# Concept Paper for Revision of M.Tech. Curriculum-2014

## 1. BACKGROUND

In cognizance of a need for reviewing the curricula of the postgraduate (PG) programmes of the Institute, a Postgraduate Curriculum Review Committee (PG-CRC) was constituted in 2012 (membership listed in Appendix-A). Master of Technology (M.Tech.) programmes account for the largest number of PG students at the Institute. Following an initial brainstorming in the PG-CRC, a curriculum workshop was conducted on October 7, 2013. The recommendations of the workshop were compiled and a draft concept paper was prepared by the PG-CRC. This was circulated to all academic units (Departments/Centres/Schools) and presented to the senate on May 13, 2014, with all the feedback received from Faculty Boards. The senate discussed the matter at length and decided on a broad framework for the M.Tech. programmes. Subsequently, the PG-CRC undertook an in-depth analysis and had discussions on the various aspects relevant to M.Tech. programmes of the Institute. The following challenges were identified regarding the M. Tech. programmes being offered by the Institute:

**i)** ***Large scale attrition of M. Tech. students*****:** It has been observed that a number of students leave the programmes in the first semester, giving rise to several vacancies. This problem has become more serious since the PSUs have started using GATE scores for their recruitment.

**ii)** ***Large variation in abilities (knowledge and skills) amongst the students admitted in an M. Tech. programme and desired level of preparedness of students admitted to a specific programme*****:** There are two types of M.Tech. programmes: one which constitutes further specialization of the undergraduate education, and the other which is multidisciplinary, and thus is loosely related to the undergraduate education or requires input from a wide variety of disciplines. In the first case, often it is argued that the level of education at the UG level is poor and hence, some 'UG' level courses have to be included again in the PG curriculum. This leads to lowering of the level of PG courses which is not desirable. On the other hand, in the second type of programmes where the background is not built up at the UG level for the PG programme, courses that build the background have to be included before advanced level courses can be taken up.

**iii)** ***Need for adopting a different pedagogy than that for undergraduate level curriculum*****:** PG students are more mature as compared to UG students, and it is expected that they should be able to do a significant amount of self inquiry and self study. Postgraduate courses should therefore be more intensive as compared to undergraduate courses. Need has been felt to reduce course work of M. Tech. students so as to improve depth of the study undertaken by them and also to encourage and facilitate self-study component in M. Tech. curriculum. The curriculum has to be so designed as to provide enough opportunity and direction for this to happen. This would require a somewhat different approach to the design of courses being offered for PG level students. In addition, the PG students should be trained in report/paper writing even before they write their project theses/dissertations.

***iv)*** ***Lack of clarity regarding desirable orientation (e.g. research or employment versus research focus improving employability) of M. Tech. Programmes*****:** Irrespective of

orientation of the student, whether towards research or employment, the performance of students in the courses and the quality of M. Tech. Project is of paramount importance for them. Thus, any efforts towards improving the research orientation of the M. Tech. Programmes would certainly improve the employability of the students as well.

**v)** ***Allocation, conduct and evaluation of M. Tech. research projects.*:** Over the years, the quality of M.Tech. projects has gone down as per common perception/experience. Projects have become time-bound rather than goal-bound, often with no tangible outcome. It is expected that a project should lead to a research paper or a patent of a product or a process. There are also many problems with evaluation of project, such as the role of supervisor vis-à-vis the evaluation committee and the type of evaluation- graded or non-graded. The possibility of offering a 'course work oriented' programme along with a 'research/ project oriented' programme may also be explored.

**vi)** ***Need for sufficient flexibility in the credit structure of the M. Tech. programme to accommodate the variety of programmes being offered at the Institute*:** In postgraduate courses the students should be treated as designers or researchers and therefore, the postgraduate programmes should be conducted differently from undergraduate programmes. In PG programmes, the faculty member acts as a facilitator for the design/research process the student goes through by self-study assignments, etc. The postgraduate students are expected to devote at least three hours of work for each classroom lecture attended by them (as against 1-2 hours expected of undergraduate students).

**vii)** ***Underutilization of M. Tech. students as Teaching Assistants (TAs) and poor work delivery by them*:** All M.Tech. students with assistantship have to put in 8-10 hours/week of TA work. This is a very large technical manpower that is available to the faculty. However, due to inadequate planning and organization at the faculty/department/institute level, this manpower is underutilized. Also in the first and the second semester, the course load often leaves little time for TA work.

***viii)*** ***Low strength of undergraduate students of IIT system (and other CFTIs) in M. Tech programmes*:** There is a widespread concern amongst the faculty about the quality of the students joining the M. Tech. programmes. It is observed that less than 20% of M. Tech. Students typically come from CFTIs or even government colleges. Improvement of intake is a must for improving the rigour of coursework and projects so as to improve research orientation and employability of M. Tech. Students.

***ix)*** ***Communication skills/Research Methodology/Professional Practices courses*:** The issues relating to communication skills and familiarity with research methodology and professional practices merit special consideration in respect of postgraduate students. There is an urgent need to enhance and expand the language lab and make available software for language ability enhancement for the benefit of postgraduate students. It is observed that technical communication and research methodology courses handled centrally are not working well even for Ph.D. students as of now. The possibility of handling these aspects at the Department level for M.Tech students may be considered.

## 2. RECOMMENDATIONS

The Senate, in a special meeting for discussing M.Tech. curriculum, held on May 13, 2014, resolved as follows:

"Resolution No. S/08/2014:

1. *An M.Tech. Programmes would have at least 48 PG credits. This may include project credits up to 24 in the form of mini, minor and major projects. The projects would be evaluated in terms of normal letter grades.*
2. *A programme may increase credit requirements by up to 6 credits either as PG credits or in the form of bridge courses. Thus the credits for a programme could go up to 54.*
3. *For a project to qualify as an M.Tech. Dissertation, the minimum credits associated with the project should be 18.*

*The senate also desired that the pedagogy for the PG courses should be distinctly different from those for the UG courses and should therefore encourage self-study and should involve term papers, presentations, assignments, etc. However, the nature and the form of these components could be discipline specific. Therefore, Departments/Centres are urged to discuss this matter and evolve their policy for implementation."*

Keeping in view the above resolution, the PG-CRC discussed the credit structure, project credits, etc., and made the following recommendations for the new curricula of M.Tech. programmes:

(a) **Credit structure**

1. Each M.Tech. Programmes would have at least 48 PG credits.
2. A programme may increase credit requirements by up to 6 credits either as PG credits or in the form of bridge courses.
3. Each M.Tech. Programme should have a minimum of 24 core credits with no other restrictions on the credit structure, leaving the discretion to the Departments/ Centres/Schools.
4. A programme may have project credits up to 24. For a project to qualify as an M.Tech. Dissertation, the minimum credits (total of all parts for the same projects) associated with the project should be 18. Academic units offering an M.Tech. programme, while scheduling semester-wise courses in the programme, should ensure that with a 12-credit project, no coursework is included, and in semesters where there are courses, project should be less than 12 credits.
5. All project credits need not necessarily be part of the core. Each Department/Centre/School should evolve a criterion to identify those students who would be eligible to do a project with higher number of total credits that would qualify it to be M.Tech. Dissertation. One possible criterion could be based on the grade earned by the student in the project component that is part of the programme core.
6. A mention of whether or not a student has a Dissertation as part of his M.Tech. Programme could be made in the final transcript.
7. The registration limits of credits per semester for full-time M.Tech students should be from 9 to 18 credits and for part-time M.Tech. students these limits should be 3-18 credits. However, the minimum for full-time students could be reduced to 6 credits in the third registered semester, if the Academic Unit recommends the same, for permitting students to go to Industry for a full 1 year project, or for sponsored candidates coming for M.Tech. coursework on 1 year leave and are expected to return to the parent company for project work.

(b) **Self-study (involving term papers, presentations, assignments, etc.) component in PG courses:** The revised credit structure is such that the average load is 12 credits per semester. The work expected from a student per credit comes out to be 4 hours per week including classroom contact. This is higher than the currently prevailing 3 hours per week per credit for 700 and 800 level courses, thus indicating that every credit in M.Tech. programmes should involve substantially higher work input on the part of students. (It was also pointed out that at present even the 3 hours per week per credit work load for students is not ensured in all courses). The committee discussed the necessity to communicate this fact to all students and faculty. The following methods were suggested:

1. Expected additional effort of student in the form of term papers, assignments, seminars *etc*. per credit in each course could be documented in the course template
2. Explicit mention of the expected efforts per credit in terms of number of hours per week could be made in the courses of study booklet and other web resources providing academic information.
3. No M.Tech. course should devote time to covering undergraduate material with the reason that the selected students do not have adequate background: such expectation of background for each course should be clearly informed to the selected students through a webpage for each M.Tech. programme. Departments/Centres/Schools may make use of TAs in preparation and maintenance of such websites.

(c) **Pre-requisites/Not allowed for conditions for UG students taking PG courses:** Departments/Centres/Schools preparing templates for PG courses must ensure that the entries corresponding to “pre-requisites” and “not-allowed for” on the course template are carefully and correctly filled, clearly indicating these requirements for UG and PG students aspiring to register for the course.

(d) **Admitting students in both semesters:** Departments/Centres /Schools would have the option to have admissions to M.Tech. Programmes in both semesters in view of the vacant seats in M.Tech. Programmes owing to attrition. The programme and the scheduling of courses be so designed as to facilitate this.

## 3. CLOSING REMARKS

The above recommendations are to be submitted for consideration of the Senate after feedback from faculty boards. The approved recommendations would then be considered for implementation. The implementation committee would also recommend changes, if any, in other rules and regulations in view of the revised curriculum.

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# Appendix-A

## Members of PG-CRC

Dean, Academics

Associate Dean, Academics (PG Research)

Associate Dean, Academics (Curriculum)

Chairman, Grades & Registration

Chairman, Time-Table Committee

Prof. B. Bhattacharjee, CE

Dr. Pritha Chandra, HUSS

Prof. M.G. Dastidar, CES

Prof. Naveen Garg, CSE

Dr. Shalini Gupta, ChE

Prof. V.K. Jain, EE

Dr. B.P. Patel, AM

Prof. D.T. Shahani, IDDC

Prof. Maithili Sharan, CAS

Prof. P.M.V. Subbarao, ME