' where the students can meet you and/or the TAs for queries re: the marks awarded to them.

Z. Finally!

1. Complete the grading, or submission of the mark-sheet, as applicable.

2. Store the answer-books as needed by your institute.

3. If your institute requires or permits, conduct a re-exam for students who have missed passing by just a few marks.

4. Create a folder (paper) or an e-folder (using the LMS) which will contain all the documents of the course. This is the ‘course file’. Archive it. Use it as a history-sheet for the next iteration of the course. Make this available to the teacher who will be the instructor next time.

5. Obtain feedback from your students. If your institute provides a common feedback procedure, use it. Otherwise, or in addition, obtain feedback (if possible, anonymous) using the LMS.

6. Enjoy your vacation.

7. Start thinking about the next rendition of the course. Use your experience of this time and the feedback received to make a better job next time.

Revised 2026 01 20