Report of the Senate Committee on Norms for Teaching Large Classes

1 Preamble

The Chairman, Senate appointed this committee in August 2010 to review norms for teaching large classes. The terms of the committee included consideration of the maximum number of students in a section and in a tutorial class, the number of teachers and teaching assistants for a course, course files and continuous evaluation norms, and other relevant issues (see Appendix I). The committee contacted Dean (AP), Associate Dean (AP), and Dy Registrar (Academic) for knowing the existing norms for large classes. However, no information about existing norms was available. Hence the committee decided to formulate norms *ab initio*.

In its early deliberations, the committee decided to enhance its scope from norms for teaching large classes to norms for effective organization of courses with large classes. Accordingly, the committee

- Invited faculty members from various departments to discuss requirements of courses with large classes in their respective departments.

- Invited a faculty member of the HSS Department to join it as a co-opted member to facilitate a broad-based analysis of the requirements of courses with large classes.

- Visited classrooms and tutorial rooms of the new classroom complex to study audio-visual and technological support for effective teaching and learning in large classes.

Several salient features of organizing courses with large classes emerged during its deliberations. Accordingly, the committee decided that norms should cover the full spectrum of issues concerning such courses—planning of a course, conduct of lectures and tutorials, academic honesty standards, and supporting systems that would provide the force multipliers for effectively scaling up the instruction in a course to cover a large number of students.

The supporting systems should focus on 3 t's of teaching large classes in the following manner:

- *Teachers:* Train the teachers to equip them with classroom techniques for large classes.

- *Teaching assistants:* Train the teaching assistants to play an effective role in scaling-up the instruction in large classes.

- *Technology:* Deploy and use technology for enhancing effectiveness of instruction.

Section 2 of this report traces evolution of the teaching and learning environment at IIT Bombay in the past twenty five years. It focuses on the new challenges faced by today's faculty. Section 3 identifies the various issues that should be addressed while organizing a course with large classes and identifies the supporting systems needed to ensure smooth running and high effectiveness of such courses. The committee had designed a questionnaire to solicit faculty opinion on various issues concerning organization of courses with large classes. Section 4 summarizes faculty opinion, as expressed in responses to the questionnaire. Section 5 contains recommendations of the committee.

2 Historical Perspective

Several changes have taken place in the teaching and learning environment at IIT Bombay in the past twenty five years. The student intake was small in the initial years. Accordingly, class sizes were small except in courses of the science-and-engineering core in the I and II years of the B.Tech. and Integrated M.Sc. programs. The first generation professors put the highest emphasis on teaching and learning and the student body also had high motivation for academics. High instructor-student interaction was feasible in courses, so instructors developed their own personality-based and course-based methodologies to achieve high effectiveness in their courses: Learning objectives were met by instructors in highly individualistic ways and many instructors prepared lecture notes and handouts to support their lectures. Drawbacks of having large classes in courses of the undergraduate core were compensated through tutorials that had high faculty participation.

The first generation professors started to retire in the late 1980's. Two significant developments took place around this time: The student intake was increased. The administration also started putting more emphasis on

research accomplishments of faculty. Consequently, the new professors had to emphasize both teaching and research. One way of balancing these two goals was to use means that would reduce faculty efforts in repeated offerings of courses. Development of slides offered one method of achieving it. This trend continued through the 1990's.

The student strength has been increased significantly in the first decade of the twenty-first century, which has resulted in large classes in Departmental courses as well. The Internet has changed the way students study and think. Student attitudes have also changed dramatically during this period. The focus on a professional and/or management career has become diffused; current students aspire for careers in the IT and financial worlds. Research pressures on the faculty have increased at a high rate during this period. These changes have projected several new challenges for the faculty:

- Counter diffused academic focus and reduced attention spans of students.

- Develop teaching methodologies to ensure high effectiveness in large classes.

- Achieve both high research productivity and high academic standards in courses.

The faculty need various kinds of help and support for effectively addressing these issues before they assume crisis proportions. The most effective way of providing these is by consciously organizing courses with large classes in a manner that would help in achieving high effectiveness of the teaching and learning process. Supporting systems should be evolved to provide continued effectiveness.

3 Organization of Courses With Large Classes and Supporting Systems

The committee has adopted the definition that a *large class* is one with 50 or more students. If a course has a large enrollment, its students would be taught separately in several *divisions*, where each division may be a large class.

The following issues should be specifically addressed while organizing courses with large classes:

1. *Course Planning:*

   (a) *Learning objectives:* In a small class, the instructor is able to articulate the learning objectives and also monitor and assess the level of learning during lectures. However, it is not possible to do so in large classes. Hence, learning objectives should be projected prominently in course proposals and/or web sites so that

      i. Students would know what the objectives are and prepare accordingly.

      ii. Instructors would explicitly address the learning objectives while delivering lectures and while setting quizzes and examinations.

   (b) *Choice of textbooks:* While the instructor of a large class would devise/use special techniques to ensure student-instructor interaction as well as student-student peer learning, such interactions would be both qualitatively and quantitatively different from those in a small class. A textbook should possess some special features to compensate for the low level of interaction with the instructor, so relevant issues are: Does the textbook support self-learning? Is it rich in explanations, worked examples and exercises?

   (c) *Modes of evaluation:* Evaluation must assess the level of learning and proficiency achieved by a student and provide feedback. How many quizzes, home assignments and exams should a course have and what should be their weightages? Also, who should set and evaluate them—faculty or teaching assistants?

   (d) *Course Files:* A *course file* is the record of a specific offering of a course in a class. What should be the contents of a course file? Who should have access to which parts of a course file?

   (e) *Issues specific to courses taught in many divisions:*

      i. Should the same textbook be used in all divisions of a course, or can different instructors follow different textbooks?

      ii. Should students in different divisions of a course be graded separately? If not, should marks be normalized across divisions before grading?

2. *Conduct of lectures:*

   (a) *Classroom techniques for instructor-students interaction:* What techniques should an instructor employ for ensuring good student participation and effective learning in a course?

   (b) *Classroom features and technological aids for teaching:* What furniture and what arrangement should a classroom have? What technological aids should it provide to the instructor?

3. *Conduct of tutorials:*

   (a) *Format and conduct of tutorials:* What format should a tutorial have for ensuring effective learning in a course? Who should conduct a tutorial, a faculty member, teaching assistants (TAs), or both jointly?

   (b) *Tutor training:* How should the teaching assistants be trained for conducting tutorials? Who should train them?

4. *Academic honesty:*

   (a) *Informing students about honesty policies and relevant rules:* How should this information be disseminated to students?

   (b) *Procedures for dealing with academic dishonesty:* What should be the responsibilities of instructors and teaching assistants in detecting and reporting cases of academic dishonesty?

5. *Supporting services:*

   For smooth running and high effectiveness of a course with large classes, faculty should be provided the following kinds of support:

   (a) *Administrative support for running of courses:* A sample list of the support functions is:

       i. Forming of divisions of a course: All divisions should be 'equivalent' in terms of academic performance of students.
       ii. Allotment of classrooms and tutorial rooms, and maintenance of the classroom equipment.
       iii. Preparing a schedule of quizzes and examinations in various courses so that load on students is evenly distributed through the semester.

(b) *A handbook for teaching large classes:* The handbook is intended to be a vital resource for the faculty. It would describe alternative models and methods relevant to the various issues in the organization of large classes, and describe some practices that have been employed by IIT Bombay faculty successfully in the past. It would also provide references to expert literature in teaching methodologies.

A sample table of contents of the handbook is included in Appendix II.

(c) *Methodological support for faculty:* A center devoted to effective teaching methodologies should be formed to provide methodological support for faculty. It would perform the following functions:

   i. Hold orientation programs for new faculty
   ii. Hold periodic seminars on issues in teaching and learning
   iii. Hold training programs for teaching assistants
   iv. Provide a service for quantitative assessment of learning in courses
   v. Provide a service for producing video recordings of lectures at faculty request and providing expert feedback for improving effectiveness of teaching
   vi. Monitor new developments in teaching methodologies and technological aids to continually update its own programs and accordingly update the handbook.

4   Faculty Opinion on Organization of Courses With Large Classes

The committee designed a questionnaire both to sensitise faculty about issues in organizing large classes, and to obtain feedback on the issues and the methods to be used in addressing them. Appendix III provides a summary of the faculty opinion expressed through the responses.

5 Recommendations

Over the past two decades the Institute has made the transition from a *mostly small-class institution* with a highly effective teaching and learning environment to a *large-class institution.* In the new environment, it is essential to organize courses with large classes with a comparable degree of effectiveness without making undue demands on the faculty. Hence the norms for large classes should focus on installing a method of effectively organizing courses with large classes. The norms should also provide for smooth operation of the method and its continuous monitoring and upgradation to respond to the fast-changing educational scenario.

Accordingly, the committee makes recommendations R1–R8.

R1: All academic units in the Institute should be required to discuss and define the following components of all courses with large classes:

    (a) Learning objectives of the course

    (b) Textbooks and grading policies, if the course has many divisions

    (c) Evaluation scheme employed

    (d) Techniques used during lectures to ensure high effectiveness and adequate instructor-students interaction

    (e) Number and organization of tutorials

    (f) Opportunities for group learning and peer learning among students

    (g) Competence of TAs and need for course-specific training of TAs

    (h) Contents, accessibility and archiving of course files

    (i) Arrangements for ensuring consistency and effectiveness across offerings in different semesters, such as forming a team of instructors, associating future instructors as course associates, etc.

R2: An audit of all classrooms in the Institute should be performed periodically to cover

    (a) Classroom furniture and arrangement

    (b) Chalkboards/whiteboards

    (c) Projecting equipment

    (d) Other technological aids.

R3: The rule-books of all academic programmes should be audited to ensure that the following items are mentioned/described adequately:

    (a) Rules governing use of dishonest means—classification of offences and penalties for them

    (b) Procedures for dealing with incidents of academic dishonesty.

R4: All academic units should be required to audit all current and future courses with large classes in accordance with recommendation R1.

R5: A course file should be maintained for every division of every course, in an electronic form. It would contain the following information:

    (a) Evaluation scheme, grading scheme, and grade statistics

    (b) Description of lectures

    (c) Handouts, slides, tutorial sheets, and assignments and projects.

R6: The following rules should be used for organizing lectures and tutorials: of a course:

    (a) For lectures:

        i. A division in a core course should not have more than 100 students; however, if necessary, a division of a course in the science-and-engineering core of the B.Tech. and M.Sc. programmes may have upto 250 students.

        ii. A division in a non-core course should not have more than 100 students.

    (b) For tutorials:

        i. Course instructors must themselves organize and conduct tutorials.

        ii. A tutorial batch should not have more than 40 students.

        iii. One TA should be provided for every 20 students in a tutorial batch.

        iv. In addition to the instructor, a sufficient number of other faculty must participate in tutorials such that the faculty to TA ratio is 1:5.

        v. A tutorial room should have twice as many seats as the number of students in the tutorial batch, so that quizzes can be conducted in that room itself.

R7: Special cell(s) should be set up for providing administrative support for running of courses. The cell(s) should perform the following tasks:

  (a) Every semester

      i. Form divisions of students for courses in the core program of the B.Tech. and M.Sc. curricula

      ii. Develop a quiz schedule for courses in the core program of the B.Tech. and M.Sc. curricula

      iii. Audit the classrooms for suitability of boards, projectors and screens, and PA system

  (b) Maintain audio/video equipment and teaching aids in classrooms

  (c) Provide photocopying support for preparation of handouts, tutorial sheets, and examination papers.

R8: A center for effective teaching methodologies should be set up with a staff of trained professionals for providing methodological support for faculty. The center should perform the following functions:

  (a) Hold orientation programs for new faculty

  (b) Hold periodic seminars on issues in teaching and learning

  (c) Hold training programs for teaching assistants

  (d) Provide a service for quantitative assessment of learning in courses

  (e) Provide a service for producing video recordings of lectures at faculty request and providing expert feedback for improving effectiveness of teaching

  (f) Monitor new developments in teaching methodologies and technological aids to continually update its own programs and accordingly update the handbook.

(Prof. D. M. Dhamdhere)   (Prof. K. Sudhakar)   (Prof. U. N. Gaitonde)
Convener

(Prof. A. Ramanathan)   (Prof. J. K. Verma)   (Prof. S. C. Patwardhan)
Co-opted member

(Prof. K. P. Kaliappan)   (Prof. A. V. Mahajan)   (Prof. Sahana Murthy)

Appendix I

D.III/C-8/2010
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Senate Committee to Review Norms for Teaching Large Classes

With expansion of student strength, the number of students in typical B.Tech. classes has increased over the years from 80 to 120. The existing norms and practices may need to be revised to ensure that teaching effectiveness is not affected by increased numbers. The following Committee is set up to review norms for teaching larger classes:

Prof. D. M. Dhamdhere   ... Convener
Prof. K. Sudhakar
Prof. U. N. Gaitonde
Prof. J. K. Verma
Prof. S. C. Patwardhan
Prof. K. P. Kaliappan
Prof. A. V. Mahajan
Prof. Sahana Murthy

The committee may consider

(1) The maximum number of students in a section for common core courses and Department courses.

(2) The number of teachers and teaching assistants assigned to a course. Duties of course associates and TAs.

(3) The maximum number of students in a tutorial class. Norms for scheduling and conduct of tutorial classes.

(4) Recommendation for course file contents and material on web, course plan. Material for course associates / TAs.

(5) Continuous evaluation norms such as typical number of quizzes, home work assignments, etc.

(6) Any other issue.

The committee may submit its report by September 30, 2010.

Sd/-
Chairman, Senate

To: All concerned
cc to: Dy. Director (AIA) & (FEA), Dean (AP)

Appendix II

A Sample Table of Contents for
A Handbook on Teaching Large Classes

1. Introduction

2. Planning of courses — use of text books

3. Preparing for courses —course files

4. Delivery of courses

   - Do's and dont's concerning classroom interaction
   - Tutorials, forming groups of students
   - Effective practices employed at IITB

5. TA training

6. Conduct of courses

   - Student strength in divisions
   - Issues in separate grading of divisions
   - Involvement of faculty other than instructors

7. Continuous Assessment

8. Suggested Grading Schemes

9. Feedback from instructors

10. Central Infrastructure

11. Center for Effective Teaching

Appendix III
Analysis of Responses to the Questionnaire

72 faculty members responded to the questionnaire of the committee. This appendix summarizes these responses.

1. *Percentage of respondents who have taught large classes:*

Whether taught large classes	% of respondents
Taught large classes in I yr B.Tech.	58.33%
Taught large classes in II-IV yr B.Tech.	77.78%
Taught large classes in M.Sc.	15.28%
Taught large classes in M.Tech.	34.72%

2. *Opinions on what ought to be the maximum number of students in a class and in a tutorial batch:* Popular opinions and average sizes are:

Class		Tutorial batch	
% of respondents	Max size	% of respondents	Max size
11.11%	40 students	20.83%	20 students
16.67%	50 students	18.05%	25 students
16.67%	100 students	22.22%	30 students
6.94%	250 students	13.88%	40 students

The averages of all responses were 126 and 31, respectively.

3. *Opinions on the ideal class size in non-core courses of B.Tech. and M.Tech.:* Popular opinions and average sizes are:

% of respondents	Ideal class size
9.72%	25 students
19.44%	30 students
26.39%	40 students
18.05%	50 students

The average of all responses was 42.

4. *Opinions about textbooks for courses taught in many divisions:*

Use of textbooks in different divisions	*% of respondents*
Different instructors could use different textbooks in different divisions	43%
Instructors could use books not listed in bulletin	29%

5. *Opinions about desirable teaching aids in classrooms:*

Teaching aids	*Favoured by*
Video camera + projector so that handwritten or printed material could be projected	64%
2 projectors and 2 independent projection screens so that two different slides could be projected at the same time	46%
Several moving chalkboards or whiteboards	63%

6. *Opinions about continuous evaluation:*

Evaluation scheme	*Favoured by*
2 quizzes of 10 marks each, a mid-sem and an end-sem	38%
4 quizzes of 10 marks each, a mid-sem and an end-sem	19%
4 tests each of 1 hour duration and an end-exam	13%

7. *Opinions about grading in a course taught by different instructors in different divisions:*

Grading scheme	*Favoured by*
Marks should be normalized across different divisions and all students should be graded together	42%
Students of different divisions should be graded separately	36%
All students should be graded together based on their absolute marks	22%

8. *About tutorials and teaching assistants:*

- *Who should conduct a tutorial?*

Who should conduct a tutorial	Favoured by
Faculty and teaching assistants in an appropriate ratio	63%
Only teaching assistants	28%
Only faculty	10%

- *What should be the format for a tutorial?*

Format for tutorial	Favoured by
An instructor should engage the entire division for one hour for clearing common doubts and solving a few difficult problems and then split into batches for the second hour of the tutorial	26%
Teaching assistants should solve a few problems and then have students explain solutions of remaining problems on the board	29%

- *Do we have adequate number of tutorials at present?*

Adequacy of tutorials in present scheme	Favoured by
We should increase the number of tutorial hours in view of increasing number of students in a class	51%
No need to increase the number of tutorials	49%

- *How are TAs used at present?*

How TAs are used	Favoured by
Prepare model solutions	25%
Attend lectures, prepare lecture notes and post on Moodle	15%
Conduct a short 10 minute quiz on each tutorial hour	4%

- *Do we need department-level TA training?*

Need for department-level TA training	Favoured by
Courses in Departments have special requirements that necessitates a Department-level TA training	69%

9. *Opinions about dealing with use of dishonest means:*

- *Awareness of the Senate rules for dealing with use of dishonest means:*

Awareness of Senate rules	% of respondents
Aware of the Senate rules for dealing with use of dishonest means	69%
Unaware of the Senate rules	31%

- *Application of Senate rules in cases of use of dishonest means:* 43% of the respondents had not encountered use of dishonest means in their courses. Those who had encountered use of dishonest means, replied as under:

Application of Senate rules by self	% of respondents
Applied the rules in appropriate situations	73%
Did not apply the rules in appropriate situations	27%

- *Opinions on level of application of Senate rules in Departments and the Institute:*

Opinion on level of application	% of respondents
Senate rules are not applied strictly in their departments	74%
Senate rules are not applied strictly across the Institute	85%