CHAPTER III

PROFILES OF THE INSTITUTIONS
This chapter describes the profiles of the institutions selected for the present study, namely, Indian Institute of Technology (IIT)-Madras and College of Engineering, Guindy (CEG). It provides an outline of the institutional goals and strategies to achieve equality and excellence. It also describes the distribution of students across various courses and branches of study, in terms of caste, gender, etc. The chapter also gives an account of teachers, learning processes and other aspects related to academic excellence in the institutes.

3.1 INDIAN INSTITUTE OF TECHNOLOGY (IIT)-MADRAS

3.1.1 Genesis

The birth of any new institute is affected by a complex set of political, economic and social factors (De, 1985: 88). The emergence of IITs was no exception to this. A peculiar kind of situation was confronted when the Second World War was raging through Europe and its impact was felt in many Asian and African countries. In India also the question of post-war reconstruction was uppermost in everybody's mind. Around the same time, the Sarkar Committee was set up in 1946. The Sarkar Committee was of the opinion that the then existing facilities for higher technical education in India were inadequate, both in quality and quantity, to meet the country's post-war requirement for high level technologies. For instance, the colleges engaged in professional and technical education accounted for only 11 percent of the total number of colleges in 1946-47.

The Sarkar Committee in its interim report recommended the setting up of not less than four higher technological institutes situated in four regions of the country. It was also suggested that the selection of students in these institutes should be purely on the basis of merit and no provincial quotas should be allotted except for some seats for the economically underprivileged classes. The expectation of the Committee was that the standard of education in these institutes should not be lower than that of any of the best technological institutes abroad. Further, it was decided that the institutes should have a proportion of about 2:1 between under-graduate and post-graduate students.

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1 Hereafter Indian Institute of Technology-Madras is referred to as either IIT or Institute.
The Sarkar Committee selected MIT in the USA as a model for the most suitable type of institution to be established in India. It was hoped that such institutes would remedy the defects of a very old system of training technical personnel to maintain equipment and oversee the industrial process imported from abroad. The Committee, while recommending the setting up of four higher technological institutes in its interim report, also proposed a few major features for the instruction and evaluation systems to be followed in the institutes.

To maintain excellence in the proposed institutes it recommended that the strength of the teaching faculty be in the scale of one faculty member for ten students in the basic courses and one faculty member for five students in special engineering courses. However, the final report of Sarkar Committee was never submitted.

As mentioned earlier, the Government of India decided to establish the All India Council of Technical Education (AICTE) in 1946. Moreover, India's First Five Year Plan, launched in 1951, noted the shortage of qualified and technical manpower in the light of increased demands created by successive steps in the growth of industry in the country. As the Second Five Year Plan started in 1956, there was greater emphasis on the heavy industry and large scale projects. The gulf between the supply and demand of qualified technical manpower became more than evident.

Within the framework of the Sarkar Committee Interim Report and on the recommendation of AICTE coupled with the needs felt in the early days of Independence as pronounced in the First Five Year Plan, the five Institutes of Technology came into being over a stretch of twelve years between 1951 and 1963. The first IIT was set up at Kharagpur near Calcutta in 1951.

The second IIT came into existence in 1958 at Bombay. The third and fourth IITs were established in succession at Madras and Kanpur in 1959 and 1960 respectively with the technical assistance and collaboration in the initial phase of development of these institutes from Germany and USA respectively. The College of Engineering and

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2 The delay in setting up the second IIT was because of the shortage for foreign exchange for the purchase of laboratory equipment (De, 1985: 90). In 1954, UNESCO agreed to extend substantial support mainly relying on contributions received from the USSR for international assistance.
Technology, New Delhi was converted into the fifth IIT in 1961 with the technical assistance from UK. More recently, a sixth IIT has been set up at Guwahati in Assam.

Thus, IIT-Madras was declared as an Institute of national importance in 1961 although it opened its doors to the first batch of students for engineering studies in 1959. The primary goal during the initial years was to develop a strong and integrated curriculum leading to the Bachelor's degree in various branches of engineering and make available efficient, well trained, dedicated and excellent young men and women to fill the ranks of engineering profession. Besides bachelor's degree in aerospace, civil, naval architecture, chemical, computer science, electrical and electronics, electronics and communications, mechanical and metallurgical engineering, IIT-Madras also offers a wide choice of elective areas of specialisation at M.Tech level. All the departments of the Institute offer research programmes for full-time and for staff members on a part-time basis for the Ph.D degree. IIT-Madras emphasises a comprehensive scheme of work-shop training and drawing practice for its students. The Central Workshop serves the dual purpose of training students and providing facilities for fabrication of new equipment. This facility is one of the best in the country and it is run on the German pattern.

The duration of the B.Tech programme in IIT-Madras is eight semesters. Initially, it was a ten semester course spanning over five years. The duration was reduced to four years in 1980. The programme of instruction in the Institute places emphasis on a general core programme comprising of basic sciences, engineering sciences, humanities and mathematics. It also focusses on an engineering core programme, introducing to the students the foundations of engineering in their branches of study. In this there are two types of courses: hard core courses and soft core courses.

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3 However, at present, except for project based bilateral programmes with the institutions abroad, no annual foreign aid is received by the IITs.

4 The Federal Republic of Germany (FRG) provided technical assistance and collaboration in the initial phase of development of the Institute.

5 The IIT-Madras started a four-year under-graduate programme in 1959 admitting students after 10 years of school education followed by two years of Inter science. The programme was changed to five years in 1961 when the students were admitted after 11 years of schooling. The pattern of school education changed subsequently. Students for four year under-graduate programme in engineering are admitted since 1980-81 after 12 years of higher secondary school education.
Hard core courses have to be completed in order to get the degree while soft core courses are not a pre-requisite for the award of degree. With strong foundations in both the basic sciences and engineering, the IIT-Madras offers an elective programme and a project approved by the department in the third and fourth year of the B.Tech course.

3.1.2 Enrolment

At present, there are a total of 2,842 students enrolled in IIT-Madras. Most of these are from the under-graduate B.Tech programme (Table 3.1). There is a slight increase in the total number of students in 1994-95 over the year 1993-94. There are 583 students enrolled at the M.Tech level, 142 in the M.Sc. Course and another 212 students are in the M.S. programme. The distribution of B.Tech students reveals some interesting results over a period of two years, i.e., 1993-94 and 1994-95. Firstly, certain fluctuations in the number of students spread across the odd semesters (I, III, V and VII) may be observed. This may be due to variation in intake capacity itself and also due to the drop-outs at the end of each semester. For instance, the total number of 349 students admitted in 1993-94 in the first semester has gone down to 347 in the third semester during 1994-95.

<table>
<thead>
<tr>
<th>Semester</th>
<th>B. Tech</th>
<th>M. Sc.</th>
<th>M. Tech</th>
<th>M. S.</th>
<th>Ph. D.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Semester</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1993-94</td>
<td>349</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994-95</td>
<td>363</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>III Semester</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1993-94</td>
<td>342</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994-95</td>
<td>347</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V Semester</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1993-94</td>
<td>332</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994-95</td>
<td>338</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VII Semester</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1993-94</td>
<td>280</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994-95</td>
<td>341</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1993-94</td>
<td>1,303</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1994-95</td>
<td>1,389</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*This includes 291 students in Engineering disciplines, 201 in sciences and 24 in Humanities and Social Sciences.
Similarly, about 342 students in the third semester during 1993-94 have reduced to 338 in the fifth semester during 1994-95. However, this trend is not observed in the case of the fifth semester students of 1993-94 moving to seventh semester in 1994-95. Here, there is a slight increase in the number of students. For instance, there were 332 students in fifth semester during 1993-94 and when these students reached seventh semester in 1994-95, they marked an increase to 341. This may be because of the existence of those students continuing beyond the VIII semester and were given a fifth year extension.

Further, of the 2,842 students on rolls in IIT-Madras in 1994-95, about 10.69 percent (304) are women, 6.93 percent (197) are from Scheduled Castes and 0.98 percent (28) are from the Scheduled Tribes (Table 3.2). The corresponding figures for the previous year 1993-94 are 9.35 percent (254), 5.26 percent (143) and 0.51 percent (14) respectively for women, SCs and STs. Though the number of students have increased in these categories over a period of one year, the increase is marginal. Thus, the women, Scheduled Castes and Scheduled Tribes are under-represented in IIT-Madras.

### TABLE 3.2

<table>
<thead>
<tr>
<th>Category</th>
<th>Total number</th>
<th>1993-94</th>
<th>1994-95</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>254</td>
<td>304</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(9.35)</td>
<td>(10.69)</td>
<td></td>
</tr>
<tr>
<td>Scheduled Castes</td>
<td>143</td>
<td>197</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(5.26)</td>
<td>(6.93)</td>
<td></td>
</tr>
<tr>
<td>Scheduled Tribes</td>
<td>14</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.51)</td>
<td>(0.98)</td>
<td></td>
</tr>
</tbody>
</table>

Note: Percentages of the total strength are in parenthesis.
<table>
<thead>
<tr>
<th>Branch of Study</th>
<th>I Semester</th>
<th>III Semester</th>
<th>V Semester</th>
<th>VII Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>SC</td>
<td>ST</td>
<td>Total</td>
</tr>
<tr>
<td>1. Computer Science</td>
<td>27</td>
<td>3</td>
<td>2</td>
<td>30</td>
</tr>
<tr>
<td>2. Electrical and Electronics</td>
<td>81</td>
<td>14</td>
<td>-</td>
<td>67</td>
</tr>
<tr>
<td>3. Electronics &amp; Communications</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4. Mechanical</td>
<td>84</td>
<td>15</td>
<td>1</td>
<td>86</td>
</tr>
<tr>
<td>5. Chemical</td>
<td>46</td>
<td>4</td>
<td>1</td>
<td>54</td>
</tr>
<tr>
<td>6. Metallurgical</td>
<td>31</td>
<td>-</td>
<td>-</td>
<td>29</td>
</tr>
<tr>
<td>7. Civil</td>
<td>48</td>
<td>1</td>
<td>-</td>
<td>42</td>
</tr>
<tr>
<td>8. Naval Architecture</td>
<td>21</td>
<td>-</td>
<td>-</td>
<td>19</td>
</tr>
<tr>
<td>9. Aerospace</td>
<td>25</td>
<td>1</td>
<td>-</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>363</td>
<td>38</td>
<td>4</td>
<td>347</td>
</tr>
</tbody>
</table>

*Continuing beyond VIII Semester.
The semesterwise distribution of students at the B.Tech level in terms of their caste/tribe across various branches reveal interesting observations (Table 3.3). The distribution of students across various branches shows that the Scheduled Caste and Scheduled Tribe students are spread across only a few branches of study, namely, computer science and engineering, electrical and electronics engineering, electronics and communications engineering, mechanical engineering, and chemical engineering. Some branches like aerospace engineering, civil engineering, metallurgical engineering and naval architecture have either marginal or no representation from Scheduled Castes and Scheduled Tribes. This may be due to the greater demand for branches like computer science, electrical, electronics and mechanical engineering as compared to civil, aerospace, metallurgy, etc. and also due to their appeal in the job market. Further, a student may go for a sought after branch of study in another Institute rather than opting for not so sought after branch in IIT-Madras.

Interestingly, some students are found to be continuing beyond the eighth semester. For instance, about 9 students are continuing beyond eighth semester. Of these, a majority (5) are from the Scheduled Castes and belong to the electrical and electronics, electronics and communications and mechanical engineering branches.

TABLE 3.4
Distribution of B.Tech Students - In Terms of Branch and Gender (1994-95)

<table>
<thead>
<tr>
<th>Branch of Study</th>
<th>I Semester</th>
<th>III Semester</th>
<th>V Semester</th>
<th>VII Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Men</td>
<td>Women</td>
<td>Men</td>
<td>Women</td>
</tr>
<tr>
<td>1. Computer Science</td>
<td>27</td>
<td>1</td>
<td>28</td>
<td>2</td>
</tr>
<tr>
<td>2. Electrical</td>
<td>79</td>
<td>2</td>
<td>64</td>
<td>3</td>
</tr>
<tr>
<td>3. Electronics</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4. Mechanical</td>
<td>83</td>
<td>1</td>
<td>84</td>
<td>2</td>
</tr>
<tr>
<td>5. Chemical</td>
<td>42</td>
<td>4</td>
<td>50</td>
<td>4</td>
</tr>
<tr>
<td>6. Metallurgical</td>
<td>31</td>
<td>4</td>
<td>27</td>
<td>2</td>
</tr>
<tr>
<td>7. Civil</td>
<td>48</td>
<td>4</td>
<td>38</td>
<td>4</td>
</tr>
<tr>
<td>8. Naval Architecture</td>
<td>19</td>
<td>2</td>
<td>19</td>
<td>-</td>
</tr>
<tr>
<td>9. Aerospace</td>
<td>24</td>
<td>1</td>
<td>17</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>349</td>
<td>14</td>
<td>327</td>
<td>20</td>
</tr>
</tbody>
</table>

6 IIT, Madras gives two more years to those who could not complete the B.Tech course within the stipulated eight semesters i.e., four years.
Further, genderwise distribution of students also reveals some interesting findings (Table 3.4). Firstly, the representation of women in almost all the branches is either negligible or marginal. Secondly, the girls are few or none in number in aerospace engineering, mechanical engineering, metallurgical engineering and naval architecture. This shows that the women are under-represented in certain branches of study. Thirdly, the representation of women is slightly better in branches like chemical engineering, electrical and electronics engineering, civil engineering, electronics and communications engineering and computer science and engineering. Of all the semesters, there are more women students in the third semester followed by seventh and fifth semesters. Interestingly, there is not even a single woman student in the first semester during 1994-95 in computer science and engineering and metallurgical engineering.

**TABLE 3.5**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
<th>Year</th>
<th>Total</th>
<th>Year</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1964</td>
<td>92</td>
<td>1969</td>
<td>321</td>
<td>1989</td>
<td>244</td>
</tr>
<tr>
<td>1965</td>
<td>115</td>
<td>1970</td>
<td>345</td>
<td>1990</td>
<td>283</td>
</tr>
<tr>
<td>1966</td>
<td>203</td>
<td>1987</td>
<td>297</td>
<td>1991</td>
<td>261</td>
</tr>
<tr>
<td>1968</td>
<td>292</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3.5 presents the data on the number of B.Tech degrees awarded from 1964 to 1992. It may be observed that about 92 students were awarded B.Tech degree in the first batch. The number has gradually increased to a maximum of 345 in 1970. However, in the later part of eighties and in the early nineties the number of degrees awarded varied in the range of 250 to 300.

Branchwise distribution of students who received their B.Tech degrees in 1993 reveals that a majority are from mechanical, electronics and communications. Electrical and electronics, chemical, civil and computer science and engineering branches (Table 3.6).

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7 The reason why women are under-represented in these branches is that these branches of study require rigorous physical work in the workshops, laboratories and the training in real work situations.
TABLE 3.6
Recipients of B.Tech Degrees - In Terms of Branch and Gender (1993)

<table>
<thead>
<tr>
<th>Branch of Study</th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Computer Science</td>
<td>14</td>
<td>2</td>
<td>16</td>
</tr>
<tr>
<td>2. Electrical</td>
<td>30</td>
<td>1</td>
<td>31</td>
</tr>
<tr>
<td>3. Electronics</td>
<td>28</td>
<td>1</td>
<td>29</td>
</tr>
<tr>
<td>4. Mechanical</td>
<td>26</td>
<td>3</td>
<td>29</td>
</tr>
<tr>
<td>5. Chemical</td>
<td>34</td>
<td>1</td>
<td>35</td>
</tr>
<tr>
<td>6. Metallurgical</td>
<td>25</td>
<td>2</td>
<td>27</td>
</tr>
<tr>
<td>7. Civil</td>
<td>59</td>
<td>1</td>
<td>60</td>
</tr>
<tr>
<td>8. Naval Architecture</td>
<td>18</td>
<td>5</td>
<td>23</td>
</tr>
<tr>
<td>9. Aerospace</td>
<td>9</td>
<td>-</td>
<td>9</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>243</td>
<td>16</td>
<td>259</td>
</tr>
</tbody>
</table>

Of the 259 students who received their B.Tech degrees, about 6.17 percent (16) are women. Interestingly, most of the women have received their B.Tech in metallurgical, computer science, aerospace and electrical branches of engineering. So, this also reinforces the impression that women are under-represented in the technical areas.

3.1.3 Strategies to Promote Excellence in IIT-Madras

(i) Admission Policy: IIT-JEE-Yardstick for Excellence

It is an accepted fact that the five IITs have been recognised both nationally and internationally as citadels of learning which provide scientific and technological education of the highest order. In view of selecting the very bright and motivated students, the Joint Entrance Examination (JEE) which is the only channel of admission to these institutes for all Indian nationals has assumed a stature and dimension with few parallels.

The demand for the admission in these institutes is very high. For instance, in 1987, about 70,544 students registered for JEE out of whom 54,161 completed all the
four papers\(^8\) of mathematics, physics, chemistry and English in 222 centres distributed all over the country (Table 3.7). Out of them, only 2,003 candidates from general category, 61 from Scheduled Caste category and a few (12) from Scheduled Tribe category qualified for inclusion in the All India Merit List. Similarly in 1993, a total of 88,991 candidates including 82,201 from general category, 5,688 from Scheduled Caste category and 1,102 from Scheduled Tribe category have registered for JEE. Of these, 2,331 candidates belonging to general category, 91 from Scheduled Castes and 15 from Scheduled Tribes were qualified for counselling.

**TABLE 3.7**

<table>
<thead>
<tr>
<th>Categorywise Distribution of Students Registered and Qualified JEE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General</strong></td>
</tr>
<tr>
<td>a. No. of registered candidates</td>
</tr>
<tr>
<td>b. No. of candidates appeared in all the 4 subjects (P,C,M&amp;E)</td>
</tr>
<tr>
<td>c. No. of candidates qualified</td>
</tr>
<tr>
<td>d. No. of candidates offered admission</td>
</tr>
<tr>
<td>e. No. of students who did not report for counselling</td>
</tr>
<tr>
<td>f. No. of students who failed to get any branch due to limited options exercised</td>
</tr>
</tbody>
</table>

From 1997 onwards the JEE would be conducted in only three subjects, namely mathematics, physics, and chemistry. Another major decision to be implemented from 1997 is that the restriction on the age limit of 21 years was lifted and the number of attempts have become unlimited. It may also be noted that since 1990, the students are allowed to write JEE in English or in any one of the 14 Indian languages which has been their medium of instruction in the 10+2 examination.
Further, it is beyond doubt that the number of candidates registered for JEE has increased tremendously over a period of six years (1987-93), except for the fact that the total number of students registered for JEE-1993 was less by five percent compared to that of JEE-1992. Thus, it is interesting to note that the percentage of candidates qualified under general category is just 2.8 percent of the total registered and in the case of SC and ST categories, the percentages of those qualified are 1.6 percent and 1.4 percent respectively.

TABLE 3.8
Seats Available and Filled for SC/ST Category (JEE-1993)

<table>
<thead>
<tr>
<th>Category</th>
<th>SC</th>
<th>ST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seats available</td>
<td>351</td>
<td>176</td>
</tr>
<tr>
<td>Qualified candidates</td>
<td>91</td>
<td>15</td>
</tr>
<tr>
<td>Offered admissions</td>
<td>87</td>
<td>14</td>
</tr>
<tr>
<td>Preparatory course</td>
<td>272</td>
<td>49</td>
</tr>
<tr>
<td>Seats vacant</td>
<td>--</td>
<td>113</td>
</tr>
</tbody>
</table>

Further, it may also be noted that all the reserved seats were filled by qualified and preparatory course candidates. More significantly, it is observed that 63.6 percent of reserved seats are vacant in the Scheduled Tribe category (Table 3.8). For about 351 seats available for Scheduled Caste students in 1993, only 87 students were offered admission and another 272 students were offered the preparatory course. Among Scheduled Tribes students, out of 176 seats available, only 14 were offered admission and another 49 were offered the preparatory course.

Thus, the percentage of qualified and selected candidates to the registered candidates reflect the standards of the JEE system which has consequently become a

9 The decrease by five percent in 1993 was mainly attributed by the Report of the JEE-1993 to the disturbances occurred in the northern part of India at the time of the sale of application forms. The sharp decrease of registered candidates in SC/ST category by 13 percent in 1993 compared to 1992 was also said to be due to the reason cited above.
yardstick for excellence in engineering and technology education selection procedure. Another important aspect of IIT-JEE is that it has developed a very clean image over a period of 30 years. This image has helped JEE emerge as the most prestigious admission system. Further, the image has also brought in its wake a tremendous amount of responsibility both for preserving that image as well as for fortifying it against the development of cracks in the system under various forces working against it.\textsuperscript{10}

The first and foremost aspect of excellence in the IIT-Madras is that it admits students purely on the basis of merit in the All India Joint Entrance Examination (JEE). As mentioned earlier, the strength of the system can be seen with the fact that only 3 percent of the total applicants would be selected for admission in the institutes. This highly selective system of JEE ensures that only bright students are admitted in the Indian Institutes of Technology (IITs) including IIT-Madras.

(ii) Monitoring Student Progress

IIT-Madras has over the years built up an arrangement to monitor the progress of each student at the class-room or departmental level. The progress is monitored by the faculty adviser and the class committee. The faculty adviser helps the students in planning their courses of study and for getting general advice on the academic programme. Further, every class of B.Tech programme will have a class committee consisting of faculty and students. The basic responsibilities of the class committees are

\begin{itemize}
\item[	extsuperscript{10}] However, certain alarming trends are found from time to time in the system of JEE. The first and foremost problem that the system faces is one of sheer numbers. Although the number of candidates seems to show progressively decreasing trend with the number of registered candidates stabilising at around 70,000 during 1987-93 period. It is felt by the organising committee of JEE-1993 that the IITs in general and the organising institute in particular find it more and more difficult to undertake this mammoth task without any hinderance. Besides resource constraints, the need for ensuring total secrecy for several crucial operations, the mobilisation of a large contingent of people of impeccable honesty and reliability to man the very delicate phases of activities, interaction with various outside agencies for the conduct of the examination in far flung areas and the unreliability of the transport and communication services coupled with the possibility of the local disturbances impose severe strains on the JEE machinery. For instance, cracks appeared to have surfaced during the JEE-1997-98. The question papers for JEE held in the first week of May 1997 are reported to have been leaked and subsequently, the Union Ministry of Human Resources and Development took unprecedented decision to reconduct the examination in early July.
to review periodically the progress of the classes to discuss problems concerning curricula and syllabi and the conduct of the classes. The methods of assessment in a course are also decided by the teacher in consultation with the class committee.

The Institute places very high emphasis on attendance. A student has to attend a minimum of 55 percent of the total working days. If anybody fails to attain this percentage, he/she will not be permitted to sit for the end semester examination in which the shortfall exists. The Institute also places utmost importance on the discipline inside and outside the campus and warns the students not to indulge in any activity which will bring down the prestige and excellence in the Institute.

IIT-Madras also has a very effective system of evaluation. This may be another indicator for the emphasis on excellence in the Institute. The credit system has three important aspects:

(a) elimination of semester-wise pass-fail, wider choice of courses in the form of electives and flexibility to permit students to progress at their own pace, subject to certain constraints.

(b) assessment procedure-tests and examinations.

(c) grading of students into categories.

Credits are assigned to the courses in the following general pattern: one credit for lecture method, one credit for each tutorial period, one credit for laboratory or practical or project session.

The curriculum for any semester, except for the final semester will normally carry credits between 21 and 27. If a student finds the load heavy in any semester or for any valid reason, he/she may off load such courses in consultation with the faculty adviser. However, the student should ensure that the total number of credits registered in any semester should enable him/her to earn the minimum number of credits. For instance, a student should have earned not less than ten successful credits in the first semester, average of 15 per semester in the subsequent semesters. If a student fails to satisfy this requirement, he/she will be asked to leave the programme. Further, it should be noted that a student needs a minimum CGPA of 5.00.

IIT-Madras places the minimum prescribed credits for the award of B.Tech degree in each branch as not less than 175 and not more than 177. All the courses of the
B.Tech programme are divided into eight categories and a student must earn a minimum number of credits under each category to be decided by the Senate from time to time. In all, a student must earn 164 credits in all the categories. Apart from this, the student has to earn the rest of the minimum required credits to be eligible for the award of the degree in his/her branch by taking unspecified courses belonging to any of the eight categories which will be decided by him/her in consultation with the faculty member and which will suit his/her individual requirements.

(iii) Excellence and Equality: Setting the Standards

IIT-Madras serves notices to the students who perform poorly in the semester examinations. Generally, almost all these students are either from SC/ST or foreign national categories. Table 3.9 shows the distribution of students on whom the notices were served at the end of each semester in 1993, and the minimum required average credits.

<table>
<thead>
<tr>
<th>Semester</th>
<th>Minimum required average credits</th>
<th>Distribution of students served with notices</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SC</td>
</tr>
<tr>
<td>II</td>
<td>44</td>
<td>3</td>
</tr>
<tr>
<td>IV</td>
<td>88</td>
<td>7</td>
</tr>
<tr>
<td>VI</td>
<td>132</td>
<td>5</td>
</tr>
<tr>
<td>VIII</td>
<td>176</td>
<td>3</td>
</tr>
<tr>
<td>X</td>
<td>199</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>19</td>
</tr>
</tbody>
</table>

Of a total of 32 students served with notices about 19 are from Scheduled Castes and another 12 are the Foreign Nationals. A majority of those served with notices are in the second and fourth semesters. One student from SC category was found to have received the notice even beyond eighth semester. Another student from Scheduled Tribe category was served notice in the eighth semester for not obtaining the minimum required average credits.
All the students, who could not secure the minimum average credits are given three notices beyond which the students invite action from the authorities. The Adviser to the Weaker Sections constantly monitors the students' performance right from the entry into the Institute till they complete their degree. If necessary, special remedial coaching classes are also arranged for the benefit of weaker section students and foreign students to achieve excellence in the Institute. Further, a student is ordinarily expected to complete the B.Tech programme in eight semesters. However, a student may complete the programme at a slower pace by taking more time, but in any case not more than 12 semesters. This is to enable most of the weaker section students and foreign students to complete their course.

The Institute provides for a summer-term course for such students. Under this programme, an elective workshop course may be offered in summer. No student should register for more than two courses during a summer term. However, the course will be open only to the students who had taken the course earlier and failed.

IIT-Madras also has a Guidance and Counselling unit which consists of faculty members and senior students, particularly third and fourth year students. Its purpose is primarily to help students particularly the freshers, who may run into trouble of any sort during their stay in the Institute. It looks after the students at the time of joining and helps them settle down smoothly to the campus life, providing whatever guidance that is required. It also monitors the academic progress of the students and tries to attend to those whose performance level is unsatisfactory. The Unit arranges tutors for various courses based on requests for such help. Generally, it seeks the cooperation of the capable senior students for this purpose.

IIT-Madras identifies the excellence and promotes it among the students. It awards a number of scholarships on the bases of merit and merit-cum-means to encourage and motivate students. Some of the merit scholarships are Institute's National prize for 7 percent of the students of the first year B.Tech on the basis of their rank in

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11 Foreign students are mostly from the neighbouring countries such as Sri Lanka, Bangladesh, Nepal and other third world countries where the standards of education are low compared to the expectations in the IITs.
JEE; Professor Narasimham Fellowship to those in second and third year of B.Tech Computer Science, Merit-cum-Means Scholarship, etc.

Besides various merit scholarships, IIT-Madras has a number of awards and prizes which are highly reputed ones. Some external agencies have also instituted a few awards in various departments in the IIT-Madras. There are three prestigious awards for excellence among the students. They are President of India Prize for the student of B.Tech course with an excellent academic record; Governor's Prize for all-round proficiency in the B.Tech course: both curricular and extra-curricular and Institute Merit Prize to the best student in terms of academic record in prescribed branches of undergraduate and post-graduate courses.

Besides these three prestigious awards, various corporate giants and other memorial prizes are being instituted to encourage and motivate students. All these awards are for the outgoing students of the B.Tech course. The industrial giants which have instituted medals/prizes are HAL, Reliance Heat Transfer Private Limited, L&T, Philips (India), Motorola, Siemens, Banco Foundation and American Bureau of Shipping. Further, there are two memorial/endowment prizes in chemical engineering, two in computer science, one each in mechanical engineering, metallurgical engineering and electrical engineering.

In addition to these awards/prizes which are public in nature and bring wide recognition to excellence from outside the Institute for the out-going students, there are a few prizes for continuing students awarded during the Institute Day celebrations to promote excellence in various branches of study. In all, about 36 students have obtained various medals/prizes/awards during 1992-93 for their outstanding academic performance. Further, Institute's merit-cum-means scholarship was given to 62 B.Tech students during the same year.12

The information on placement of the IIT-Madras graduates shows that about 60-70 percent of the B-Tech students are placed every year. A detailed description of the placement of graduates in various branches is shown in Table 3.10.

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12 Interestingly, the Institute decided to set up a few awards/prizes for Scheduled Caste/ Scheduled Tribe students and girls separately for the best academic performance among them. However, the idea was dropped following a stiff resistance from these sections of students. The students from these sections did not want to segregate from other students and get identified differently.


TABLE 3.10
Number of Students Placed, 1992-93

<table>
<thead>
<tr>
<th>Branch of Study</th>
<th>No. of students registered for placement</th>
<th>No. of students placed</th>
<th>No. of students who got more than one job</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>General</td>
<td>SC/ST</td>
</tr>
<tr>
<td>1. Computer Science</td>
<td>31</td>
<td>28</td>
<td>-</td>
</tr>
<tr>
<td>2. Electrical</td>
<td>30</td>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td>3. Electronics</td>
<td>41</td>
<td>23</td>
<td>3</td>
</tr>
<tr>
<td>4. Mechanical</td>
<td>65</td>
<td>31</td>
<td>3</td>
</tr>
<tr>
<td>5. Chemical</td>
<td>31</td>
<td>13</td>
<td>-</td>
</tr>
<tr>
<td>6. Metallurgy</td>
<td>25</td>
<td>11</td>
<td>-</td>
</tr>
<tr>
<td>7. Civil</td>
<td>29</td>
<td>14</td>
<td>-</td>
</tr>
<tr>
<td>8. Naval Architecture</td>
<td>9</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>9. Aerospace</td>
<td>16</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>227</td>
<td>150</td>
<td>7</td>
</tr>
</tbody>
</table>

(iv) Physical Facilities

In terms of the infra-structural facilities, the Institute has a very well equipped laboratory infrastructure. The structure and pattern of the laboratory resembles the actual setting of the industry. The laboratory instruction in IIT-Madras is basically aimed at providing the experimental learning component of the engineering education. It was expected to illustrate the basic concepts and introduce terminology and definitions necessary for engineering applications and practices. There are 15 laboratory/workshop facilities in computer science and engineering; 12 in electrical and electronics and communications; 12 in metallurgical engineering; 10 in mechanical engineering, 4 in applied mechanics, 6 each in civil engineering and 3 in Aerospace engineering; 8 in physics and 9 in chemistry.

With its rich collection of books and journals, the central library at IIT-Madras caters not only to the information requirement of students and faculty of the Institute, but also of the industries and institutions in and around Madras city. The library has a colossal collection of 0.17 million books i.e., around 60 books per student. About 720 national and international journals are subscribed regularly by the Institute. The annual budget provided to the library annually is Rs.10 million. The staff and student members of the library are 4,690 as against the 2,198 industrial associate members, five corporate
members and 60 special members. The library has a book bank facility for weaker section students. It has around 10,000 books for circulation.

(v) Teachers

The teacher is an important facilitator of excellence in the Institute. It has a well knit team of 400 teaching and scientific staff drawn from different parts of the country. In terms of their professional skills, they are rated at the top in India and are comparable to other reputed institutes abroad. In all, there are 180 professors with experience in teaching and research in science and technology. Fifty percent of them are in the departments of mechanical engineering, electrical engineering, applied mechanics, chemistry, physics and civil engineering. There are 68 associate professors and 113 assistant professors in the Institute.

Another indicator of teacher excellence could be the number of teachers with a doctoral degree. Out of 400 faculty members, about 353 have Ph.D degrees. Interestingly, all the teachers in some departments have Ph.D degree. For instance, applied mechanics, chemical engineering, metallurgical engineering, chemistry, mathematics and physics do not have a single teacher without Ph.D.

A third measure of teacher excellence may be the acquisition of foreign degrees and the past institutional record. It is observed that a large number of teachers completed their degrees from the IITs itself. It is also noticed that a considerable number of teachers obtained their degrees from abroad. For instance, about 247 teachers obtained their degrees from abroad, mostly from Western industrialised countries. Remaining teachers in IIT-Madras also obtained degrees from reputed Institutes like the Indian Institute of Science (IISc), Bangalore. Thus the teachers have rich exposure to the latest developments in science and technology.

Besides, most of the teachers frequently visit the Western industrial centres to update themselves about the latest developments in the frontier areas of research in their branches. For instance, about 60 faculty members visited abroad for academic activities during 1992-93. During the same period, nearly 122 faculty members have participated in various conferences, seminars, symposia conducted by various institutes/organisations in the country or abroad. It is also to be noted that many teachers in IIT-Madras have
been awarded some national or international awards for their contribution to the growth of science and technology. About 9 professors were conferred awards/honoured by various organisations during 1992-93.

IIT-Madras also organises national and international seminars in science and technology related areas. During 1992-93, about 30 seminars and 3 symposia/workshops and one international seminar were conducted. International collaboration and MOUs are also entered with the University of Pertanium, Malaysia, University of Malaya, Kuala Lumpur and Institut Teknologi, Mara, Malaysia in 1993-94. The main objectives of the MOU are staff exchange, training and development and research collaboration.

(vi) Consultancy and Sponsored Research

The Institute undertakes consultancy for various industries in the country and abroad as well. This is done with a view to develop interaction with the industry, promote consultancy and sponsored research, compile and disseminate scientific and technological information and to train engineers to take up entrepreneurship as a career. The clients of the Institute cover small, medium and large scale industries of private, public and government undertakings all over the country and some are from abroad. The IIT-Madras generally undertakes the design, development, trouble shooting, fielding and analysis, etc. The total value of consultancy assignments undertaken by the IIT-Madras is on an upward trend. It increased from Rs. 8.7 millions in 1988-89 to Rs. 22.2 millions in 1992-93.

It also coordinates research activities relating to national and international research programme of the Institute. It undertakes bilateral research ventures with Germany, USA, Australia, etc. Currently, about 10-15 research projects with these countries are underway. The total value of the sponsored research projects awarded was 56 millions in 1992-93. The major sponsoring agencies are Department of Science and Technology, Department of Ocean Development, Department of Electronics, Department of Non-Conventional Energy Sources, Aeronautical Development Authority, CSIR, Department of Atomic Energy, ISRO and Defence, etc.

The Institute also keeps close liaison with various industrial establishments in private as well as public sectors, which greatly need highly qualified technical manpower
turned out of IITs. About 150 companies in the corporate sector visit the Institute every year to conduct campus interviews and select graduates and post-graduates from all the disciplines.

Thus, the Institute undertakes various measures to achieve excellence and create proper environment to pursue the academic excellence by the students as well as teachers by providing the best facilities available in India.

3.1.3 Strategies to Achieve Equality

In 1972-73, IIT-Madras proposed to initiate certain special efforts for the benefit of the students belonging to Scheduled Castes and Scheduled Tribes to be admitted to the B.Tech course from 1973-74 academic session for the first time. They include the organisation of a special four week orientation programme to help raising the knowledge of the students in English, Mathematics, Physics and Chemistry; organisation of special tutorial classes and the nomination of a faculty member as an adviser to the weaker section students.

In 1973-74, candidates for the B.Tech degree course belonging to SC/STs are offered the following concessions:

(a) 15 percent of the seats for Scheduled Caste and 5 percent of seats to Scheduled Tribe candidates are reserved at each IIT including IIT-Madras.

(b) The upper age limit is relaxable up to five years.

(c) They are exempted from payment of tuition fees.

Besides these, the Institute appointed a faculty member who belongs to ST category as Adviser and a Committee was formed with Deputy Director as Chairman to attend to their problems.

About 34 SC/ST students were admitted to the B.Tech course during 1973-74. IIT-Madras gave them an orientation programme of three weeks duration in order to acquaint them with the programme of study and given general preparatory background in mathematics, physics, chemistry and English. At the end of the first semester of study, 50 percent out of 34 students qualified to proceed to the second. The remaining 17 students who were deficient in three or more subjects were given a special programme
of study during the second semester in order to enable them to repeat the subjects of the first semester. A very special effort was made to bring the level of these students to that of regular students. At the end of this special programme, only three out of 34 benefitted.

Since 1974-75, the Institute organised a unified 10½ months academic programme covering the first year of the course. The 35 students admitted are placed in two groups and individual attention is paid to the students, the objective being to raise them from the in-coming level of deficiency to a reasonable standard when they could be injected into the normal stream at the commencement of the second year.

In 1980-81, it started a programme where-in it invites a group of eleventh standard school students from weaker sections to visit the Institute. The Institute met their travel expenses and provided board and lodging. They were taken round the Institute and were also given full details of JEE. Further, in 1982-83, as part of its continuing efforts to increase the intake of students of weaker sections it offered financial assistance to about 100 candidates from SC/ST category appearing for JEE to various IITs in the country. The assistance, first of its kind offered by any IIT intended to enable the SC/ST students to undergo specialised training in reputed private institutions engaged in coaching for JEE. Further, 90 percent of the tuition fee will be under-written by the Institute.

Yet another attempt is that about 170 students belonging to SC/ST category from Andhra Pradesh, Kerala, Karnataka, Pondicherry and Tamil Nadu were selected for contact cum correspondence programme for JEE. Since 1983-84, the correspondence course has taken many forms before it finally was designed as a preparatory course of one academic year. The preparatory course is conducted every year alternatively at IIT-Bombay and IIT-Madras for the south zone students belong to reserved categories. This programme is still being implemented by the IITs and a perceptible change is observed over the years among those who undergo this preparatory coaching.

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13 The programme involves correspondence classes and three contact classes each of about one week duration to be held in June 1983, December 1983 and April 1984. Immediately after the last two contact classes, they will be writing JEE-1984 staying in IIT-Madras. A nominal fee of Rs.75 will be collected from the participating students for the entire coaching programme.
The Institute also has a weaker sections cell which monitors the progress of the Scheduled Caste and Scheduled Tribe students and their problems - academic and non-academic. In the case of academic problems, the cell arranges tutions for the academically weak students by either the faculty members or by the senior students. A senior member of the faculty is the chairman of the cell and a separate office is created for this purpose. In addition, the Institute also conducts the remedial classes for the academically weak students. However, the decision to conduct remedial classes depends on the individual departments and teachers concerned. These classes are generally conducted in the evening time or during the weekly holidays. The students from weaker sections and Foreign National category usually avail this programme. These classes are expected to provide an opportunity to cope with the academic pressure in the institute.

3.2 COLLEGE OF ENGINEERING, GUINDY (CEG)\(^\text{14}\)

3.2.1 Historical Context

The College of Engineering, Guindy owes its inception to Michael Topping, an astronomer and the Geographical and Marine Surveyor at the Presidency of Fort St.George (University of Madras, 1957:242). In 1789, Topping proposed to provide a permanent observatory for the accommodation of the company's astronomical instruments. Later, this took the form of a Survey School in 1794. In 1842, it was recognized that the Survey School was quite inadequate for the requirements of the Public Works Department and it was proposed to establish a College of Engineers, in connection with the Madras University, in which Civil Engineering should be taught. However, this proposal was rejected by the Honourable Court of Directors in 1843 on the ground that the condition of general education in the Presidency was not sufficiently advanced to warrant the establishment of a college for professional subjects (University of Madras, 1957: 244).

In 1847, the Government of India revived the question of starting the College of Engineers, and referred to the Madras Public Works Commissioners, who in turn recommended the establishment of a college at Madras on the model of one founded in

\(^{14}\) Hereafter, College of Engineering, Guindy is referred to as either CEG or College.
1847 at Roorkee. The College of Engineers was to train men for the various subordinate grades of the PWD and was to consist of three branches of which the first, for sub-engineers, was to be restricted to persons who had actually served as oversears; the second was for upper subordinates, and the third was for lower subordinates (University of Madras, 1957: 244). From 1859, the Survey School came to be called the civil engineering college. Further, in 1877, the college was affiliated to Madras University which was established in 1857. In 1894, the University of Madras instituted a degree in mechanical engineering and B.C.E was changed into the B.E. degree. The Madras University was the first in India to institute a degree in mechanical engineering (University of Madras, 1957: 227).

In 1904 the Reorganisation Committee recommended B.A. as the entrance qualification for the degree course. The Committee also recommended the shifting of the College from Chepauk to Guindy. In 1912, the qualification for admission was reduced to the Intermediate. The duration of the course for engineers was changed from 3 to 4 years and the college was transferred to its present premises at Guindy in 1920.

The degree course in electrical engineering was started in 1930. Degree courses in telecommunication engineering and highway engineering were introduced in the year 1945. The college started a new two-year course in civil engineering in 1947 for oversears so as to meet the demands of the Public Works Department. However, the course was abolished in 1950 as it was felt that this institution should concentrate only on the training of the engineering graduates appearing for the B.E. degree of the Madras University (University of Madras, 1957: 247).

On the introduction of the research degree in engineering by the University of Madras in 1935, members of staff of this institution availed themselves of the facilities offered and 'research' was a new feature added to the college. Further, a post-graduate course in public health engineering leading to the M.Sc. degree was instituted in the college in 1955. In 1956, three more post-graduate courses, namely, (i) hydraulic engineering and dam construction and design, (ii) structural engineering and (iii) electrical machine design were started. In 1958, the Civil Engineering Department had four well-equipped laboratories; Mechanical Engineering Department had two laboratories and a workshop and Electrical Engineering Department had five laboratories.
The College Library was perhaps the only technical library in Madras till late 50s with a large collection of latest engineering books and journals. The College was under the Director of Public Instruction and was affiliated to the Madras University. The functioning of the College was more or less carried out by the Board of Studies in Engineering of the Madras University, which recommends changes in the syllabus as well as any other matter relating to the courses of studies and instruction in the college. Women students were admitted in the college for the first time in 1940. Till 1957, only ten have graduated from the College and only one was on rolls in that year (University of Madras, 1957: 247).

However, on 4th September 1978, the Periagnar Anna University of Technology as a unitary university was created. It comprised the century old College of Engineering, Guindy; Madras Institute of Technology, Chrompet; and three departments of technology (chemical, textile and leather) and the School of Architecture of the University of Madras located in the Alagappa Chettiar College of Technology Campus, Guindy. Thus, the College of Engineering, Guindy has become the principal seat of the Periagnar Anna University of Technology established as per the Tamil Nadu Act No.30 of 1978. The College of Engineering, Guindy as the government institution, the Madras Institute of Technology (MIT) as a private autonomous institute and others are the erstwhile departments of the University of Madras.

The University was established with the following objectives:

(1) To provide facilities and offer opportunities for higher education in engineering, technology and allied sciences by instruction, training, research, development and extension and by such other means as the university may deem fit.

(2) To devise and implement a programme of education in engineering and technology and allied sciences that is relevant to the current needs of the

15 College of Engineering, Guindy (CEG) is the main campus of the Anna University where almost all the schools, departments and centres are located. In other colleges/institutes under Anna University, those departments which are not covered in CEG are generally located. The administration and day to day running of the CEG are one and the same. Even, annual reports, handbooks and any information on the individual colleges are not maintained separately, but under the unified Anna University. So, here in this chapter, CEG and Anna University are inseparable and are used to mean one and the same. However, information is provided separately for CEG and Anna University wherever it was possible.
society, alive to the long-term requirement and responsive to the anticipated changes and developments, in terms of breadth of diversity and depth of specialisation.

(3) To further the advancement of knowledge in engineering, technology and allied sciences, to prosecute and promote research; to disseminate and advance the knowledge thereon for the betterment of society and to bring about widespread awareness of the tools and methods continuously generated by the advances in engineering, technology and allied sciences.

(4) To serve as a centre for fostering cooperation and exchange of ideas between the academic and research community, on the one hand, and the industrial and government employers, on the other, and to promote entrepreneurship among the students.

In pursuance of the objectives stated above, the Periagnar Anna University of Technology (PAUT)\(^1\) has instituted and offered some new and diversified courses. They are B.E. in industrial engineering and B.E. (part-time) in electronics and communications engineering. By 1982, Anna University has become unique in the field of under-graduate education. It offered under-graduate programme in 18 areas of specialisation, the widest spectrum available in any single institution. Under a policy of selective diversification at the under-graduate level, a graduate degree programme was introduced in 1981. Another new course of B.E. in printing technology was offered from 1983-84. The Anna University is the first to offer a degree programme in printing technology in the entire country. In 1981, the University introduced for the first time B.E. programme in mining engineering. Further, during 1988-89, B.Tech programme in rubber technology was introduced.

From its traditional role as a centre of higher learning, teaching, research and development CEG has added a new dimension, namely, to be a service and resource institution for national development. To cope with this role, the university has launched upon innovative approaches to promote coordination among its constituent units and to ensure optimal utilisation of its human and physical resources. These innovations

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\(^1\) In 1982, the Government of Tamil Nadu, through an amendment to the University Act, has changed the name from Periagnar Anna University of Technology to 'Anna University'.
included the development and establishment of more departments and also centres of excellence.

Thus, the present academic structure of the Anna University consists of 14 Departments, 7 Advanced Centres, 5 specialised schools and one institution of national importance. The Departments are Aeronautical Engineering, Chemistry, Civil Engineering, Humanities and Social Sciences, Leather Technology, Management Studies, Mathematics, Mechanical Engineering, Mining Engineering, Physics, Production Technology and Textile Technology. The advanced centres are centre for environmental studies, crystal growth centre, centre for bio-technology, centre for new and renewable sources of energy, ocean data centre, Ramanujan computing centre and centre for water resources. The specialised schools of Anna University are school of Architecture and Planning; School of Computer Science and Engineering, School of Electrical and Electronics Engineering, School of Electronics and Communication Engineering and School of Instrumentation and Electronics. The only institute of national importance is the Institute of Remote Sensing.

In view of the substantial and sophisticated facilities available in the above departments, Anna University offers 21 under-graduate degree programmes, 36 post-graduate programmes, 5 post-graduate diploma programmes and 5 M.Phil degree programmes. The 21 under-graduate degree programmes include 13 eight- semester B.E./B.Tech Courses, 6 six-semester B.tech courses, one B. Arch Course of 10 semesters and one B.Sc. in applied geology of six semesters.

### 3.2.2 Enrolment

The first batch of students for the five year B.E., part-time B.E., B.Tech and post-graduate courses of the university were admitted in July, 1979. Initially, the undergraduate courses were offered in five branches, namely, civil, mechanical, electrical and electronics, electronics and communications and production engineering. In 1979-80, the admission was offered to 35 in civil, 136 in mechanical, 44 in electrical and electronics, 65 in electronics and communications and 15 in production engineering.\(^\text{17}\) Since 1978-

\(^{17}\) Another major development during 1980-81 was that the five year B.E. and B.Tech degree courses were structured as four year programmes.
19, the intake of students at both under-graduate and post-graduate levels increased considerably (Table 3.11).

The intake at the under-graduate level gradually increased from 760 in 1978-79 to 979 in 1992 and that at the post-graduate level from 472 in 1981 to 636 in 1987. The intake of students at the post-graduate level found to be 603 in 1992. Further, the intake of women also marked a considerable increase from 113 in 1981 to 279 in 1992. In percentage terms, the intake of women increased from 8.3 in 1981 to 17.63 in 1992.

However, the Vice-Chancellor's Report during the fourteenth convocation (1994) reveals that Anna University has the largest number of Women studying in engineering and technology courses in the country. For instance, out of a total enrolment of 5,131 students in 1994, about 893 are women students.

**TABLE 3.11**

*Intake of Students at Anna University (1978-1992)*

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Under-graduate</strong></td>
<td>760</td>
<td>889</td>
<td>899</td>
<td>731*</td>
<td>889</td>
<td>869</td>
<td>912</td>
<td>920</td>
<td>979</td>
</tr>
<tr>
<td><strong>Post-graduate</strong></td>
<td>472</td>
<td>439</td>
<td>481</td>
<td>465</td>
<td>514</td>
<td>565</td>
<td>636</td>
<td>603</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>1,361</td>
<td>1,338</td>
<td>1,212</td>
<td>1,354</td>
<td>1,383</td>
<td>1,477</td>
<td>1,556</td>
<td>1,582</td>
<td></td>
</tr>
<tr>
<td><strong>No. of women students</strong></td>
<td>--</td>
<td>113</td>
<td>125</td>
<td>155</td>
<td>130</td>
<td>139</td>
<td>189</td>
<td>242</td>
<td>279</td>
</tr>
<tr>
<td><strong>% of women</strong></td>
<td>--</td>
<td>8.30</td>
<td>9.34</td>
<td>12.78</td>
<td>9.60</td>
<td>10.05</td>
<td>12.79</td>
<td>15.55</td>
<td>17.63</td>
</tr>
</tbody>
</table>

*No intake of part-time B.E. students due to revision of curriculum to match with the full-time programme.

The distribution of total number of students in terms of their caste/tribe in all the years across all the branches in CEG is shown in Table 3.12. The number of students from Backward Classes form the chunk of the total number of students. Together with Most Backward Classes, they constitute more than 50 percent in all the branches and years of study. Students from Scheduled Castes are also in considerable number. Thus, the total strength of the reserved category students in CEG constitute around 80-90 percent of the total strength in all the branches.\footnote{Many reserved caste students in CEG have also got seats in the open competition without making use of their reservation facility. This is particularly true in the case of BCs and MBCs thereby increasing the total percentage of students with reserved caste background.}

The number of forward caste (non-reserved castes) students is very small in all the branches except in computer science where their number is considerable. In computer science, the non-reserved caste students constitute about 25-50 percent of the total students in the class. In branches like mining, printing technology, civil, electronics and communication, electrical and electronics, the reserved caste students form the large percentage. The presence of Scheduled Tribe students is not uniform across many branches of study and wherever they are present, their number is negligible. Thus, the composition of the B.Tech course in CEG is weighed heavily in favour of reserved castes.

Another aspect is the distribution of students in terms of gender (Table 3.13). The number of women in the B.E./B.Tech course of CEG is not very encouraging. In some branches, the number of women is not as insignificant as in others. For example, the number of women in the first and second years of computer science, in particular, and in all the years of electronics and communications engineering and electrical and electronics engineering, in general, is considerable. Except these, the participation of women in other branches of study across all the years is either nil or negligible.
TABLE 3.12
Enrolment in CEG by Branch of Study and Caste (1994-95)

<table>
<thead>
<tr>
<th>Branch of Study</th>
<th>First Year</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A  B  C  D</td>
<td>A  B  C  D</td>
<td>A  B  C  D</td>
<td>A  B  C  D</td>
<td>A  B  C  D</td>
<td>A  B  C  D</td>
<td>A  B  C  D</td>
<td>A  B  C  D</td>
</tr>
<tr>
<td>------------------------------</td>
<td>------------</td>
<td>-------------------</td>
<td>-------------------</td>
<td>-------------------</td>
<td>-------------------</td>
<td>-------------------</td>
<td>-------------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>1. Computer Science</td>
<td>18 22 27 60</td>
<td>15 29 23 67</td>
<td>5 27 27 59</td>
<td>11 37 17 65</td>
<td>11 30 21 62</td>
<td>11 37 18 65</td>
<td>10 37 18 65</td>
<td>10 37 18 65</td>
</tr>
<tr>
<td>2. Electrical and Electronics</td>
<td>14 28 17 59</td>
<td>15 30 23 68</td>
<td>11 37 17 65</td>
<td>11 30 21 62</td>
<td>11 37 18 65</td>
<td>10 37 18 65</td>
<td>10 37 18 65</td>
<td>10 37 18 65</td>
</tr>
<tr>
<td>3. Electronics and Communications</td>
<td>11 30 15 56</td>
<td>10 35 18 63</td>
<td>8 42 17 66</td>
<td>10 37 18 65</td>
<td>10 37 18 65</td>
<td>10 37 18 65</td>
<td>10 37 18 65</td>
<td>10 37 18 65</td>
</tr>
<tr>
<td>4. Mechanical</td>
<td>18 57 26 101</td>
<td>21 66 14 101</td>
<td>21 67 23 111</td>
<td>17 59 27 103</td>
<td>17 59 27 103</td>
<td>17 59 27 103</td>
<td>17 59 27 103</td>
<td>17 59 27 103</td>
</tr>
<tr>
<td>5. Civil</td>
<td>5 12 8 25</td>
<td>8 11 1 20</td>
<td>8 8 1 17</td>
<td>9 15 4 28</td>
<td>9 15 4 28</td>
<td>9 15 4 28</td>
<td>9 15 4 28</td>
<td>9 15 4 28</td>
</tr>
<tr>
<td>6. Industrial</td>
<td>2 9 4 15</td>
<td>3 13 2 18</td>
<td>1 6 8 15</td>
<td>4 8 5 17</td>
<td>4 8 5 17</td>
<td>4 8 5 17</td>
<td>4 8 5 17</td>
<td>4 8 5 17</td>
</tr>
<tr>
<td>7. Production</td>
<td>- 9 3 12</td>
<td>6 9 7 22</td>
<td>3 11 2 16</td>
<td>2 9 1 12</td>
<td>2 9 1 12</td>
<td>2 9 1 12</td>
<td>2 9 1 12</td>
<td>2 9 1 12</td>
</tr>
<tr>
<td>8. Printing Technology</td>
<td>4 9 2 15</td>
<td>4 13 4 21</td>
<td>8 12 3 23</td>
<td>8 5 5 18</td>
<td>8 5 5 18</td>
<td>8 5 5 18</td>
<td>8 5 5 18</td>
<td>8 5 5 18</td>
</tr>
<tr>
<td>9. Mining</td>
<td>1 17 4 22</td>
<td>3 9 12 -</td>
<td>4 11 1 16</td>
<td>3 6 - 9</td>
<td>3 6 - 9</td>
<td>3 6 - 9</td>
<td>3 6 - 9</td>
<td>3 6 - 9</td>
</tr>
<tr>
<td>Total</td>
<td>66 193 106 365</td>
<td>85 215 92 392</td>
<td>68 221 99 388</td>
<td>71 196 106 373</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: (1) A-SC/ST, B-BC/MBC, C-FC and D-Total.
(2) The data presented here pertain to the departments in CEG alone and not Anna University as a whole.
TABLE 3.13

Distribution of B.Tech Students in Terms of Gender CEG (1994-95)

<table>
<thead>
<tr>
<th>Branch of Study</th>
<th>First Year</th>
<th></th>
<th>Second Year</th>
<th></th>
<th>Third Year</th>
<th></th>
<th>Fourth Year</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>W</td>
<td>T</td>
<td>M</td>
<td>W</td>
<td>T</td>
<td>M</td>
<td>W</td>
</tr>
<tr>
<td>1. Computer Science</td>
<td>41</td>
<td>19</td>
<td>60</td>
<td>49</td>
<td>18</td>
<td>67</td>
<td>51</td>
<td>8</td>
</tr>
<tr>
<td>2. Electrical &amp; Electronics</td>
<td>48</td>
<td>11</td>
<td>59</td>
<td>52</td>
<td>16</td>
<td>68</td>
<td>48</td>
<td>17</td>
</tr>
<tr>
<td>3. Electronics &amp; Communication</td>
<td>41</td>
<td>15</td>
<td>56</td>
<td>43</td>
<td>20</td>
<td>63</td>
<td>50</td>
<td>16</td>
</tr>
<tr>
<td>4. Mechanical</td>
<td>95</td>
<td>6</td>
<td>101</td>
<td>100</td>
<td>1</td>
<td>101</td>
<td>109</td>
<td>2</td>
</tr>
<tr>
<td>5. Civil</td>
<td>21</td>
<td>4</td>
<td>25</td>
<td>9</td>
<td>11</td>
<td>20</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>6. Industrial</td>
<td>12</td>
<td>3</td>
<td>15</td>
<td>14</td>
<td>4</td>
<td>18</td>
<td>11</td>
<td>4</td>
</tr>
<tr>
<td>7. Production</td>
<td>10</td>
<td>2</td>
<td>12</td>
<td>18</td>
<td>4</td>
<td>22</td>
<td>13</td>
<td>3</td>
</tr>
<tr>
<td>8. Printing</td>
<td>11</td>
<td>4</td>
<td>15</td>
<td>17</td>
<td>4</td>
<td>21</td>
<td>20</td>
<td>3</td>
</tr>
<tr>
<td>9. Mining</td>
<td>22</td>
<td>-</td>
<td>22</td>
<td>12</td>
<td>-</td>
<td>12</td>
<td>16</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>301</td>
<td>64</td>
<td>365</td>
<td>314</td>
<td>78</td>
<td>392</td>
<td>327</td>
<td>61</td>
</tr>
</tbody>
</table>

Notes: 1. M = Men; W = Women; T = Total.
2. The data presented here pertain to the departments in CEG alone and not Anna University as a whole.

Source: Anna University, Annual Report, 1994-95, Guindy, Madras.
3.2.3 Excellence in CEG: Strategies and Concerns

(i) Admission Policy

The selection of students to the College of Engineering has undergone many changes over a period of two decades. Initially, the admission to the CEG was on the basis of marks in the qualifying examination and marks in the interview. However, a major policy decision was taken in 1984 to abolish the weightage for the interview. Rather, an entrance examination is to be conducted for the B.Tech programme. The qualifying examination and the entrance examination were given the weightages of 200 marks and 50 marks respectively for all the professional courses in Tamil Nadu. Thus, the admission procedure to professional courses in engineering, medicine and agriculture was changed by the Government of Tamil Nadu in 1984 and the entrance examination has become a pre-requisite for admission. Anna University was entrusted with the conduct of this entrance examination.

The admission procedure to Anna University underwent another change since 1993-94. From 1993-94 onwards, the weightage for the entrance examination was increased from 50 marks to 100 marks. It may be noted here that there is no minimum marks for passing in the qualifying examination.

Anna University conducts a common entrance examination for engineering, medicine and agriculture in mathematics, physics, chemistry and biology. The combination of subjects vary for the students seeking admission to different courses.\(^1\)

In 1992, about 24,144 candidates have appeared for the engineering course and 16,083 for medicine and another 13,912 for the agriculture.\(^2\)

\(^1\) For instance, a student seeking admission in engineering will take examination in mathematics, physics and chemistry and those for medicine will take biology instead of mathematics. The student can also appear in all the four to seek admission either of the three courses, viz., engineering, medicine and agriculture.

\(^2\) The statistics for 1993 and 1994 were divided in terms of those taking examination in different subjects, namely, mathematics, physics, chemistry and Biology. For instance, 32,744 candidates appeared in mathematics examination in 1993 and about 33,147 in 1994. Those appeared in biology were about 29,959 in 1993 and 30,028 in 1994. However, 44,505 in 1993 and 44,458 in 1994 have taken the examination in both physics and chemistry. Thus the increase over a period of one year is small and not very considerable.
(ii) Monitoring Student Progress

The credit system of evaluation was introduced during the year 1993-94. This system has enough flexibility for the students in the choice of courses and continuous internal evaluation. It enables the faculty to update the course contents to incorporate new ideas and trends in different disciplines and at the same time has reduced the burden of administering the examination system. All results are declared within four weeks of the examination.

The college recorded 93 percent success in the under-graduate programmes and 99 percent in the post-graduate programmes in 1992-93. Further, an analysis of the performance of the under-graduate students in 1989-90 reveals that as many as 24 percent of the students achieved first class with distinction and about 67 percent obtained first class and only 9 percent got the second class. Interestingly, none failed in the course. One contributory factor which facilitates a better performance by the students is the existence of a system of student advisers which fosters better student-teacher interaction and academic counselling and professional development.

The system of rewards to recognise the talents of the students also encourages them to strive for excellence. The university has instituted University gold medals for the first rank holders with no defaults in all the under-graduate courses and the post-graduate courses. In all, there are about 160 different types of scholarships, prizes and medals instituted in the university. Besides these scholarships, there are thirteen endowment medals for awards to meritorious students in different categories. Further, several students have won distinctions and honours for excellence in academic as well as extra-curricular activities. In addition, the Anna University received many distinctions in games and sports as well.

The placement and training cell was established in 1974 in CEG. This cell assists the graduates in finding suitable positions in industries, quasi-governmental organisations. This cell arranges training for students during the summer. The placement and training cell.

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21 Some of the prominent academic awards obtained by the students in 1993-94 are Rieter Award by Rieter Machinery Limited, Switzerland for an M.Tech student, first prize at Alchemy '93 held at REC-Trichy for 2 B.Tech students, National Technology Award of Government of India for three B.E. students and President's Gold Medal for an M.E. student, etc.
section corresponds with about 1020 manufacturing organisations. About 35 industries on an average conduct campus interviews, written tests and group discussions.

Table 3.14 shows the distribution of students registered and selected and the total percentage of those selected through the campus placement cell. It may be observed that there is a high demand for the industry oriented programmes of CEG. For instance, students in the branches like mechanical engineering, electronics and communication, production engineering and industrial engineering have been the most sought after along with the computer science and electrical and electronics engineering so far as job market is concerned. Civil engineering continues to be the least preferred branch.

TABLE 3.14

<table>
<thead>
<tr>
<th>Branch of Study</th>
<th>1989-90</th>
<th>1990-91</th>
<th>1992-93</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Regist.</td>
<td>Select.</td>
<td>%</td>
</tr>
<tr>
<td>1. Computer Science</td>
<td>45</td>
<td>38</td>
<td>84.4</td>
</tr>
<tr>
<td>2. EEE</td>
<td>40</td>
<td>28</td>
<td>70</td>
</tr>
<tr>
<td>3. ECE</td>
<td>45</td>
<td>38</td>
<td>84.4</td>
</tr>
<tr>
<td>4. Mechanical</td>
<td>90</td>
<td>70</td>
<td>80</td>
</tr>
<tr>
<td>5. Civil</td>
<td>15</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>6. Production</td>
<td>10</td>
<td>6</td>
<td>60</td>
</tr>
<tr>
<td>7. Industrial</td>
<td>10</td>
<td>9</td>
<td>90</td>
</tr>
<tr>
<td>8. Printing</td>
<td>12</td>
<td>6</td>
<td>50</td>
</tr>
<tr>
<td>Technology</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: The data presented here pertain to the departments in CEG alone and not Anna University as a whole.


(iii) Library Facilities

The total number of volumes in the library at the end of the year 1979-80 were 62,706 and, in 1989-90, it reached 95,698 volumes. Similarly, the number of books in the Book Bank increased from 2,210 in 1979-80 to 10,331 in 1989-90. The expenditure on library was Rs.1.18 million in 1979-80 and Rs.1.37 million in 1984-85. The Anna University estimated the per-capita student expenditure as Rs.270 per year in 1980-81 and that in 1984-85 was Rs.369 per year.
(iv) Teachers

The sanctioned faculty strength of CEG is 540 comprising of 89 professors, 162 assistant professors and 289 lecturers and others. The teaching faculty are ably supported by supporting staff, both technical and non-technical. Several members of the faculty have availed the incentive of undertaking faculty exchange programme to work in industrial establishments during vacation periods. Another important aspect is that about 50 percent of the teachers possess doctoral level qualifications. Further, a total of 14 faculty members have participated in major international conferences for presenting research papers during 1993-94. In addition, 30 faculty members availed long-term fellowship for post-doctoral research and other training funded by organisations such as DAAD, ICTP-Italy, Indo-Swiss Programme, ALIS Programme of U.K., etc. Moreover, the teachers are active in participating in seminars and conferences and in publication work. For instance, while nearly 250 papers from various departments of the College were published/presented in 1984, about 340 research papers were published by the faculty members in national and international journals and 151 research papers were presented in conferences, seminars and symposia besides 11 book type publications in 1992-93.

(v) Institutional Cooperation and Foreign Collaboration

Another aspect through which the Anna University tries to achieve excellence is by fostering close formal and informal academic and research relationships with a number of neighbouring scientific and research institutions such as Central Leather Research Institute, Structural Engineering Research Centre, Society for Applied Microwave Electronics Engineering and Research, Institute of Mathematical Sciences, IIT-Madras and M.S.Swaminathan Research Foundation, resulting in mutual advantages for extensive research activities and use of sophisticated facilities.

Further, a proposal was submitted in 1977 for modernisation of various laboratories in the college with the assistance from the Federal Republic of Germany. This proposal was modified to cover other institutions also and a comprehensive development programme for assistance was submitted in 1982. The two professors deputed by the Government of Federal Republic of Germany (FRG) visited Anna
University in 1982. This has culminated in the Indo-FRG Agreement for the project entitled, "Modernisation of Training Areas at Anna University in Electronics and Communications, Industrial Engineering and Process Control Instrumentation," in 1987 with a contribution of 11.4 millions from FRG. Further, Overseas Development Authority (ODA), UK, gave assistance to the Printing Technology Department for faculty and equipment enhancement in 1987. MOUs are also signed by Anna University with many industrial giants like SPIC for establishing Bio-Processing Lab in the Centre for Bio-technology, etc.

(vi) Consultancy and Sponsored Research

Again, there is enormous increase in the volume of the sponsored research and consultancy work from 1981 to 1993. While 35 consultancy works were undertaken fetching an income of nearly 0.5 million in 1981, about 86 consultancy jobs were taken in 1983 and turnover for this was 1.03 million. Similarly, about 48 sponsored research projects of worth 14.4 millions were undertaken in 1987, whereas in 1992-93 the number of sponsored research projects went up to 79 and the total worth of the projects to 118.2 millions.

The College promotes interactions with a variety of industries through its industrial associate schemes. The consulting and testing services and faculty exchange programmes are also undertaken with specific industries or groups of industries or with industry associations. Major examples of such arrangements entered into by Anna University are South Indian Sugar Research Foundation, Indian Finished Leather Manufacturers Exporters Association, Indian Institute of Architects, Torrent Pharmaceuticals, DRDL, C-DAC, SPIC, CII, Madras Refineries Limited, etc.

Anna University continues to receive significant levels of support from the Government of Tamil Nadu and Government of India as well as from several national level organisations, as block grants, plan and non-plan schemes and special research grants. The levels of support from such sources for the year 1992-93 were as follows:

1. Government of Tamil Nadu (Block Grant): Rs.82 millions
2. UGC (Plan Scheme) : Rs.14.2 millions
3. Ministry of Human Resources Development: Rs.19.1 millions
4. 79 sponsored research projects from different state and central government departments, ministries and other funding agencies amounting to Rs.118.2 millions.

3.2.4 Concern for Equality

Initially, the policy of reservation was applicable only to the Scheduled Castes and Backward Classes. About 18 percent of seats were reserved for Scheduled Castes and about 30 percent for the Backward Classes. However, the category of Most Backward Classes (MBCs) was introduced in 1989 and was given an additional 20 percent reservation in all the professional colleges including Anna University. Further, the reservation for Scheduled Tribes is also new as it was introduced only in 1991. Only one percent of seats are reserved for Scheduled Tribes in Anna University. Therefore, the total percentage of reservations in Anna University is 69 percent which is the highest anywhere in the country.

Another important measure is the setting up of an SC/ST Cell in the University in 1989 to focus on the problems of weaker sections. Further, there is an SC/ST Committee for which the Vice-Chancellor is the Chairman and all the Deans and Directors are the members of the Committee.22

The CEG also conducts a few remedial extra classes for the academically weak students to provide them an opportunity to cope with academic pressure. However, the conduct of the remedial course is not taken up uniformly at the college level. It is the discretion of the individual teacher and the department to offer a remedial or extra class in a particular course. Besides, there is no other programme/mechanism to monitor the progress of the weaker section students.

Thus, though CEG has taken interest in implementing the policy of reservation by providing 69 percent reservation of seats to SCs, STs, BCs and MBCs, the specific measures for improving their academic performance and for the non-academic problems are virtually non-existent.

22 However, there is no report either of the Committee or of the SC/ST Cell so far on the plight of SC/ST students in the University.
3.3 SUMMARY

This chapter gives the profiles of both IIT-Madras and CEG (Anna University). While IIT is one of the six institutes of national importance in higher technical education managed by the Central Government, CEG is a state level college of reputation under the Government of Tamil Nadu. Both the institutes offer graduate, post-graduate and doctoral programmes in several branches of study and specialisations in the emerging areas of technology and engineering. Both the institutes have semester system and the under-graduate programme is run in eight semesters. Both the institutions have a very strong foundation in basic sciences and engineering.

However, there are differences between the two institutes in terms of their strategies to achieve excellence and equality in their institutes. The differences are mainly visible in the objectives, admission policies, courses of study, evaluation methods, workshop training, infrastructural facilities, teachers, reward systems. The preceding chapters describe and compare the perceptions of students on various aspects of equality and excellence.