Proceedings of the Thirteenth Meeting of the All-India Council for Technical Education

held at

New Delhi on 30th April, 1960

MINISTRY OF SCIENTIFIC RESEARCH & CULTURAL AFFAIRS
GOVERNMENT OF INDIA

MSR&CA—1

PRINTED BY THE MANAGER, GOVERNMENT OF INDIA PRESS, FARIDABAD, 1961

ALL-INDIA COUNCIL FOR TECHNICAL EDUCATION

Minutes of the 13th Meeting held on 30th April, 1960 at New Delhi

The 13th meeting of the All-India Council for Technical Education was held on the 30th April, 1960, at 11-00 A.M. Professor Humayun Kabir, Minister for Scientific Research & Cultural Affairs, presided over the deliberations.

The following were present :—

1. Prof. M. S. Thacker	Educational Adviser (Tech.) to the Government of India
Members of Parliament	
2. Shri P. R. Ramakrishnan	Lok Sabha
Ministries of Government of India	
3. Brig. N. Sen Gupta	Ministry of Defence
4. Shri S. P. Mahna	Ministry of Finance
5. Shri S. Abdul Qadir (Accompanied by Shri Raj Nath)	Ministry of Labour & Employment
6. Shri Mahmood Butt	Ministry of Steel, Mines & Fuel (Deptt. of Mines & Fuel)
7. Shri B. C. Mathur	Ministry of Steel, Mines & Fuel (Deptt. of Iron & Steel)
8. Shri P. D. Chawla	Ministry of Works, Housing and Supply
9. Shri M. Hayath	Ministry of Irrigation and Power
10. Shri R. Krishnaswamy	Ministry of Railways
11. Shri A. C. Ramachandani	Ministry of Information and Broadcasting
12. Shri H. P. Sinha	Ministry of Transport & Communications (Deptt. of Transport)
13. Shri T. R. Mantan	Ministry of Transport & Communications (Deptt. of Communications & Civil Aviation)
14. Shri S. Mullick	Ministry of Food and Agriculture
15. Shri H. N. Sethna	Deptt. of Atomic Energy
16. Shri V. R. Narasimhan	Central Board of Irrigation and Power
17. Shri R. Prasad	Ministry of Home Affairs

State Governments

18. Shri C. V. D. Murthy	Andhra Pradesh
19. Shri Radhika Das (Accompanied by Deputy Director of Technical Education)	Assam
20. Shri D. L. Deshpande	Bihar
21. Shri V. V. Gopalakrishna Iyer	Kerala
22. Shri S. D. Sharma	Madhya Pradesh
23. Shri J. C. Abraham	Madras
24. Shri Anna Rao Ganamukhi	Mysore
25. Dr. H. B. Mohanty	Orissa
26. Shri Suraj Mal	Punjab
27. Shri V. G. Garde	Rajasthan
28. Shri Bhagwan Swarup	Uttar Pradesh
29. Dr. D. M. Sen	West Bengal

Industry & Commerce

30. Shri B. F. Goodchild	Associated Chambers of Commerce of India
31. Shri Bharat Ram	-do-
32. Prof. G. M. Nabar	Employers Federation of India
33. Shri G. Y. Mangrulkar	-do-
34. Prof. M. P. Gandhi	Federation of Indian Chambers of Commerce and Industry

Labour

35. Shri B. K. Nair	Indian National Trade Union Congress
36. Shri P. Subbaramaniah	National Federation of Indiarn Railwaymen

University Grants Commission

37. Dr. C. D. Deshmukh

38. Dr. B. D. Laroia

Association of Principals of Technical Institutions (India)

39. Dr. T. Sen

Professional Bodies

40. Shri M. P. Chitale	Institute of Chartered Accountantss

Nominees of Government of India

41. Dr. S. R. Sen Gupta

Chairmen of Regional Committees (Ex-officio)

42. Lala Shri Ram	Northern Regional Committee

Chairmen of All India Boards of Technical Studies (Ex-officio)

43. Dr. V. K. R. V. Rao	Commerce
Lala Shri Ram (See No. 42)	Textile Technology
44. Shri N. K. Mitra	Engineering & Metallurgy
45. Shri S. H. Parolkar	Architecture & Regional Planning

Secretary

46. Shri G. K. Chandiramani

Dr. A. N. Khosla, Member, Planning Commission, and Shri K. L. Joshi, Director (Education), Planning Commission attended by special invitation.

The following members were unable to attend :—

1. Shri K. G. Saividain	Educational Adviser to the Government of India

Members of Parliament

2. Shri Ganpati Ram	Lok Sabha
3. Shri Jaspat Roy Kapoor	Rajya Sabha

Planning Commission

4. Shri T. N. Singh

Ministries of Government of India

5. Dr. B. D. Kalelkar	Commerce & Industry

State Governments

6. Shri T. N. Tolani	Bombay
7. Shri G. A. Mukhtar	Jammu & Kashmir
8. Shri B. D. Bhatt	Delhi
9. Shri P. C. Saxena	Himachal Pradesh
10. Shri N. M. Patnaik	Tripura
11. Shri S. D. Bahuguna	Manipur

Industry & Commerce

12. Shri T. R. Gupta	All India Organisation of Industrial Employers
13. Shri Kanchanlal C. Parikh	-do-
14. Shri A. M. M. Murugappa Chettiar	Federation of Indian Chambers of Commerce and Industry

Labour

15. Shri Michael John	Indian National Trade Union Congress
16. Shri Shanta Ram S. Twado	Hind Mazdoor Sabha

Central Advisory Board of Education

17. Col. B. H. Zaidi

Inter-University Board of India

18. Dr. A. L. Mudaliar

National Institute of Sciences of India

19. Prof. S. K. Mitra

National Council for Rural Higher Education

20. Shri T. S. Avinashilingam Chettiar, M.P.

Association of Principals of Technical Institutions (India)

21. Shri V. Lakshminarayanan

Professional Bodies

22. Shri D. P. R. Cassad	Institution of Engineers

Nominees of Government of India

23. Shri Fazal I. Rahimtoola

Chairmen of Regional Committees (Ex-officio)

24. Shri J. J. Ghandy	Eastern Regional Committee
25. Shri Kasturbhai Lalbhai	Western Regional Committee
Dr. A. L. Mudaliar (See No. 18)	Southern Regional Committee

Chairmen of the All-India Boards of Technical Studies (Ex-officio)

26. Dr. G. P. Kane	Chemical Engineering & Chemicaal Technology
27. Prof. V. N. Adarkar	Applied Art
Shri J. J. Ghandy (See No. 24)	Management

The Chairman welcomed the members of the Council to the meetinag and delivered his inaugural address. A copy of the address is aat Annexure I.

The Council thereafter proceeded with the consideration of the agendda (Annexure II).

Item No. 1 :—**To confirm the minutes of the 12th meeting of the Councicil**

It was reported that the minutes of the 12th meeting held at Neww Delhi on 13th April, 1959, had been circulated to the memberrs. Shri C. V. D. Murthy had suggested deletion of the first para of thae

minutes on Item No. 11 relating to "recognition of architectural studies and giving them grants". The Chairman had decided that the following be deleted from the minutes circulated :

> "The Council noted with regret the action of the Andhra Government in starting an architectural diploma course in 1951 without the prior intimation or concurrence of the All-India Council for Technical Education".

The minutes, as circulated, with the above change were confirmed.

Item No. 2 :—**To report the action taken on the recommendations/decisions of the Council made at the 12th meeting**

Common Examination for Admission to Engineering Colleges

The Council noted that common admission examination for entry into the second year of the Five-Year Integrated Courses had been organised by the Higher Technological Institutes at Kharagpur and Bombay. The Council recommended that the question of holding common examinations for admission to all the engineering colleges should be pursued with the State Governments and other authorities concerned.

A suggestion was made that experience of actual work in an industry for a specified period may be made a compulsory pre-requisite for entry into an engineering college. The Council was of the view that such a requirement would not be necessary for every course and, in any case, in the present conditions in the country, the course would not be a feasible measure.

Teachers for Technical Schools

Lala Shri Ram suggested that it should be made compulsory for the industry, if necessary by legislation, that it sends its technologists to educational institutions on a part-time basis to help in teaching, both with a view to overcoming the shortage of technical teachers in the institutions and to make available to the teaching institutions the experience of technologists in industry.

The Council was of the view that greater participation by men in industry should be secured by all means, but it should be ensured that the right type of men will be made available to the teaching institutions.

The Council noted the action taken on the other recommendations made at its 12th meeting.

Item No. 3—**To report the reconstitution of the Co-ordinating Committee**

In view of the creation of the new State of Gujerat, that State would be represented on the Co-ordinating Committee during the period 1-7-1961 to 30-6-1962. With this observation, the Council recorded the report.

Item No. 4 :—**To report the important decisions taken by the Co-ordinating Committee since the last meeting of the Council**

Minimum age limit for admission

The Council noted that ultimately when the new pattern of education

at the secondary level is introduced throughout the country, students from schools will be coming out at the age of 17+. The Council was of the view that it would be appropriate then that the minimum age of entry into the engineering degree courses should be fixed at 17 +. That will also be the age for entry into the 3-Year Science or Arts Courses in the various Universities. The Council agreed that at present the minimum age limit may be fixed at 16+ as recommended by the Co-ordinating Committee, but felt that this should be regarded as a transitional measure.

The Council further noted that in some of the Universities, the date for the purpose of reckoning the age was not 1st July as recommended by the Co-ordinating Committee, *e.g.* in Delhi University the crucial date is the 1st October. The Council was of the view that there should be uniformity in regard to this matter. Since the question affected all institutions in the country, including the Science and Arts Colleges. The Council requested the University Grants Commission to deal with the question. Pending consideration of the matter by the University Grants Commission, the Council accepted the suggestions made by the Co-ordinating Committee that 1st July may be taken as the crucial date for determining the age for the purpose of applying the age limit in engineering and technological institutions.

Mining Engineering Training

The Council noted that the Co-ordinating Committee at its meeting held in March 1960 had approved a proposal for the setting up of a Directorate of Practical Training which will organise, supervise and coordinate the practical training of mining students in the country as a whole. On the recommendations of the Council, the Central Government had given grants to a number of institutions for organising training facilities for degree and diploma courses in mining. The students trained at these institutions can find employment only if they pass certain examinations prescribed by Government to qualify as Mines Managers, and the fulfilment of the conditions of eligibility for sitting at these examinations required practical training for a specified period after leaving college. There were many problems which confronted the students and the institutions in this connection, and the Council therefore considered it important and urgent that the Directorate of Practical Training should be set up quickly.

It was pointed out that the first batch of students from institutions which had started recently on the recommendations of the All-India Council for Technical Education will be coming out this year. With some difficulty, the institutions had been able to get the mining organisations to agree to provide practical training facilities, but the latter had made it clear that no residential accommodation would be provided by them for the trainees. Private accommodation was also not available. In these circumstances, the only solution was that the mining organisations or Government should build houses or hostels for trainees, otherwise the mining industry would not be able to fill up the positions of Mines Managers in future. The Council recommended that, pending the setting

up of the Directorate of Practical Training, this question should be looked into urgently by the Ministry of Steel, Mines and Fuel, in conjunction with the Ministry of Scientific Research & Cultural Affairs, and immediate steps should be taken to make arrangements for residential accommodation for the trainees.

The Council was further of the view that some concession should be given in the fulfilment of the requirement of practical training, having regard to the education and training of mining graduates and diploma holders in the educational institutions. At present, no concession was given in this behalf, and whether a person came from college or from outside, he had to put in the same period of practical training to be eligible to sit for the Mines Managers Certificate Examinations.

Subject to the above observations, the Council recorded the report on the important decisions taken by the Co-ordinating Committee.

Item No. 5 :—**To nominate a representative of the All-India Council for Technical Education on the Board of Governors of the School of Town & Country Planning**

The Council nominated Shri A. D. Pandit, Joint Secretary, Ministry of Works, Housing and Supply, as its representative on the Board of Governors of the School of Town & Country Planning, New Delhi.

Item No. 6 :—**Admissions to technical institutions in excess of sanctioned intake**

A view was put forward that students failing in the first year examination should not be readmitted to the college; such students should be asked to take to other vocations. The Council noted that its previous recommendation in this matter, which had been conveyed to all the institutions, was that a student entering the engineering and technological institutions should be required to pass the 1st year examination within two years of his joining and if he failed to do so, his name should be struck off the rolls of the college concerned. It was felt by some of the members that it would be hard on the students if on account of one failure, they were to be deprived of the opportunity to go through technological courses. The failure could be due to personal difficulties or other *bona fide* reasons.

After a great deal of discussion, the Council decided that a statistical study of failures should be made to enable the Council to consider the question whether one attempt or two attempts should be permitted to students to pass the 1st year examination.

The Council noted that the regulations of some of the Universities required compulsory attendance at a college by the student if he failed in a University examination. There were other cases where although such attendance was not considered obligatory, the authorities felt that the provision of facilities to failed students to attend lectures and do laboratory work was most desirable to enable them to appear for the

examination again. Some members felt that despite the possible obligations to failed students, nothing should be done which would result in depriving new entrants of the facilities they were legitimately entitled to. Sometimes the failures were large, and it was not possible for an institution to accommodate all the failed students without detriment to the instruction of new entrants.

Recognising that situations in different places and at different times would vary, and, therefore, flexibility in this matter was of paramount importance, the Council recommended that technical institutions may be permitted to exceed the sanctioned intake up to a limit of 10% to enable the institutions to provide facilities to failed students, but that no rigid formula or regulation be laid down restricting either the admission of failed students or of new entrants. The Principal of the institution concerned should be given latitude to regulate the admissions of failed students and new entrants in the manner considered best in the circumstances, but in no case the total admissions should exceed the sanctioned intake by 10%.

Item No. 7 :—**To consider the proposals received from the State Government of Bombay regarding various aspects of technical education**

(a) Estimates of cost of furniture required for a Polytechnic

The Council noted that the list of furniture drawn up by the Government of Bombay included several items which were not normally required for such institutions. Further, Polytechnics elsewhere had been able to provide the required furniture within the present sanctioned estimate of Rs. 35,000. The Council was, therefore, of the view that sufficient justification did not exist for any large scale revision in the estimates as proposed by the Government of Bombay. The Council, however, recommended that in individual cases, having regard to the cost of timber and labour charges and other factors in a particular area, the concerned Regional Committee may consider requests for small revisions.

The Council desired that the Secretariat should frame a list of furniture with approximate cost of guidance for the authorities of the polytechnics.

(b) Inclusion of expenditure incurred by a Polytechnic on award of scholarships as an approved item of expenditure for recurring grant

The Council noted that the number of scholarships available in the country was generally small. The recent scheme of the Centre for award of merit-cum-poverty scholarships had helped but was still inadequate in comparison to the demand. Having regard to these considerations, the Council recommended that expenditure incurred by technical institutions on the award of scholarships instituted by them should be considered as an approved item of expenditure for the purpose of payment of recurring grants provided the scholarships are given on considerations of merit and poverty, and not on the basis of any other factors.

Item No. 8 :—**To report the progress of schemes of technical education under the Second Five-Year Plan**

A reference was made to the good work done by the Administrative

Staf College at Hyderabad, which started in December, 1957. The Central Government had promised and paid an *ad hoc* recurring grant of Rs. 3 lakhs per annum for a period of three years (1957–60). The College was now receiving applications for entry into its courses far in excess of the number that it could admit, and there was evidence of increasing interest of industry and commerce in the activities of the College. The Central Government, the State Governments and the State Projects were also deriving benefit from the courses run at the College. It was suggested that, as in the case of private industry and commerce, which pay subscriptions to the College for its working, Government should also pay adequate subscriptions every year. Without such Governmental support, the College would find it difficult to maintain itself and in any case, since the Government was also deriving benefit from the College, it was only right that it should make annual financial contributions for the running of the College. It was also suggested that the Central Government should continue to pay a sum of Rs. 3 lakhs annually for the next five years.

The Council strongly recommended the continuance of financial support to the Administrative Staff College at Hyderabad with an annual recurring grant or subscription. The Council was not in a position to make specific recommendations regarding the amount which should be paid annually and desired that this should be decided after a scrutiny of the full details pertaining to the running of the College. The Council further desired that a comprehensive note on this College and its working should be placed before it at the next meeting.

Item No. 9 :—**To receive the report of the working group on technical education for the Third Five-Year Plan**

The Council agreed generally with the approach made by the Working Group in the formulation of the Third Five-Year Plan of Technical Education and endorsed the various recommendations made by the Group subject to the following observations :—

(a) The attempt to inculcate into the students a scientific outlook, and to develop their interest in engineering, should not be confined to curricular studies at the elementary and secondary education stages. Opportunities should be provided to the young student to develop his aptitude for science and engineering through extra-curricular activities.

(b) Increased provision should be made in all technical institutions for equipping libraries and for providing other reading materials to the students on an adequate scale.

(c) The problem of shortage of teachers should be tackled vigorously and with a sense of urgency. The various measures that should be taken in this regard should be formulated after a careful analysis of the present position.

(d) In the existing situation, it does not seem practicable to expand institutions into large-sized units for student enrolments of 3,000–6,000. If, however, such an expansion has to be tried

on a very limited scale, the matter should be examined carefully before further steps are taken. Before the expansion is undertaken at any particular institution, definite criteria to ensure maintenance of standards of instruction and satisfactory administration of the large unit should be laid down. Unless these criteria could be rigidly enforced, no institution should be expanded into a very large unit.

The Council considered it essential that teaching staff in technical institutions should be given adequate scales of pay and other fringe benefits, particularly residential accommodation. The Council also emphasised the necessity of providing scholarships and loans to ensure that on account of financial difficulties, meritorious students would not be denied the opportunity of undergoing technical courses. For the improvement of quality of Technical Education, the Council considered that measures designed to attract to technical institutions staff of the right calibre and bright students was a *sine qua non.*

The Council endorsed the recommendation of the Co-ordinating Committee made at its meeting held in March, 1960, that grants should be given to institutions for the construction of staff quarters with the stipulation that the income derived from rents may be utilised for the purposse of meeting the recurring expenditure, due allowance being made for thiis in determining the recurring grants to be given by Government.

The Council also stressed the necessity of making adequate provision in the Third Five-Year Plan for developing institutions providing courses in commerce and applied arts.

Item No. 1 :—**To consider the proposal of the Government of Orissa for starting a Regional Engineering College at Rourkela**

Having regard to the fact that Rourkela was fast developing into a centre of industrial activity, the Council recommended that a Regional College should be established at that place.

With the establishment of a college at Rourkela, 9 out of the 15 States will each have a regional college. The Council recommended that the question of establishing regional colleges in the remaining States should be considered on merits of each proposal that may be received.

Item No. 11 :—**To consider the scheme of establishment of a Foundry and Forging Institute**

The Council recommended for acceptance the scheme prepared by its Expert Committee for the establishment of a Central Institute for Foundry and Forging and suggested that it be located at Ranchi.

The Council was, however, of the view that the Expert Committee should reconsider the question of the intake capacity of the proposed institute after taking into account the firm requirements of industry for trained personnel in this field. Preference should be given to candidates sponsored by industry for training at the institute.

In the opinion of the Council, such institutions in specialised fields should not prepare students for degrees of Universities, but should give their own certificates.

Item No. 12 :—**To consider a note on the reservation of seats for Scheduled Castes, Scheduled Tribes and Backward Classes for admission to Engineering and Technological Institutions in the country**

The Council considered this item together with item No. 15. The recommendations of the Council may be seen under that item.

Item No. 13 :— **All-India Boards of Technical Studies**

(A) Board of Studies in Engineering and Metallurgy

(i) Duration of Practical Training for the Award of National Certificate or State Diploma

The Council accepted the recommendation of the Engineering Board that practical training for a period of two years should continue to be prescribed for the award of National Certificate in Engineering, with the proviso that experience gained by a candidate during his employment, if found satisfactory, may count towards the requirement of practical training. The Council was of the view that the State Boards of Technical Education should also prescribe similar conditions in respect of practical training for the award of State Diplomas (which are equivalent in standard to the National Certificate).

(ii) Diploma Course in Automobile Engineering

The Council approved a scheme of one year Automobile Course formulated by the Board.

(iii) Draftsmanship Courses

The Council approved the scheme of draftsmanship courses in (i) Civil Engineering and Architecture, and (ii) Electrical and Mechanical Ergineering, formulated by the Board, which will be run in the polytechnics in the country.

Shri Abdul Qadir, Director General of Resettlement and Employment, informed the Council that a number of training centres working under the aegis of the Ministry of Labour were providing draftsmanship courses. He suggested that the National Council for Vocational Trades should be consulted in the matter for provision of these courses at institutions other than the polytechnics.

The Council was informed that the question of continuance or otherwise of draftsmanship courses at the industrial training centres was being discussed between the Ministry of Labour and Employment (Shri Abdul Qadir) and the Ministry of Scientific Research and Cultural Affairs (Prof. Thacker). The Council suggested that Prof. Thacker may look into this question with a view to settling it, and if found necessary by him, a Joint Committee consisting of representatives of the Council and the National Council for Vocational Trades may be appointed.

(B) Chemical Engineering Board

Five-Year Integrated Course

The Council approved the scheme of Five-Year Integrated Course in Chemical Engineering formulated by the Board.

Item No. 14 :—**Regional Committees**

Northern Regional Committee

Re-distribution of seats

The Council noted that the Northern Regional Committee had approved the proposals regarding re-distribution of seats between the different branches of engineering at the Punjab Engineering College, Chandigarh and Ramgarhia Polytechnic as under :—

Branch of Engineering	Existing intake	Proposed intake
Punjab Engineering College, Chandigarh		
Civil Engineering	120	90
Mechanical Engineering	60	75
Electrical Engineering	60	75
	240	240
Ramgariha Polytechnic, Phagwara		
Civil Engineering	120	90
Mechanical Engineering	30	45
Electrical Engineering	30	45
	180	180

Government Central Textile Institute, Kanpur

The Council approved the recommendation of the Regional Committtee for developmental expenditure as under, for the proper conduct of Degree and full-time certificate courses at the Institute :—

Non-recurring

(*a*) Buildings .. .. Nil

(*b*) Equipment .. .. Rs. 2,36,514

Recurring

For salary of additional staff .. .. .. Rs. 88,650

In this connection, it was suggested that facilities for instruction at the degree level in textile technology should be properly co-ordinated between the Government Central Textile Institute, Kanpur and the Indian Institute of Technology, Kanpur to be set up by the Central Government.

Centrally sponsored Polytechnics in Rajsthan

The Council approved the recommendation of the Regional Committee to establish two Centrally-sponsored Polytechnics in Rajasthan at Kotah and Alwar. The Council further approved the following expenditure for the estabilshment of each of the two polytechnics. Each of the polytechnics will have an intake of 120 students in the first year.

Non-recurring

	Rs.
Buildings (53,800 sq. ft. plinth)	8,07,000
Equipment	8,00,000
Library	50,000
Furniture	35,000
TOTAL ..	16,92,000
Recurring (Nett)	2,63,300
Hostel Loan for 180 students	4,96,800

Government Polytecnic, Bikaner

The Council approved the recommendation of the Regional Committee for expenditure as under for the establishment of a Government Polytechnic at Bikaner, under the State's Second Five-Year Plan. The Polytechnic will admit 120 students into the 1st year—Civil 30, Mechanical 45 and Electrical 45.

Non-recurring

	Rs.
Buildings (53,800 sq. ft. plinth)	8,07,000
Equipment	8,00,000
Library	50,000
Furniture	35,000
TOTAL ..	16,92,000
Recurring (Nett)	2,63,300
Hostel Loan for 180 students	4,96,800

Audio-Visual Equipment for Polytechnics

The Council approved the recommendation of the Regional Committee for a grant of Rs. 8,000 to be given each of the following institutions for Audio-Visual equipment :—

(i) Technical College, Dayalbagh, Agra ;

(ii) S. D. Polytechnic, Baijnath ; and

(iii) Mehar Chand Polytechnic, Jullundur

Ajmer Polytechnic

The Council approved the recommendation of the Regional Committee for an additional building expenditure of Rs. 99,190 to enable the State Government to provide the necessary instructional accommodation. The Council noted that a sum of Rs. 3,96,800 had been recommended for the Civil Engineering/Diploma Course and a sum of Rs. 3,21,015 had been recommended for courses in Mechanical Engineering

and Electrical Engineering. The additional sum of Rs. 99,190 which will bring the total cost to Rs. 8,17,005 is necessary on account of the increased cost of construction.

Conversion of ceremonial halls into Drawing Halls

The Council approved the recommendations of the Regional Committee that the Ceremonial Hall constructed at the Government Technical Institute, Gorakhpur, may be converted into Drawing Hall by providing wooden partition at the cost of the State Government and the expenditure incurred at the hall may be regarded as admissible item under the developmental programme for Central grants.

As regards the Government Textile Institute, Kanpur, the Council recommended that the Ceremonial Hall may continue as a regular auditorium and the State Government may construct a separate Dye House for the Institute at their own cost.

Admission of diploma holders to degree courses in engineering and technology

The Council was of the view that separate degree courses should be organised either on full-time or on a part-time basis for diploma holders in engineering. Further the State Boards may also consider the question of instituting advanced diploma courses for such students.

Additional recurring grants for polytechnics

The Council approved the recommendation of the Regional Committee for revision of estimates of recurring grants to nine institutions as under :—

Name of the institution	Intake	Courses offered	Recurring grant previously recommended	Revised recurring estimates	Remarks
(1)	(2)	(3)	(4)	(5)	(6)
			Rs.	Rs.	
1. Technical College Dayalbagh, Agra.	90	Electrical & Mechanical Engineering.	72,000	1.07,000	
2. P.M.V. Technical institute Mathura.	(*a*) 40	Mechanical	34,000	86.640	Applicable so long as the Institute offers Mechanical Engineering course only with an intake of 40 students.
	(*b*) 120	Civil, Electrical & Mechanical Engineering.	2,26,550	2,47,550	Applicable when the Institute starts offering Civil, Electrical & Mechanical Engineering courses with an intake of 120 students.

(1)	(2)	(3)	(4)	(5)	(6)
			Rs.	Rs.	
3. Hevett Engg. School, Lucknow.	(a) 120	Civil Engineering.	30,000	78,800	
	(b) 120	Civil Electrical & Mechanical Engineering.	2,01,990	2,12,990	Applicable on the introduction of Electrical & Mechanical Engineering courses.
4. Civil Engg. School, Lucknow.	(a) 120	Civil Engineering.	27,000	78,800	
	(b) 120	Civil Electrical & Mechanical Engineering.	2,01,990	2,12,990	Applicable on the introduction of Electrical & Mechanical Engg. courses.
5. Guru Nanak Engineering College, Ludhiana.	120	Civil, Electrical & Mechanical Engineering.	33,900	70,000	For the year 1956-57 only, this is the grant originally recommended by the Visiting Committee for diploma courses in Civil, Electrical & Mechanical Engg. and degree course in Civil Engg. only. In 1956-57 the College was offering these courses.
6. National Institute of Engineering, Hoshiarpur.	120	Civil, Electrical & Mechanical Engineering.	61,000	2,12,990	—
7. Ramgarhia Polytechnic, Phagwara.	180	Civil, Electrical & Mechanical Engineering.	*	2,46,490	*The Visiting Committee had stated in its report that the salary scales of the staff should be revised and suitably qualified staff should be appointed. However, the Visiting Committee made no recommendations regarding the recurring grants.
8. Mehr Chand Polytechnic, Jullundur.	120	Civil, Electrical & Mechanical Engineering.	75,000	2,12,990	—
9. S.D. Polytechnic, Baijnath.	60	Civil Engineering.	30,300	83,100	—

Guru Nanak Engineering College, Ludhiana

The Council approved the proposal to grant an additional loan of

Rs. 46,000 to Guru Nanak Engineering College, Ludhiana, for the construction of students hostel. The total loan for the hostel construction for 230 students will now amount to Rs. 6,90,000. The Council further accepted the proposal of the Regional Committee for additional expenditure of Rs. 54,814 on the instructional buildings for the College. The increase is necessitated by the higher cost of construction (Rs. 12 per sq. ft. as against Rs. 10 per sq. ft. estimated originally).

Item No. 15 :—**To consider a note on the standard of candidates admitted to Technical Institutions**

The Council considered this note along with Item No. 12 relating to reservation of seats for Scheduled Castes and Scheduled Tribes and Backward Classes.

The Council noted that by and large the standard of admissions had not been affected beyond permissible limits on account of reservations and generally the standard was high. The Council also accepted the necessity of providing facilities for classes or groups of people who on account of circumstances in the past were educationally and/or socially backward. At the same time, the Council considered it essential that in providing facilities to such groups talented persons from amongst other classes are not denied admissions to technical institutions. Another important considerations was that there should not be too large a gap in the standard of attainment of students admitted in the reserved seats and those admitted to the open seats.

Having regard to the above consideration the Council recommended (i) that the number of reserved seats at technical institutions for all classes or groups of students from backward sections should not ordinarily exceed 25% of the total number of seats available, with provision for marginal adjustments not exceeding a further 10% of such seats; in the case of states or territories with special problems; (ii) that the students admitted in the reserved seats should have a certain minimum standard of marks; (iii) that the gap in the marks secured at the qualifying examination by the last person admitted in the reserved seats and that in the open seats should not exceed 10%; and (iv) that the reservations may continue in accordance with the above principles for a period of 10 years and thereafter they should be gradually reduced over the next 10—15 years, so that at the end of 20—25 years the reserved seats are reduced to nil.

The question of reservation of seats for persons outside the State in which a particular college is situated, was also considered. The Council was of the view that in future when there will be at least one engineering college in each of the States, there should be no need to reserve seats for individual States; some provisions would however be necessary for the Centrally Administered Areas which do not have their own institutions. The Council further noted that in some of the State Institutions, the regulations do not permit any person from outside the State to seek admission. The Council was of the view that such restrictions should be done away with. The institutions should be open to students from all over the country and it should be the endeavour of the institutions to admit some students from outside the State.

Item No. 16 :—**To consider the proposals received from the Government of Andhra Pradesh regarding various aspects of technical education**

Sandwich course in Mechanical Engineering for Training of Foremen as prepared by the All-India Council for Technical Education

The Council noted that the scheme of sandwich courses had been formulated by an expert committee which had examined carefully the requirements of industry and other organisations for well-trained practical men. The courses were being conducted successfully at two centres, namely Calcutta and Madras. The Council was therefore of the view that no new situation had arisen in which the scheme required modification, at this stage. However, the points raised by Commodore Lele may be examined in the Ministry of Scientific Research & Cultural Affairs.

Structural changes in the existing diploma courses of the National Certificate standard under Civil, Mechanical and Electrical Engineering to suit the needs of modern industry

The Council decided to remit the proposals of the Government of Andhra Pradesh in regard to structural changes in the existing diploma courses to the appropriate Boards of Technical Studies.

Practical Training for Degree and Diploma holders coming under the purview of stipendiary schemes of the Government of India

The Council agreed that practical training given to graduates and diploma holders should be under proper supervision and according to a carefully prepared programme. The Council was of the view that satisfactory arrangements had generally been made in the establishments where Government of India stipendiaries were receiving their training. However, the Regional Officers may examine the arrangements in any particular case where it was reported that the arrangements were not satisfactory and they should persuade the establishments to bring about the necessary improvements.

Item No. 17 :—**To consider the proposal of the Central Water and Power Commission for the establishment of an Institute of Hydro-dynamics**

While agreeing generally that facilities for advanced studies and research in Hydro-dynamics and related fields should be developed within the country, the Council did not favour the present proposal of the Ministry of Irrigation and Power for the establishment of a separate institute of Hydro-dynamics with functions that included award of degrees and other academic distinctions. The necessary facilities could be developed by enlarging the scope of the activities of the Central Water & Power Research Station at Poona. The Research Station should be developed mainly for research but provision may be made also for advanced training in Fluid Mechanics, Hydraulic Irrigation, Hydraulic structures and related fields. While the training conducted should not be with a view to conferring post-graduate degrees and other qualifications, Universities may

recognise the Research Centre as a suitable place of study for candidates who wish to supplicate for the Doctorate.

*Item No.*18 :—**To consider the report of the Annual Inspection Committee for the Water Resources Development Training Centre, Roorkee University, Roorkee, for the year 1959-60**

The Council recommended that in order that the facilities created at Roorkee University in Water Resources Development may be fully utilised, the State Governments and other authorities should be requested to depute their officers for training in larger numbers. The Council wished to emphasise that since the facilities were specially created for the benefit of the country as a whole, the State Governments should bear the expenditure on lodging, boarding, etc. of the officers who are deputed by them for the training.

The meeting terminated with a vote of thanks to the Chair.

ANNEXURE I

Speech delivered by

PROFESSOR HUMAYUN KABIR

Minister for Scientific Research and Cultural Affairs and Chairman of the All-India Council for Technical Education on the occasion of the 13th Meeting of the All-India Council for Technical Education held on 30th April, 1960 at New Delhi

Friends,

I have great pleasure in welcoming you to this thirteenth meeting of the All-India Council for Technical Education. This meeting today has a specia importance, as we are already in the last year of the Second Five-Yea Plan and are now engaged in formulating the Third Five-Year Plan. I provides, therefore, a suitable opportunity to review the progress male in the field of technical education in the last ten years, consider the problems which still await solution and propose measures for the successful implementation of a programme of technical education best suited to the changing requirements of free India. There has been during this perod, as you are all aware, an almost phenomenal expansion in technica education in terms of quantity. The time has now come when we mus place greater emphasis on qualitative improvement and the provisio of more diversified courses needed by the rapid and increasing industrialisation of the country.

A dealed report has been placed before you regarding the progress of techncal education during the first four years of the current plan. I will, tierefore, content myself with only a very brief survey. It had originall been proposed that, of the four Higher Technological Institutes to be esablished in India, the second and the third should be started during tie Second Plan period, and the fourth deferred to the Third Plan. Ve have in fact already started the second and the third at Bombay and Macras and the fourth at Kanpur will begin functioning from July-August tiis year.

As yu are aware, the Institute at Kharagpur has already been in existence for nine years and has at present an under-graduate enrolment of about 1,500 and nearly 250 post-graduate students. The Bombay Institute stared functioning in July 1958, in temporary accommodation but has alreaty moved to its own building at Pawai. In addition to first year degree courses in five subjects, it has organised eight post-graduate courses and has on its staff 12 Professors from the U.S.S.R. and other countries in addition to two Russian translators. The Institute at Madras started functionng in July 1959 and is the first institution to start

the five-year integrated course from its very inception. Three German Professors and two German technicians are serving in the Institute and a number of Indian teachers have been sent to Germany for advanced studies. The construction of the buildings of the Institute has started on a fine plot of 613 acres of land given free of cost by the Government of Madras at Guindy near the Raj Bhavan. The Institute at Kanpur will begin with six branches in under-graduate courses and will be housed temporarily in the accommodation provided by the Harcourt Butler Technological Institute. We are hoping that construction of its own building will start very soon on the spacious area offered by the State Government free of cost. Six eminent educationists from the U.S.A. visited India last year and have submitted their report about the pattern of education at this Institute. Professors from the States will be available to us in the initial stages of this Institute.

This expansion of facilities will not, however, be fully effective unless we provide an adequate number of scholarships to poor but meritorious students. In my view, the provision of scholarships and the improvement of status and salary scales of teachers are the two most important factors for improving the standard of education, whether it be in the technical or any other field. The value of an institution depends solely on its students and teachers. Devoted teachers and able students can to a large extent overcome the handicap of shortage of accommodation and equipment. Without good teachers and earnest students, not even the best buildings and equipment can give us the desired results. The provision of scholarships is specially necessary in technical education, as such education is expensive and beyond the reach of many poor but deserving students. In fact, our acceptance of the democratic form of Government entails that such scholarships must be provided on a scale which will ensure that no able student is denied the opportunity of studies merely because of poverty.

I am happy to say that we have introduced in 1959-60 the scheme of Merit-cum-Means Scholarships under which 1,039 scholarships have been awarded to students studying in the Diploma or the First Degree courses in technical institutions. Details of the scheme will be found in the report already submitted to you, and I am sure you will agree that there must be a considerable expansion in their number during the Third and subsequent Plans. Our aim must be to ensure, as is already the case in advanced countries like the U.K., the U.S.A. or the U.S.S.R., that no able student is denied the opportunity of higher studies because of lack of means.

You will remember that we have in the past regeretted the shortage of teachers in almost all technical institutions. Inadequate salaries have been one of the major reasons for this, and I informed the Council last year that the Government of India have in principle accepted the proposal of the Council to upgrade these salary scales, so that teachers in technical institutions will receive salaries that are comparable to those of the higher administrative services of the Government. The Government of India have agreed to bear for a period of five years the entire additional

experses involved in the improvement of the salaries of teachers of all technical institutions. All State Chief Ministers accepted the proposal in principle, but I regret to say that in spite of our best efforts, only six State Governments have till now formally accepted the scheme. I feel that this is a question which must be settled immediately. Unless we can ensure that the existing institutions are adequately staffed, it would be not only futile but may be harmful to try to expand facilities for technical education at the present accelerated rate. And yet, the present state of development in the country demands that the programme of expansion of technical education must not only be maintained, but increased. I would therefore earnestly plead that all State Governments who have not yet implemented the scheme should give effect to it at least before the beginning of the next academic year.

In order to meet this shortage of teachers in technical institutions, we have instituted last year a scheme of training under which 109 brilliant graduates in Engineering and Technology have been selected and sent for training to five centres viz., Indian Institute of Technology, Kharagpur, the University of Roorkee, Roorkee, College of Engineering, Poona, the College of Engineering, Guindy and the Bengal Engineering College. Details of the scheme will be found in the report submitted to you, but its essential features are participation in the teaching work of the institution as understudies to senior Professors and further studies in a post-graduate course or programme of research. Apart from the arrangements made in India we have also sent a large number of graduates to the U.S.A., the U.K., the U.S.S.R., and France for higher education and training.

There is one other question to which I would like to draw your special attention. This relates to the maintenance of proper standards in technical institutions while at the same time ensuring that all sections of the community receive their due share in technical education. The Constitution provides for reservation of seats for students belonging to the Scheduled Castes and the Scheduled Tribes. In addition, the Constitution empowers the State to give special facilities to other communities that are backward. The justification for such special treatment lies in the need and the desire to equalise opportunities for all. We have also to remember that ultimately the whole nation suffers if any section or group remains undeveloped or under-developed. In the modern world, technical education that is spread through the entire community is a condition not only for national progress but for national survival. At the same time we have to remember that technical education is expensive and we must therefore satisfy ourselves that the opportunities offered have been properly utilised by all entrants to technical institutions.

The Council desired that data on these and allied points should be collected from all institutions and analysed and major issues examined in detail. The information collected so far is interesting but not fully conclusive. There is however enough evidence to show that given the proper opportunity and training, students from so-called backward groups can catch up with students of the educationally more advanced sections of

the community. This is not surprising, for individuals rather than groups show marked variations in ability. There are fools in the most brilliant families and occasional geniuses among the most backward people. A more congenial atmosphere gives a better start to the individual and that is why students from educated and progressive sections have an initial advantage over students from less fortunate groups. Students from backward sections may require initially a little more encouragement and attention but in many cases, once these are provided, they are able to catch up with their more fortunate fellows and compete with them on more or less equal terms.

It appears to me that we have to ensure two things. On the one hand, individuals from certain sections of the community may require some special concessions in the beginning. On the other hand, such concessions must never become permanent, as permanent concessions have the effect of permanently damaging the initiative of those who get them. We should therefore frame a programme by which students from less fortunate sections of the community may be given special facilities for an initial period of about ten years with the condition that these must be withdrawn in a regular and graduated manner over the next ten or 15 years so that at the end of 20 to 25 years, the period needed to rear a new generation, all special preferences must disappear fully and completely.

Among the various subjects which we will consider today, perhaps the most important is the formulation of the Third Five-Year Plan of Technical Education. A Working Group set up some time ago to assist in the preparation of the Third Plan has submitted its recommendations to the Planning Commission. This group has estimated that on the basis of the investment proposed for all sectors of our economy under the Third Five-Year Plan, we would need about 48,000 degree holders and 82,000 diploma holders in Engineering and Technology if the projects are to be carried out fully. The various schemes of technical education already undertaken by us will produce about 49,000 degree holders and 76,000 diploma holders during the Third Plan. We need not therefore anticipate any serious shortage of technical personnel for the execution of the Third Plan projects, as the gap between the demand and the supply in respect of diploma holders can be filled up by expanding the training capacity of the existing institutions.

The Third Plan has been correctly described as the take-off period of our economy. We can confidently expect that expansion in industry and agriculture will be much more rapid during the fourth than in any of the earlier Plan periods. We have therefore to plan for the expansion of technical education during the Third Plan period in order to meet the requirements of increased personnel of the Fourth Plan. The working group has suggested that during the Third Plan period, admissions to degree courses should be increased by 6,000 bringing the total to 20,000 admissions per year and at the diploma level by 15,000 in order to bring the total admissions to 40,000 per year. I shall have something to say about this in a moment, but before I do so, I would draw your attention to an important but novel recommendation made by the Working Group in this connection.

The Group has suggested that the student enrolment in a degree college should be greatly increased. We have not so far thought of institutions with student enrolment of over 1,500 for the under-graduate courses. In fact till very recently, most of our institutions had an enrolment of only about 500. During the last three to four years the training capacity of all institutions has been considerably expanded but even so the maximum size of any college that we have established so far is for an under-graduate enrolment of 1,500. The Council must examine carefully whether the proposed three or four-fold expansion of the colleges would be desirable from the point of view of efficiency and economy. I am sure the Council will agree that it is better to produce one able and well qualified engineer than five inefficient ones.

I will now return to the Working Group's proposals for the Third Plan. When the Second Five-Year Plan was first formulated, the provision made for additional intake at degree and diploma level was about 600 at the degree and about 2,500 at the diploma level. It was proposed that five Engineering Colleges and 21 Polytechnics should be established for the purpose. This estimate proved inadequate and had to be revised upwards thrice, first by about 3,000 at the degree and 9,000 at the diploma level. A second and third revision became necessary and the final figure for the Second Plan was 12,980 for the degree and 26,957 for the diploma level, as against the original Plan proposal of 7,232 at the degree and 12,792 at the diploma level. In fact the position already reached is over 11,000 at the degree and almost 21,000 at the diploma level. This is an indication of the rate at which the demand for trained personnel is increasing and proves how difficult it is to assess accurately the demands of a growing economy.

In order to provide for this expansion in facilities for technical education, the original proposal of colleges and polytechnics had to be drastically revised. The original plans had provided for the establishment of five Colleges and 21 Polytechnics. To meet the enlarged requirements, this was increased to 24 colleges and 91 Polytechnics in addition to considerable expansion of facilities in existing institutions. According to the final allocation, it was proposed that eight Engineering Colleges and 47 Polytechnics should be established by the States themselves. Of these, seven Colleges and 35 Polytechnics have already started functioning. Seven Colleges and 20 Polytechnics were to be set up with the assistance of private agencies and the entire number has been established. In addition, the Coordinating Committee at its meeting held in March 1960, has approved in principle the establishment of two more Engineering Colleges and one more Polytechnic in the private sector. The Council has also recommended that the Centre must provide the entire capital cost for the establishment of eight new Regional Engineering Colleges in addition to a new College of Engineering to be established at Delhi. The Council also recommended the establishment of 27 Polytechnics by the Central Government as regional institutions. Of these, one college and four Polytechnics have already started and the rest are expected to start functioning before the end of 1961.

In view of our experience during the Second Plan, I am a little sceptical about the proposal to increase the facilities at the Degree level by only 6,000 and at the Diploma level by only 15,000 during the Third Plan. In the case of the Second Plan, the original target of admission into Engineering Colleges had to be increased from 7,232 to 12,980 and from 12,792 to almost 27,000 in the case of Polytechnics. With the increasing tempo of our industrial development, I am very doubtful if a provision of 6,000 additional places at the Degree level and 15,000 at the Diploma level would be adequate for our requirements during the Fourth Plan.

The number at the Degree level might just suffice, especially if we provide for better utilisation of highly trained scientific personnel. At present we are sometimes using degree holders for services which are rendered by Diploma holders in other countries. At the Diploma level, I am almost certain that the proposed figure of 15,000 additional places will have to be considerably revised. The changes necessary to make the pattern of education in engineering and technology more consistent with the requirements of modern industry, will also call for much more enlarged provision at the diploma level. When India became free the intake at the degree and diploma level was roughly equal. By the end of the First Plan, there were roughly three Polytechnic students to two degree students. At the end of the Second Plan, this ratio is likely to be 2 : 1. In industrially developed countries, the ratio is hardly ever less than 4 : 1. In view of this, our aim should be to provide a ratio of at least 2.5 : 1 at the end of the Third Plan. This would mean increasing facilities for polytechnic education up to 50,000 admissions per year instead of the 40,000 recommended by the Working Group.

It has also been worked out that the completion of the projects begun during the Second Plan would itself require a minimum provision of Rs. 110 crores during the Third Plan. In addition, if we have to provide for 6,000 places at the degree level and 15,000 at the diploma level, as estimated by the Working Group, the provision for full-time courses would alone require Rs. 40 crores. An additional Rs. 26 crores would be required to provide scholarships to meritorious but needy students, introduce the improved salary scales that have already been accepted, and provide for part-time courses at the degree and the diploma level. The Planning Commission has agreed that a total provision of Rs. 176.89 crores is the minimum required for technical education in the Third Five-Year Plan, if we are to provide the personnel required to carry out our programmes and provide the necessary expansion for personnel in the Fourth Plan. Any reduction of this figure can be only at the cost of reducing the proposed targets and this is likely to lead to a shortage of trained personnel that may endanger the execution of all our industrial and agricultural programmes.

Another factor has to be borne in mind. Apart from catering to the need for technical personnel, which is bound to grow in the course of the next few years, these polytechnics provide a very useful corrective to the unbalanced growth of arts and science colleges. It is a matter for some concern that while there has been an almost phenomenal increase

in the provision of technical education, the overall figures indicate that arts colleges have increased proportionately even more. As elementary education becomes universal and secondary education more widespread, an increase in facilities at higher levels is inescapable. It is far better that this increase should be in the field of technical education, specially at the polytechnic level rather than in science or arts colleges.

A third consideration is based on the principles of equity. By the end of the Second Plan, out of the 320 districts in India, 117 districts will have been covered with at least one polytechnic each and about 200 for the whole country. Of the remaining 203 districts, it seems inescapable that at least 113 more districts should be provided with a polytechnic each before the end of the Third Plan. This would yield an additional intake for the country as a whole of 14,700 places and if they are properly phased, the expense in addition to what has already been provided would be only Rs. 8.26 crores. It is for consideration whether, for this relatively small amount of Rs. 8.26 crores, we should deny polytechnics to 113 districts which need and lack them.

You will remember that on the recommendation of the Council, the Government of India appointed last year the Committee on Post-Graduate Education in Engineering and Technology and the Committee on Commerce Education, with Professor Thacker and Dr. V. K. R. V. Rao respectively as Chairmen. These Committees are concerned more with the improvement of quality than the aspect of quantitative expansion, and as such, they reinforce the recommendation already made by the Council for placing greater emphasis on qualitative improvement than quantitative expansion. It may be necessary to make some modifications in our programmes when these reports are received, but I do not think that it will mean any material alteration of the outline now under consideration of the Council.

I must not take any more of your time but before I conclude I must once again pay a tribute to the Council for its contribution to the expansion of technical education in the country. Without the devoted work of the Council and its many Committees, the phenomenal expansion and improvement in technical education that have taken place would not have been possible. The members of the Council and its Regional and Visiting Committees have not only advised us with regard to specific schemes placed before them but have initiated many innovations for improving the quality of technical education in the country. On behalf of the Council and on my own behalf, I must also thank all the experts who have served on our Committees and Boards and given freely of their time, thought and energy in the service of the Nation.

I extend to you once again my warm welcome and request you to take up consideration of the Agenda.

ANNEXURE I

ALL-INDIA COUNCIL FOR TECHNICAL EDUCATION

13th Meeting

Date : 30th April, 1960.

Time : 10.00 A.M.

Place : Commission Room 'G', Vigyan Bhavan, Maulana Azad Road, New Delhi.

AGENDA

Item No. 1 :—To confirm the minutes of the 12th meeting of the Council.

Item No. 2 :—To report the action taken on the recommendations/decisions of the Council made at the 12th meeting.

Item No. 3 :—To report the reconstitution of the Coordinating Committee.

Item No. 4 :—To report the important decisions taken by the Coordinating Committee since the last meeting of the Council.

Item No. 5 :—To nominate a representative of the All-India Council for Technical Education on the Board of Governors of the School of Town & Country Planning, New Delhi.

Item No. 6 :—Admission to technical institutions in excess of the sanctioned intake.

Item No. 7 :—To consider the proposals received from the State Government of Bombay regarding various aspects of Technical Education.

Item No. 8 :—To report the progress of Technical Education Schemes under the Second Five-Year Plan.

Item No. 9 :—To receive the report of the Working Group on Technical Education for the Third Five-Year Plan.

Item No. 10 :—To consider the proposal of the Government of Orissa for starting a Regional Engineering College at Rourkela.

Item No. 11 :—To consider the scheme of establishment of a Foundry and Forging Institute.

Item No. 12 :—To consider a note on the reservation of seats for Scheduled Castes, Scheduled Tribes and Backward Classes for admission to Engineering & Technological Institutions in the country.

Item No. 13 :—All-India Boards of Technical Studies :—

(a) Matters for report

(b) Recommendations for consideration

Item No. 14 :— Regional Committees :—

(a) Matters for report

(b) Recommendations for consideration

Item No. 15 :—To consider a note on the standard of candidates admitted to Technical Institutions.

Item No. 16 :—To consider the proposals received from the State Government of Andhra Pradesh regarding various aspects of technical education.

Item No. 17 :—To consider the proposal of the Central Water and Power Commission for the establishment of an Institute of Hydrodynamics.

Item No. 18 :—To consider the report of the Annual Inspection Committee for the Water Resources Development Training Centre, Roorkee University, Roorkee for the year 1959-60.

ItemNo.—1 : **To confirm the minutes of the 12th meeting of the Council.**

The minutes of the 12th meeting of the All-India Council for Technical Education held on the 13th April, 1959 were circulated to the members. In pursuance of the comments received from Shri C. V. D. Murthy on item No. 11 regarding "Recognition of Architectural Studies and giving of grants", the first para of the proceedings *viz.*,

> "The Council noted with regret the action of the Andhra Government in starting an architecture Diploma Course in 1951 without the prior intimation or concurrence of the All-India Council for Technical Education".

was deleted

The above amendment was circulated to all the members of the Council.

As no further comments have been received from the members the proceedings as amended may be deemed to have been confirmed by circulation.

Item No. 2 :—**To report the action taken on the recommendations/decisions of the Council made at the 12th meeting.**

The AllIndia Council for Technical Education held its 12th meeting on the 13th April, 1959. The action taken on the recommendations/decisions of the Council is reported below :—

Recommendations/Decisions	Action taken
1. Common Examination for admission to Engineering Colleges	
The Council noted that the State Governments had not responded favourably to its suggestion for holding the common entrance	As a first step, it has been decided to hold a common test for the admission of I.Scs. to the second year of five-year integrated

examination on regional basis for admission to Engineering Colleges in the country and desired that its Secretariat should collect information and submit a detailed note to enable the Council to make definite and detailed recommendations on the problems pertaining to admissions including the reservation of seats for any specific classes or categories of candidates.

courses at the Higher Technological Institutes at Kharagpur and Bombay. The question of organising a common test for the admission of Higher Secondary pass candidates to the first year of the courses is under consideration.

Pending the submission of the note and its consideration, the Council decided that common admission examinations might be organised for the Higher Technological Institutes set up by the Central Government and such other central and state institutions as might agree to join the scheme voluntarily. The question of holding such tests on Regional basis for the entire country was held in abeyance.

As regards the reservation of seats etc., a detailed note is placed before the Council under Item No. 12 of the Agenda.

2. Degree Courses for the benefit of Diploma holders

The Council decided that Universities be requested to formulate Degree Courses for the benefit of those who had passed the National Certificate courses or equivalent State Diploma Courses. The Council further decided that wherever the Universities did not provide such facilities, the State Boards might formulate Advanced Diploma Courses of equivalent standard.

The Universities and the State Boards have been addressed in the matter.

3. Post-graduate courses in Landscape Architecture

In view of the growing importance of Landscape Architecture, the Council endorsed the recommendation of the Board that post-graduate courses in Landscape Architecture be organised at the School of Town & Country Planning, Delhi and the Indian Institute of Technology, Kharagpur.

The recommendations of the Council have been sent to the institutions concerned. The institutions have been requested to start the courses, as soon as possible.

4. Training abroad for teachers of Architectural Schools

The Council generally agreed with the views of the Architecture Board that teachers in Architectural schools should be sent abroad for further training to acquaint themselves with the latest developments and that in addition to the United Kingdom, centres like Italy, Mexico and Japan should also be considered for training. The Council also recommended that efforts might be made to secure such training facilities under the International Aid Programmes.

The recommendations of the Council have been noted. The institutions concerned have been requested to send proposals for securing training facilities for their staff members under the Foreign Aid Programmes during 1960-61.

5. Report of the Sub-Committee of University Grants Commission regarding incorporation of Engineering Schools as Departments of Universities

The Council expressed the view that in the present situation, it was neither practicable nor necessary to incorporate Engineering Colleges as Departments of Universities.

The views of the Council have been communicated to the University Grants Commission.

6. Nomination of representative of the All-India Council for Technical Education on Merchant Navy Training Board

The Council nominated Shri B. Sen Gupta, the then Principal, Victoria Jubilee Technical Institute, Bombay, as its representative on the Merchant Navy Training Board.

Consequent on the transfer of Shri B. Sen Gupta as Director, Indian Institute of Technology, Madras, the Chairman of the All-India Council for Technical Education has nominated Prof. A. C. Roy, Principal, Bengal Engineering College, Howrah, as the representative of the Council on the Merchant Navy Training Board.

7. Training & Placement Officers

In view of the importance of organised practical training for technical students, the Council decided to request the University Grants Commission to consider its decision on the question of

After a reconsideration of the matter, University Grants Commission has agreed to the appointment of Placement and Training Officers.

appointment of Training & Placement Officers in the University Departments of Engineering.

8. Teachers for Technical Schools

The Council was of the view that greater collaboration should be brought about between the technical institutions and industry, both private and Government sponsored. Exchange of personnel would be of mutual advantage to both. Industry should provide part-time teachers to the educational institutions.

The State Governments have been addressed in the matter. As recommended by the Coordinating Committee on the first March, 1960, the Minister for Industry is being requested to write to private industry for their assistance to technical institutions.

9. Recommendations of the Regional Committees

The Council approved Schemes prepared by its Regional Committees for the development of 20 existing institutions, providing courses in Engineering & Technology, and for the establishment of 11 new institutions under the normal Development programme. The estimated cost of all the above development is Rs. 2,46,06,130 non-recurring and Rs. 43,62,126 additional recurring (ultimate). The Council recommended that grants in accordance with the approved pattern of assistance may be given for the above development. The Council also recommended that interest-free loans amounting to Rs. 57,59,500 may be given to institutions for the construction of students hostels.

The recommendations of the All-India Council for Technical Education in respect of non-University Institutions have been approved by the Central Government. In the case of University Institutions, the recommendations of the Council have been communicated to the University Grants Commission for necessary action.

10. Recommendations of the Post-graduate Development Committee

The Council accepted the scheme of research development in Engineering & Technology formulated by the Post-graduate Development Committee and recommended that grant of Rs. 5,43,400 non-recurring and Rs. 2,20,300 recurring per annum may be given to the institutions for the purpose.

11. Foundry & Forging Training Centre

The Council appointed an Expert Committee to work out the details for the Foundry & Forging Training Centre and to make recommendations on the question of location of the Centres at Ranchi or any other suitable place.

The Committee held two meetings *viz.* on 4th February, 1960 and 31st March, 1960. A separate note on the subject is placed before the Council under item No. 11.

12. Post-graduate Development Committee

The Council endorsed the decision of the Post-graduate Development Committee to set up a Commission to evaluate the progress of Post-Graduate Courses at different centres and to suggest suitable measures for their improvement and for the further development of Post-Graduate education in the country.

The Central Government have appointed the following Committee :—

1. Prof. M. S. Thacker (Chairman)
*2. Dr. A. N. Khosla
3. Dr. D. S. Kothari
**4. Dr. K. S. Krishnan
5. Dr. H. L. Roy
6. Prof. B. Sen Gupta
7. Dr. P. R. Ramakrishnan, M.P.
8. Dr. S. Bhagavantham
9. Shri G. K. Chandiramani
10. Dr. P. K. Kelkar, Member-Secretary.

The Committee has started its work.

NOTE—*Shri N.S. Gupchup has been appointed in place of Dr. A.N. Khosla who resigned.
**Dr. K.S. Krishnan has resigned.

Item No. 3:—**To report the reconstitution of the Co-ordinating Committee**

The All-India Council for Technical Education at its last meeting held on the 13th April, 1959, amended the Constitution of the Coordinating Commitee in order to provide for the representation of the States in each region, in rotation on a yearly basis.

The term of the office of the members of the Committee expired on the 8th February, 1959 in the normal course. However, as the reconstitution of the Committee could not be completed before that time, the term was extended up to the 30th June, 1959, with the approval of the Chairman.

The Coordinating Committee has now been reconstituted with effect from the 1st July, 1959. The Composition of the reconstituted Committee is given at Annexure–I.

Annexure to Item No. 3

List of Members of the Co-ordinating Committee of the All-India Council for Technical Education (for the term from 1-7-1959 to 30-6-1962)

1. Prof. Humayun Kabir, (Chairman)
   Minister for Scientific Research & Cultural Affairs and Chairman, All-India Council for Technical Education.

2. Prof. M. S. Thacker,
   Educational Adviser (Technical),
   Government of India.

3. Chairman, (Ex-officio member)
   University Grants Commission,
   New Delhi.

4. The Financial Adviser, (Ex-officio member)
   (Scientific Research & Cultural Affairs),
   New Delhi.

Chairmen of the Regional Committees (Ex-officio members)

5. Shri J. J. Ghandy,
   C/o. Tata Iron & Steel Works,
   Jamshedpur.
   (Chairman of the Eastern Regional Committee)

6. Shri Kasturbhai Lalbhai,
   Pankoro's Naka, Ahmedabad.
   (Chairman of the Western Regional Committee)

7. Lala Shri Ram,
   22-Curzon Road, New Delhi.
   (Chairman of the Northern Regional Committee)

8. Dr. A. L. Mudaliar,
   Vice-Chancellor,
   Madras University, Madras.
   (Chairman of the Southern Regional Committee)

Chairmen of the Boards (Ex-officio members)

9. Dr. V. K. R. V. Rao,
   Vice-Chancellor,
   Delhi University, Delhi.
   (Chairman of the All-India Board of Technical Studies in Commerce).

10. Shi N. K. Mitra,
16,Hindustan Road.
Raibehari Avenue. Calcutta.
(Chirman of the All-India Board of Technical Stuies in Engineering & Metallurgy).

11. Dr.G. P. Kane,
Seror Industrial Adviser (Chemical),
Miistry of Commerce & Industry,
Deelopment Wing, New Delhi.
(Chirman of the All-India Board of Technical Stuies in Chemical Engineering and Chemical Teanology).

12. Lal Shri Ram,
22-Curzon Road, New Delhi.
(Chirman of the All-India Board of Technical Stuies in Textile Technology).

13. Shi S. H. Parelkar,
Meows House, Medows Street,
Foi, Bombay-1.
(Chirman of the All-India Board of Technical Stuies in Architecture & Regional Planning).

14. Shi V. N. Adarkar,
Pricipal,
J. J. Institute of Commercial Art, Bombay,
(Chirman of the All-India Board of Technical Stuies in Applied Art).

15. Shi J. J. Ghandy,
C/o Tata Iron & Steel Works,
Jamshedpur.
(Chirman of the All-India Board of Technical Stuies in Management).

16. **Representatives of Parliament of India (By rotation)**

(i) Shri Ganapati Ram, M.P. (1-7-1959 to 30-6-1960)
Village Nimaich, P.O.
Saur, District Banaras.

(ii) Shri Jaspat Roy Kapoor, (1-7-1960 to 30-6-1961)
M.P., Sheetla Gali,
Agra.

(iii) Shri P. R. Ramakrishnan, (1-7-1961 to 30-6-1962)
M.P., "Jyothi", A/36, Race
Course Road, Coimbatore
(South India).

17. Representatives of States in Northern Region (By rotation)

(i) Shri G. A. Mukhtar, Director of Education, Jammu & Kashmir, Srinagar. (1-7-1959 to 30-6-1960)

(ii) Shri V. G. Garde, Principal, Engineering College, Jodhpur. (1-7-1960 to 30-6-1961)

(iii) Deputy Minister for Industries, Uttar Pradesh, Lucknow. (1-7-1961 to 30-6-1962)

18. Representatives of States in Southern Region (By rotation)

(i) Shri C. V. D. Murthy, Director of Technical Education, Andhra Pradesh, Hyderabad. (1-7-1959 to 30-6-1960)

(ii) Minister for Education, Mysore, Bangalore. (1-7-1960 to 30-6-1961)

(iii) Minister for Education, Madras, Madras. (1-7-1961 to 30-6-1962)

19. Representatives of States in Eastern Region (By rotation)

(i) Minister for Education, Assam, Shillong. (1-7-1959 to 30-6-1960)

(ii) Dr. H. B. Mohanty, Additional Secretary, Government of Orissa, Political & Services (Planning Deptt.), Bhubaneswar. (1-7-1960 to 30-6-1961)

(iii) Minister for Education, West Bengal, Calcutta. (1-7-1961 to 30-6-1962)

20. Representatives of States in Western Region (By rotation)

(i) Shri T. N. Tolani Director of Technical Education, Bombay. (1-7-1959 to 30-6-1960)

(ii) Secretary, Education Department, Madhya Pradesh Government, Bhopal. (1-7-1960 to 30-6-1961)

(iii) Shri T. N. Tolani, Director of Technical Education, Bombay. (1-7-1961 to 30-6-1962)

21. Representative of other members of the Council
Shri M. P. Gandhi,
Jan Mansion,
Sir Pherozshah Mehta Road,
Fort, Bombay.

Nominees of the Chairman

22. Dr. A. N. Khosla,
Member,
Planning Commission,
New Delhi.

23. Dr. S. R. Sen Gupta,
Director,
Indian Institute of Technology,
Kharagpur.

NOTE : —The Chairman of the All-India Council for Technical Education would preside over the meetings of the Co-ordinating Committee whenever possible and during his absence, the Educational Adviser (Technical) to the Government of India would be the Chairman.

Item No. 4:—**To report the important decisions taken by the Coordinating Committee since the last meeting of the Council.**

Since the last meeting of the Council the Coordinating Committee held a meeting on the 1st March, 1960. The important decisions and recommendations of the Committee are as given below :—

(a) Admission of B.Scs. to degree courses in Engineering

The Coordinating Committee discussed the question of admission of B.Scs. to the 5-year integrated courses in Engineering and giving them exemption from a part of the courses. The question of reserving a certain number of seats at each institution for B.Scs. was also discussed. The Coordinating Committee set up a Sub-Committee consisting of the following members to examine the matter in detail and make final recommendations :—

1. Prof. M. S. Thacker (Chairman)
2. Dr. S. R. Sen Gupta
3. Dr. V. K. R. V. Rao
4. Shri A. L. Mudaliar
5. Shri R. N. Dogra
6. Lala Shri Ram
7. Shri J. J. Ghandy.

(b) Re-constitution of Boards of Technical Studies

The Boards of Technical Studies have been reconstituted for the triennium, 1st January, 1960—31st December, 1962. The constitution of each Board provides for a representative of All-India Council for Tech-

nical Education and four nominees of the Coordinating Committee excepting the Board of Management Studies which provides for five nominees of the Coordinating Committee. The Coordinating Committee appointed the representatives of All-India Council for Technical Education and its own nominees on the various Boards as shown at Annexure I. The Committee also appointed Shri J. J. Ghandy as the Chairman of the Management Board for the term 1960–62.

(c) Courses in Textile Technology

The Board of Technical Studies in Textile Technology had formulated schemes for the following courses in Textile Technology :—

(i) A 3-year composite course in weaving and spinning for the National Certificate or equivalent award.

(ii) A 4-year degree course in Textile Technology providing for specialisation either in spinning or in weaving.

The Coordinating Committee was of the view that specialisation at the first degree stage either in spinning or in weaving tended to restrict the scope of employment of graduates and the courses formulated by the Board may not give a broad-based training in the whole field of Textile Technology. The Committee, therefore, requested the Board to re-examine the matter.

(d) Applied Art Courses

The Coordinating Committee endorsed the recommendations of the Applied Art Board that efforts should be made to secure the services of some suitable experts in such fields as Exhibition Display, Graphic Reproduction, Typography, Publicity Design, etc. from the U.S.A. or U.K. or Germany or France under the various aid programmes, for the development of art education in the country. The Committee also endorsed the suggestion that a certain number of selected teachers from art institutions should be sent abroad for higher training.

The Committee accepted the recommendations of the Board regarding the development of facilities for training in industrial design at four selected institutions in the country. The Committee agreed that Sir Gorden Russel, Director General, Council of Industrial Design, Board of Trade, United Kingdom, may be invited to visit India for a short period to advise on this aspect of development.

The Committee approved the revised scheme of training in Printing Technology prepared by the Board. The scheme provides for a 3-year course of the National Certificate standard instead of the present 2-year course in the various branches of printing. The Committee also approved the development of the Regional Schools of Printing for the introduction of the revised certificate course.

(e) Minimum age limit for admission

The Coordinating Committee decided to recommend to technical institutions and Universities that a minimum age limit of 16 years may be prescribed for admission to the 5-year integrated degree courses in

Engineering. Having regard to the different dates of commencement of the sessions at the institutions, the Committee suggested that the 1st July of the year in which admission is sought may be the crucial date for the applicaton of the age limit. The Committee, further expressed the view that the upper age limit of 21 should not be rigidly enforced but may be relaxed in the deserving cases.

(f) Pedagogical training for technical-teachers of multi-purpose schools

The Committee approved a scheme of pedagogical training for technical teachers of multi-purpose schools prepared by an Expert Committee. The scheme provides for a 3-month course to be conducted at selected centres in cooperation with polytechnics and teachers' training colleges.

(g) Provision of students' amenities

The Committee agreed in principle that students' amenities such as canteens, cycle stands, common rooms, etc. should be included as admissible items of expenditure for the purpose of grants-in-aid. The Committee appointed a small Sub-Committee to work out the details of these items.

(h) Libaries for Technical Institutions

The Committee expressed the view that a well equipped library was essential to a technical institution in maintaining high standards. Due to a general rise in the prices of books, most institutions are hard put to it to equip their libraries satisfactorily. The Committee, therefore, approved a sugestion that the non-recurring grant for library should be increased from Rs. 75,000 to Rs. 2 lakhs in the case of institutions conducting degree courses and from Rs. 50,000 to Rs. 75,000 in the case of polytechnics.

(i) Staff quarters

The Committee was of the view that the provision of staff quarters at technical institutions was an essential measure for attracting and retaining right persons for the teaching profession. The Committee recommended that every effort should be made by the Central Government to assist technical institutions in the construction of staff quarters at least in the Third Plan period.

The Committee recommended that the terms and conditions of assistance for the construction of staff quarters should be drawn up by the Central Government in such a manner that the scheme was practicable. The normal method of giving interest-bearing loans and charging the current rate of interest on the entire amount was impracticable and, therefore, some other suitable formula was necessary. The Committee suggested for the consideration of the Government that the amounts required for the construction of staff quarters may be sanctioned as grants. The rents collected by the institutions may be utilised by them for their normal maintenance and development.

(j) Mining Engineering Training

The Coordinating Committee approved a scheme formulated by the Joint Committee of the All-India Council for Technical Education and the Steering Committee of the Coal Council of India for the National Certificate course in Mining and Mine Surveying. The scheme provides for three-year courses to be conducted on sandwich pattern between mining schools and mining industry.

The Committee approved a proposal for the setting up of a Directorate of Practical Training which will organise, supervise and coordinate the pratical training of mining students in the country as a whole. The Committee also endorsed the recommendations of the Joint Committee regarding the setting up of an independent Statutory Board for controlling examinations for Mine Managers and other mining personnel.

The Committee accepted a proposal that at least 10% of the seats both in degree and in diploma courses in mining at all institutions should be reserved for students of those states where such facilities did not exist.

(k) Equipment for Technical Institutions

The Chairman, All-India Council for Technical Education appointed some time back an Expert Committee under the Chairmanship of Lala Shri Ram to examine the entire question of equipment for engineering colleges and polytechnics; to revise the lists of equipment in the light of the present day requirements and to suggest measures to facilitate the procurement of equipment from indigenous and foreign sources. The Committee in a comprehensive report submitted recently, furnished a revised list of equipment for conducting degree and diploma courses in Engineering. The equipment included in the revised list was classified into two broad categories *viz.* (a) items which may be obtained from indigenous sources and (b) items which are at present to be necessarily imported. Revised estimates for both categories were also furnished.

The Equipment Committee recommended a number of measures for expediting procurement of equipment both from indigenous sources and from abroad. Important among the measures are :

(A) Equipment from indigenous sources

(i) An estimate of the requirements for various items should be made both in respect of existing institutions and new institutions likely to be established in the Third Plan period. The estimates should then be made known to all indigenous manufactures to enable them to plan production on the requisite scale.

(ii) Full information should be collected regarding the items that are being produced, their manufacturers, prices, delivery schedule etc. and circulated to all institutions.

(iii) Wherever certain items are not being produced at present, suitable manufacturers should be located by the Ministry of Commerce & Industry and asked to undertake their production.

(iv) Indigenous manufacturers may require detailed designs, specification etc. in respect of certain items of equipment. Wherever possible, arrangements should be made to prepare the designs and specifications with the help of experts within the country. Arrangements should also be made to obtain from foreign manufacturers designs and specifications of as many items as possible. If necessary, the right to produce the equipment within the country should be purchased on suitable terms.

(v) Institutions should be asked to make in their own workshops as many items as possible that are not being produced by manufacturers in the country. For that purpose, arrangements should be made to prepare detailed designs, specifications etc. with the help of experts and to furnish them to the institutions.

(vi) Even in respect of those items which are at present being imported, efforts should be made to produce as many of them as possible within India and for that purpose whenever necessary, design and right of manufacture should be secured from foreign manufacturers.

(vii) To ensure quick and coordinated action on the above lines, a special Cell should be set up in the Ministry of Commerce & Industry (Development Wing) that will work in close association with the Ministry of Scientific Research and Cultural Affairs and the recently created Scientific Instruments Organisation of the Council of Scientific and Industrial Research. A small Advisory Committee consisting of teachers of engineering and experts should be set up to advise the Cell from time to time regarding the various aspects of indigenous production.

(B) Equipment from Abroad

(i) Efforts should be made to locate sources of supply of various items, their cost, delivery period etc. through a central agency, that should be set up specially for this purpose. On the basis of the information obtained, the agency should decide the best sources of supply from all points of view and particularly of foreign exchange involved. Wherever possible, the Central agency should negotiate for the most favourable terms.

(ii) Technical Institutions should be advised to operate through the Central agency which should act as purchase and procurement organisation for all institutions. The advantages of this arrangement are many, as for instance, avoidance of delay that is inevitable when each institution has to go through the entire drill; negotiated prices that may not be subject to fluctuations; standard quality products; assured sources of supply and quick delivery; quick completion of procedural formalities in respect of import licence and foreign exchange etc.

(iii) The foreign exchange allotted by the Central Government from time to time for technical institutions should be placed at the disposal of the Central agency which should meet the requirements of individual institutions on the basis of their requests for the import of equipment. The central agency should also assume responsibility for fulfilling the various procedural formalities required, as for instance import licence etc. on behalf of all institutions and facilitate quick import of equipment.

(iv) Wherever the agency considers it in the interest of quick and economic supply, the Indian agent-firms of foreign manufacturers may be given favourable terms enabling them to hold stocks, against assured off-takes anticipated.

(v) Considering all aspects of the matter, the Directorate General of Supplies and Disposals or the State Trading Organisation should function as the central agency and should set up a Cell specifically for this purpose, within their respective overall organisation. The Cell should work in the close association with the Ministry of Scientific Research and Cultural Affairs (Technical Education Division).

The Coordinating Committee approved the recommendations of the Lala Shri Ram Committee regarding revisions in the list of equipment for degree and diploma courses, production of equipment within the country, arrangements necessary to facilitate procurement of equipment by institutions and other related aspects. As regards the proposal to set up a central purchase agency, the Committee decided that the matter should be first discussed with the Directorate General of Supplies to ensure that the setting up of the agency will not lead to delays in the procurement of equipment and that it will be an improvement over the existing arrangements.

(l) Shortage of teachers

The Coordinating Committee noted with concern that the staff position in a large number of institutions continued to be unsatisfactory. The shortage of staff varied not only from institution to institution but also from one category of staff to one another in the same institution. The scheme of improved salary scales approved by the Central Government had not yet been implemented at most of the institutions and that was also responsible for a further worsening in the situation.

The Committee was of the view that a comprehensive survey of the staff position at technical institutions in each region should be carried out. The existing position should be analysed both quantitatively and qualitatively and the specific reasons for the shortage of staff at different levels should be clearly identified. On the basis of the survey carried out, detailed measures should be formulated for the improvement of the staff position.

The Committee decided that a detailed report should be prepared on the above lines by the Regional Offices or by the Regional Committees. The report should be considered either at the next meeting of the Committee or at a special meeting to be held for the purpose.

(m) Film Libraries

The Committee was of the view that for the improvement of the standards of instruction, technical institutions in the country should exhibit regularly technical films to students and the films should cover a wide range of subjects of particular interest to them. In order to facilitate this arrangement, adequate provision should be made by the Central

Government for the purchase of technical films, for maintaining film libraries on a regional basis and for circulating the films regularly to technical institutions. The Committee recommended that a well-equipped technical film library should be established at each of the four Regional Offices at Bombay, Calcutta, Madras and Kanpur which may serve technical institutions in their respective areas.

(n) **Estimates for Technical Institutions**

On the recommendations of the Regional Committees, the Coordinating Committee approved estimates for the establishment of technical institutions, improvement and development of existing institutions etc. as given in Annexure—II.

Annexure-I to Item No. 4

Representatives of All-India Council for Technical Education and Coordinating Committee nominated on the Boards of Technical Studies.

Name of the Board	Representative of A.I.C.T.E.	Nominees of the Coordinating Committee
Engineering & Metallurgy	Dr. S.R. Sen Gupta	1. Dr. B. R. Nijhawan 2. Dr. N. K. Mitra 3. Shri S. B. Junnarkar, (Former Principal, Birla Vishwakarma Mahavidyalaya, Anand) 4. Prof. R. C. Narayanan (Delhi Polytechnic)
Chemical Engineering & Chemical Technology.	Dr. H.N. Sethna	1. Dr. H.L. Roy 2. Dr. G.P. Kane 3. Dr. M.D. Parekh (National Rayon Corporation, Bombay) 4. Dr. N.R. Kuloor, (Formerly of Shri Ram Industrial Research Institute)
Architecture and Regional Planning.	Shri D.G. Karanjgaonker, Chief Architect, Govt. of Madhya Pradesh.	1. Prof. V.N. Prasad 2. Shri A.P. Kanvinde 3. Shri S.K. Joglekar 4. Shri M. Fayazuddin
Commerce	Shri Murugappa Chettier	1. Shri B.N. Das Gupta 2. Shri S. Velayudham 3. Prof. M.P. Gandhi 4. Prof. A. Das Gupta
Textile Technology ..	Lala Shri Ram	1. Shri Srinagabhushana 2. Dr. C. Nanjundayya 3. Shri B. Rajram Tata Industries Private Ltd., (Textile Deptt.) Bombay. 4. Shri T.N. Sharma, (Delhi Cloth Mills)
Applied Art	Shri S.H. Parelkar	1. Shri K.K. Sen 2. Shri V.N. Adarkar 3. Shri K.K. Hebbar, (Practising Artist, Bombay) 4. Shri D.P. Roy Chowdhury
Management	Dr. A.L. Mudaliar	1. Shri J.J. Ghandy 2. Lala Shri Ram *3. Shri N. Dandekar 4. Shri B.F. Goodchild 5. Dr. A.R. Mudaliar

*As Shri N. Dandekar regretted his inability to serve on the Board, Shri J.M. Shrinagesh has been appointed in his place.

Annexure-II to Item No. 4

1. College of Engineering, Poona	For provision of facilities for high voltage engineering work
2. Walchand College of Engineering, Sangli	
3. Faculty of Technical & Engineering, M.S. University, Baroda	
4. Birla Vishwakarma Mahavidyala, Anand	
5. L.D. College of Engineering, Ahmedabad	
6. Lukhdirji College of Engineering, Morvi	
7. College of Engineering, Nagpur	
8. Government College of Engineering and Technology, Raipur	
9. Polytechnic at Jalgaon	Establishment
10. Polytechnic at Porbander	
11. Polytechnic at Dohad	
12. Government Polytechnic, Nagpur	Development of Diploma Courses
13. Ajmer Polytechnic, Ajmer	Development for Diploma Courses in Electrical and Mechanical Engineering
14. Polytechnic at Kanpur	Establishment
15. Polytechnic at Mirzapur	
16. Polytechnic at Faizabad	
17. Polytechnic at Sundar Nagar	
18. University of Roorkee	For provision of facilities for high voltage work
19. College of Engineering & Technology, Muslim University, Aligarh.	
20. Punjab Engineering College, Chandigarh	
21. Guru Nanak Engineering College, Ludhiana	
22. Thapar Institute of Engineering and Technology, Patiala	
23. M.B.M. Engineering College, Jodhpur	
24. Punjab Institute of Textile Technology, Amritsar	Development for diploma courses in Textile Technology
25. Roorkee University, Roorkee	Development for degree course in Architecture
26. Engineering College, Palghat	Establishment
27. College of Engineering, Anantpur	For the provision of facilities for high voltage work
28. College of Engineering, Hyderabad	
29. University Engineering College, Waltair	
30. University Engineering College, Tirupati	
31. Government College of Technology, Coimbatore	
32. Engineering College, Annamalai University	
33. P.S.G. College of Technology, Coimbatore	
34. Coimbatore Institute of Technology, Coimbatore	
35. A.C. College of Engineering & Technology, Karaikudi	
36. Thiagaraja College of Engineering, Madras	
37. Engineering College, Trichur	
38. Thangal Kanju Musaliar College of Engineering, Quilon	
39. B.D.T. College of Engineering, Devangri	
40. University Engineering College, Bangalore.	
41. B.M.S. College of Engineering, Bangalore	
42. National Institute of Engineering, Mysore.	
43. Engineering College, Gulbarga	
44. B.V. Bhoomaraddi College of Engineering and Technology, Hubli	
45. C.P.C. Polytechnic Institute, Mysore	Development for diploma courses
46. B.V. Bhoomaraddi College of Engineering & Technology, Hubli	Development of degree and diploma courses

47. Polytechnic at Ultadanga	
48. Polytechnic at Barasat	
49. Polytechnic at Malda	
50. Polytechnic at Purnea	
51. Polytechnic at Darbhanga	For establishment
52. Polytechnic at Silchar	
53. Polytechnic at Gaya	
54. Polytechnic at Kendrapara	
55. B.P.C. Institute of Technology, Krishnagar	For development of diploma courses
56. Sree Ramakrishna Silpa Vidyapith, Suri	For development of diploma courses
57. Birla Institute of Technology, Ranchi	
58. Bihar College of Engineering, Patna	For provision of equipment for high voltage work
59. College of Engineering & Technology, Jadavpur University	
60. Assam Engineering College, Gauhati	
61. Muzaffarpur Institute of Technology, Muzaffarpur	For etablishment
62. Serampore College of Textile Technology, Serampore	For development for degree courses
63. Polytechnic at Belgaum	
64. Polytechnic at Karwar	For establishment
65. Polytechnic at Chickmagalur	
66. Polytechnic at Annamalainagar	

In addition, the Coordinating Committee also approved loans for a number of institutions for the construction of hostels.

Item No. 5 :—**To nominate a representative of the All-India Council for Technical Education on the Board of Governors of the School of Town and Country Planning, New Delhi**

According to the constitution of the Society of the School of Town and Country Planning, Delhi, the Board of Governors of the School includes one representative of the All-India Council for Technical Education. Dr. V. K. R. V. Rao, Vice-Chancellor, Delhi University, represented the Council on the Board for a term of three years upto 31-3-1960. The Board is being reconstituted for the next term of 3 years with effect from 1st April, 1960. The All-India Council may now appoint its representative on the new Board.

A list of the members of the Council is given in the Annexure.

Annexure to Item No. 5

ALL-INDIA COUNCIL FOR TECHNICAL EDUCATION

List of Members

(a) Chairman (Ex-officio)	1. Prof. Humayun Kabir, Minister for Scientific Research & Cultural Affairs, Government of India, New Delhi.
(b) (i) Education Adviser (Tech.) to the Government of India, (Ex-officio)	2. Prof. M. S. Thacker, Educational Adviser (Tech.), Ministry of Scientific Research & Cultural Affairs, New Delhi.
(ii) Educational Adviser to the Government of India, (Ex-officio)	3. Shri K. G. Saiyidain, Secretary, Ministry of Education, New Delhi.
(c) Chairmen of the Regional Committees of the Council (Ex-officio)	
Eastern Regional Committee	4. Shri J. J. Ghandy, Director, Tata Iron & Steel Co., Jamshedpur.
Western Regional Committee	5. Shri Kasturbhai Lalbhai, Pankora, Naka, Ahmedabad.
Northern Regional Committee	6. Lala Shri Ram, 22-Curzon Road, New Delhi.
Southern Regional Committee	7. Dr. A. L. Mudaliar, Vice-Chancellor, Madras University of Madras.
(d) Chairman of the All-India Boards of Technical Studies (Ex-officio)	
Commerce	8. Dr. V. K. R. V. Rao, Vice-Chancellor, Delhi University, Delhi.
Textile Technology	9. Lala Shri Ram, 22-Curzon Road, New Delhi.
Engineering & Metallurgy	10. Shri N. K. Mitra, 16, Hindustan Road, Rashbehari Avenue, Calcutta.

Architecture and Regional Planning	11. Shri S. H. Parelkar, Medows House, Medows Street, Fort, Bombay.
Chemical Engineering and Chemical Technology	12. Dr. G. P. Kane, Senior Industrial Adviser (Chemical), Ministry of Commerce & Industry, Development Wing, New Delhi.
Applied Art	13. Prof. V. N. Adarkar, Principal, J. J. Institute of Commercial Art, Bombay.
Management	14. Shri J. J. Ghandy, Director, Tata Iron & Steel Co., Jamshedpur.

(e) Representatives of Ministries/ Departments of Government of India

Commerce & Industry	15. Dr. B. D. Kalelkar, Senior Industrial Adviser (Engg.), Development Wing, Ministry of Commerce & Industry, New Delhi.
Defence	16. Secretary, Ministry of Defence, New Delhi, (or his nominee).
Finance	17. Financial Adviser (Scientific Research & Cultural Affairs), New Delhi.
Labour & Employment	18. Director General of Resettlement and Employment, New Delhi.
Ministry of Steel Mines & Fuel	
(i) Department of Mines & Fuel	19. Secretary, Department of Mines & Fuel, Ministry of Steel, Mines, & Fuel, New Delhi, (or his nominee).
(ii) Department of Iron & Steel	20. Shri B. C. Mathur, I.A.S., Deputy Secretary, Ministry of Steel, Mines & Fuel, Department of Iron & Steel, New Delhi.
Ministry of Works, Housing and Supply	21. Shri A. D. Pandit, I.C.S., Joint Secretary (Works), Ministry of Works, Housing & Supply, New Delhi.
Ministry of Irrigation & Power	22. Shri M. Hayath, Chairman, Central Water & Power Commission, New Delhi.

Ministry of Railways	23. Director, Mechanical Engineering, Railway Board, New Delhi.
Ministry of Home Affairs (Directorate of Manpower)	24. Shri R. Prasad, Joint Secretary, Ministry of Home Affairs, (Directorate of Manpower), New Delhi.
Ministry of Food & Agriculture	25. Shri S. Mullick, I.C.S., Joint Secretary, Department of Agriculture, Ministry of Food & Agriculture, New Delhi.
Ministry of Information & Broadcasting	26. Shri A. C. Ramachandani, Chief Engineer, All India Radio, New Delhi.
Ministry of Transport & Communications	
(i) Department of Transport	27. Shri H. P. Sinha, I.S.E., Consulting Engineer (Rd. Development) and Joint Secretary, Ministry of Transport, Department of Transport, New Delhi.
(ii) Department of Communications and Civil Aviation	28. Shri D. C. Das, I.C.S., Joint Secretary, Ministry of Transport & Communications, Department of Communications & Civil Aviation, New Delhi.
Department of Atomic Energy	29. Shri H. N. Sethna, Chief Scientific Officer, (Chemical Engineering), Atomic Energy Department. Trombay, Apollo Pier Road, Bombay.
Planning Commission	30. Shri T. N. Singh, Member, Planning Commission, Udyog Bhavan, New Delhi.
Central Borad of Irrigation and Power	31. Shri Baleshwar Nath, Secretary, Central Board of Irrigation & Power, Curzon Road, New Delhi.
(f) Lok Sabha	32. Shri P. R. Ramakrishnan, M.P., "Jyothi", 6/36, Race Course Road, Coimbatore (South India).
	33. Shri Ganapati Ram, M.P., Village Nimaich, P.O. Kaur, District, Banaras.
(g) Rajya Sabha	34. Shri Jaspat Roy Kapoor, M.P., Sheetla Gali, Agra.

(h) (i) State Governments

Government of Andhra Pradesh	35. Shri C. V. D. Murthy, Director of Technical Education, Andhra Pradesh, Hyderabad.
Government of Assam	36. Minister for Education, Assam, Shillong.
Government of Bihar	37. Deputy Minister for Industries, Bihar, Patna (Shri L. P. Shahi).
Government of Bombay	38. Shri T. N. Tolani, Director of Technical Education, Bombay.
Government of Madhya Pradesh	39. Secretary, Education Department, Government of Madhya Pradesh, Bhopal.
Goyernment of Madras	40. Minister for Education, Madras, or in his absence, Secretary, Department of Health, Education and Local Administration, or Director of Technical Education, Madras.
Government of Orissa	41. Dr. H. B. Mohanty, Additional Secretary, Government of Orissa, Political & Services (Planning) Deptt., Bhubaneswar.
Government of Punjab	42. Shri Suraj Mal, Minister for Public Works, Punjab, Chandigarh.
Government of Uttar Pradesh	43. Deputy Minister for Industries, Uttar Pradesh, Lucknow.
Government of West Bengal	44. Minister for Education, West Bengal, Calcutta.
Government of Jammu & Kashmir	45. Shri G. A. Mukhtar, Director of Education, Jammu & Kashmir, Srinagar.
Government of Mysore	46. Minister for Education, Mysore, Bangalore.
Government of Rajasthan	47. Shri V. G. Garde, Principal, M.B.M. Engineering College, Jodhpur.
Government of Kerala	48. Shri V. V. Gopalakrishna Iyer, Director of Technical Education, Kerala State, Trivandrum.

(i) **Union Territories**

Delhi	49. Director of Education, Delhi Administration, Delhi.
Himachal Pradesh	50. Shri P. C. Saxena, I.A.S., Secretary (Education), Himachal Pradesh, Simla-1.
Tripura	51. Shri N. M. Patnaik, I.A.S., Chief Commissioner, Tripura, Agartala.
Manipur	52. Shri S. D. Bahuguna, Director of Education and Ex-officio Secretary, Education, Manipur Administration, Imphal.

(i) **Industry & Commerce**

Associated Chambers of Commerce of India	53. Shri B. F. Goodchild, C/o M/s. Saxby & Farmer (India) Ltd., 17, Convent Road, Entally, Calcutta.
	54. Shri Bharat Ram, C/o Delhi Cloth & General Mills Co., Delhi.
All-India Organisation of Industrial Employers	55. Shri T. R. Gupta, Director, Jay Engineering Works Ltd., 183-A, Prince Anwarshah Road, Calcutta-31.
	56. Shri Kanchanlal C. Parikh, Ahmedabad Jupiter Spg. Wvg. and Mfg. Co. Ltd., Dadhechi Road, P.B. No. 43, Ahmedabad.
Employers Federation of India	57. Prof. G. M. Nabar, Director, Deptt. of Chemical Technology, University of Bombay, Bombay.
	58. Shri G. Y. Mangrulkar, Staff Training Officer, Tata Iron & Steel Co., Jamshedpur.
Federation of Indian Chambers of Commerce & Industry	59. Shri A. M. M. Murugappa Chettier, 52/53, Jehangir Street, Madras.
	60. Prof. M. P. Gandhi, Jan Mansion, Sir Pherozshah Mehta Road, Fort, Bombay.

(j) Labour	
Indian National Trade Union Congress	61. Shri Michael John, M.P., 17, K-Road, Jamshedpur.
	62. Shri B. K. Nair, President, Indian National Trade Union Congress, Kerala Branch, 70, Feet Road, Ernakulam (Kerala).
National Federation of Indian Railwaymen	63. Shri P. Subbaramaniah, General Secretary, National Federation of Indian Railwaymen, Railway Loco Quarters, Vijayawada-2.
Hind Mazdoor Sabha	64. Shri Shanta Ram S. Tawde, Secretary, Engineering Mazdoor Sabha, Kamgar Sadan, Nawab Tank Road, Mazgaon, Bombay-10.
(k) Central Advisory Board of Education	65. Col. B. H. Zaidi, Vice-Chancellor, Muslim University, Aligarh.
(l) Inter-University Board of India.	66. Dr. A. L. Mudaliar, Vice-Chancellor of Madras University, Madras.
(m) National Institute of Science of India, Mathura Road, New Delhi	67. Prof. S. K. Mitra, D.Sc., F.R.S., Emeritus Prof. of Physics, Calcutta University, Institute of Radio, Physics & Electronics, 92, Upper Circular Road, Calcutta-9.
(n) National Council for Rural Higher Education	68. Shri T. S. Avinashilingam, M.P., Director, Shri Ramakrishna Mission, Vidyalaya Rural Institute, Coimbatore.
(o) Association of Principals of Technical Institutions (India)	69. Dr. T. Sen, Rector, Jadavpur University and Principal, College of Engineering & Technology, Jadavpur.
	70. Shri V. Lakshminarayanan, Principal, Birla College of Engineering, Pilani (Rajasthan).
(p) Professional Bodies	
Institution of Engineers	71. Shri D. P. R. Cassad, M.I.E., Shirin Lodge, Byramji Town, Nagpur-1.

Institute of Chartered Accountants	72. Shri M. P. Chitale, F.C.A., 19, Alli Chambers, Medows Street, Fort, Bombay-1.
(q) University Grants Commission	73. Chairman, (Ex-officio), University Grants Commission, New Delhi.
	74. Dr. B. D. Laroia, Development Officer (S. & T.), University Grants Commission, Old Mill Road, New Delhi.
(r) Nominees of Government of India	75. Dr. S. R. Sen Gupta, Director, Indian Institute of Technology, Kharagpur.
	76. Shri Fazal I. Rahimtoola, Ismail Building, Dr. Dadabhoy Naoroji Road, Bombay-1.

Item No. 6:—**Admissions to technical institutions in excess of the sanctioned intake**

Under the Scheme of Improvement and Development of Technical Institutions initiated in 1947-48, the All-India Council permitted the institutions to admit to the first year of degree and diploma courses failed students over and above the sanctioned intake subject, however, to a limit of 10% of the sanctioned intake. Such a provision has, however, not been made in respect of institutions approved subsequently for establishment or development under the Five-Year Plans.

It has, recently been brought to the notice of the Ministry that certain institutions are admitting students to the first year of degree and diploma courses in excess of their sanctioned intake. The reason for the increased admissions is stated to be due to students who have failed and have to repeat the course. Some institutions, also admit more students since certain students drop out in the course of the year and the seats remain vacant.

The advice of the All-India Council is sought on what should be the general policy of the Central Government in the matter and whether any specific provision should be made for the admissions of failed students over and above the sanctioned intake.

Item No. 7:—**To consider the proposals received from the State Government of Bombay regarding various aspects of Technical Education**

(a) Estimates of cost of furniture required for a Polytechnic

Note received from the Government of Bombay

In its 12th meeting, the All-India Council of Technical Education, considered the request of the Government of Bombay to enhance the

ceiling on the expenditure for furniture required for a Polytechnic. Government of India have estimated the expenditure on furniture at Rs. 35,000 only to the Government Polytechnic at Sholapur while for Government Polytechnic at Karad, it is Rs. 67,000. The Council, however, decided on the recommendations of the Co-ordinating Committee that the ceiling of Rs. 35,000 for furniture already fixed was adequate and that the Regional Committee may consider revision of this figure in individual cases having regard to the increased cost of Timber and Labour charges in any particular area.

2. The Secretary, Western Regional Committee, Bombay, and the Ministry of Scientific Research and Cultural Affairs, New Delhi, were requested to supply a list of furniture sanctioned by the Government of India, the cost in respect of which is estimated at Rs. 65,000. The Secretary, Western Regional Committee could not supply such list of furniture.

3. The Ministry of Scientific Research & Cultural Affairs, has stated that the provision of Rs. 35,000 made by the Council is a block provision and no model list is drawn up for guidance. The Ministry has further stated that provision made for furniture has been found to be adequate from experience.

4. It is, however, the experience of the Government of Bombay that the requirements of the furniture of the Government Polytechnics cannot be accommodated within the ceilings prescribed by Government of India. In the absence of the model list, it cannot be said whether the requirements are properly taken into consideration before prescribing a ceiling. The minimum requirements of these Polytechnics considered essential for smooth running of a Polytechnic with 120 annual admissions are indicated in the enclosed statement from which it will be seen that the cost comes to about Rs. 90,000.

5. In view of the above, it is suggested that a Committee may be appointed to consider the request to enhance the ceiling for furniture required for a Polytechnic.

Note from the Secretariat of the Council

Government of Bombay sent in 1959 a proposal for enhancing the estimates for furniture from Rs. 35,000 to Rs. 90,000 for a Polytechnic conducting diploma courses in Civil, Electrical and Mechanical Engineering with an intake of 120 students. The Council considered the matter and expressed the view that an amount of Rs. 35,000 should be adequate. The Council, however, recommended that the Regional Committees may consider a revision of this estimate in individual cases having regard to the cost of timber and labour charges at any particular area.

The above views of the Council were communicated to the Government of Bombay.

List of furniture required for a Government Polytechnic, with capacity of 120

Sl. No.	Particulars of furnitures	Nos.	Estimated Cost
			Rs.
	Class Room Furniture		
1.	3 Seated Desks	120	20,000
2.	Platform (10′×5′)	6	
3.	Lecturer's Table (5′×2½′)	6	
4.	Back-Board (Double Sliding) (8′×4′)	6	
	Drawing Class Furniture		
1.	Drawing table with two lockers	180	20,000
2.	Drawing steels	180	
3.	Chest of drawers for keeping the term-work	7	
4.	Platform (10′×5′)	2	
5.	Lecturer's Table (5′×2½′)	2	
6.	Back-Boards	2	
	Workshop Furniture		
1.	Lockers for storing Term Work unit of 24	9	14,000
2.	Lockers for the use of students unit of 24	9	
3.	Racks, Cupboards, Pigeon hole lockers, etc.	12	
	Furniture for Principal's Office, Main Office and Staff and Student Room		
1.	Tables of different sizes	44	17,000
2.	Chairs	100	
3.	Racks and News papers stand	4	
4.	Common room furniture for staff and students	30	
5.	Storewell cupboards	30	
	General Furniture		
1.	Laboratory Tables (5′×2½′) (for model room)	10	7,000
2.	Library Tables	10	
3.	Chairs for Library	60	
4.	Cabinet steel book cases for library	15	
5.	Survey Instrument Room Racks and stands	10	
6.	Four drawer Index Cabinets	2	
	Laboratory Furniture		
1.	Physics table with sink (5′×2½′)	15	12,000
2.	Physics Steels	30	
3.	Chemistry Tables with sinks (6′×4½′)	8	
4.	Chemistry stools	32	
5.	Bilance Tables (5′×2½′)	4	
6.	Applied Mechanics Laboratory Tables (5′×2½′)	10	
7.	Applied	20	
8.	Hydraulic Laboratory Tables (5′×2½′)	5	
9.	Stools	20	
10.	Strength of materials Solid Mechanic and Testing Laboratory Tables	10	
11.	Stools	20	
12.	Heat Engine Tables	5	
13.	Stools	20	
14.	Eectric Laboratory Tables	10	
15.	Stools	20	
16.	Eectronic Laboratory Tables	5	
17.	Stools	10	
	Total estimated cost		90,000

(b) Inclusion of expenditure incurred by a Polytechnic on award of Scholarships as an approved item of expenditure for recurring grant :

(i) Note from Government of Bombay

It is seen that while assessing the maintenance recurring grant for Polytechnic, the expenditure on award of scholarships to the students of the institutions is excluded. The need for liberal provision of scholarships to enable the poor and meritorious students to complete the educational career is being felt. A good number of students have to leave the institutions due to financial difficulties. These are likely to increase with the larger intake of students to the institutions. The working group on Technical Education, New Delhi, recommended adequate provision being made in the Third Plan for financial assistance by way of scholarship. It is, therefore, necessary to increase the number of scholarships to assist the meritorious students to pursue their studies successfully.

It is, therefore, suggested that expenditure on merit scholarships should be inculded for assessment of per capita maintenance expenditure for purposes of financial assistance by way of Grant-in-aid.

(ii) Note from Secretariat of the Council

The Central Government have formulated and implemented in 1959-60 a central scheme of Merit-cum-Means Scholarships to extent state aid to meritorious but poor students studying degree and diploma courses at all technical institutions in the country. Under the scheme 1,039 Scholarships have been instituted in 1959-60 (current academic session) of which 692 are for degree course students and 347 for diploma course students. The value of each scholarship is Rs. 75 p.m. for degree courses and Rs. 50 p.m. for diploma courses. All Scholarships are tenable for 12 months in the year. The institutions where the scholarship holders are studying have been requested to exempt them from the tuition fees. If that is not agreed to, the fees payable will be sanctioned separately by the Central Government.

During 1960-61 session, it is proposed to institute an equal number of Scholarships for fresh students and also continue the scholarships already awarded subject to the satisfactory progress of the students, to enable them to complete their studies. It is also proposed to enlarge the Scholarships scheme in the Third Plan period and cover about 20–25% of the students by Scholarships.

In view of the above position it seems hardly necessary that the Central Government should also share the expenditure incurred by institutions for the scholarships instituted by them.

Item No. 8:—To report the progress of schemes of technical education under the Second Five-Year Plan

A. State Government Plan

It was reported to the All-India Council at its last meeting held on the 13th April, 1959, that the Second Five-Year Plans of State Govern-

ments had been revised to include the establishment of 8 engineering colleges and 45 polytechnics. The plans have been further revised and the revised plans now provide for eight engineering colleges and 47 polytechnics. The state-wise distribution of the institutions and the position regarding their location etc. are given in the statement at Annexure I. Seven Engineering Colleges and 35 polytechnics have started functioning.

The Government of Kerala has decided that the college at Palghat will be established in the private sector. The Co-ordinating Committee approved the proposal at its meeting held on 1st March 1960.

The State Governments had originally provided for the establishment of 66 Junior Technical Schools. The position has since changed and the number of schools now decided for establishment upto the end of 1960-61 is 42. 20 schools have already started functioning. The Statement at Annexure II indicates the position state-wise. It is understood that Madras and Mysore States which have made no provision for Junior Technical Schools are reconsidering the matter. Definite information is awaited from them regarding the number of schools that they propose to set up by 1961.

In the current year the Central Government has allocated a sum of Rs. 100.00 lakhs to State Governments as grant-in-aid for various schemes of Technical Education. A provision for Rs. 180.00 lakhs has been made in the budget estimates for 1960-61 for the same purpose.

The Working Group discussions on the State Plan Budget for 1960-61 were held in December-January, 1960. The revised plan outlay on technical education schemes and the plan budget for 1960-61 as recommended by the Working Group are given in the Statement at Annexure III.

B. Central Governments Plans

(a) Higher Technological Institutes

(i) Western Higher Technological Institute

The Indian Institute of Technology, Bombay, which started its first academic session in 1958 in a rented building, has since shifted its main activities in its own buildings at Powai, Bombay.

The batch of 100 students drawn from all parts of the country was admitted to various under-graduate courses in 1959-60. During 1959-60 the following courses have also been organised:

(i) Industrial Electronics

(ii) Electro-Vacuum Technology

(iii) Technology of Silicates

(iv) Heavy Inorganic Chemicals

(v) Fino Organic Chemicals

(vi) Electro-Chemical Technology

(vii) Design of Chemical plant

(viii) Soil Engineering

Equipment costing about Rs. 60 lakhs has so far been received by the institute under the Unesco aid programme and bilateral agreement. It is expected that by the end of 1962 the Institute will receive the entire equipment costing 10 million roubles (Rs. 120 lakhs). 12 foreign experts and 2 Russian Translators are working at present at the Institute. 12 Indian scholars are also undergoing training in the U.S.S.R. and will take up teaching assignments at the institute on return.

The Institute has been organised at present with the following eight departments :

(i) Chemical Engineering Department including Chemistry
(ii) Civil Engineering Department
(iii) Electrical Engineering Department
(iv) Mechanical Engineering Department
(v) Metallurgical Engineering Department
(vi) Mathematics Department
(vii) Physics Department
(viii) Humanities Department

The following buildings of the Institute have been completed :

(a) One Hostel for 200 students
(b) 6 Type IV flats
(c) 12 Type III flats
(d) 12 Type I flats (for class IV employees)
(e) One teaching-cum-storage building
(f) 6 workshops—150 ft x 150 ft.

(ii) Indian Institute of Technology, Madras

The Indian Institute of Technology, Madras, started its first academic session in July, 1959 when 120 students were admitted to the first year of five-year integrated course in Civil, Mechanical, Electrical, Chemical and Metallurgical Engineering. Professor B. Sen Gupta has been appointed as the Director of the Institute.

Madras Government has given free of cost a plot 632 acres of land at Guindy for the Institute. Pending the construction of the Institute buildings at Guindy the Institute has started its work in the A.C. College of Technology and Leather Research Institute. The following building programme of the Institute is under execution :—

(i) Seven units of workshops
(ii) One unit of storage-cum-teaching accommodation
(iii) Student's hostels for 400 students
(iv) One unit of Officer's hostels for 40 officers

(v) Six units of residential quarters for officers

The following departments are proposed to be set up at the institute :—

(i) Department of Humanities

(ii) Department of Physics

(iii) Department of Mathematics

(iv) Department of Chemistry

(v) Department of Applied Mechanics

(vi) Department of Civil Engineering

(vii) Department of Mechanical Engineering, Communication Engineering and Electronics

(viii) Department of Electrical Engineering including Electrical

(ix) Department of Chemical Engineering and Chemical Technology.

(x) Department of Metallurgy

The following assistance has been received from the Government of West Germany :—

(a) 509 cases of equipment (cost has yet to be determined)

(b) 4 Professors and 1 Foreman.

(c) 13 Indian teachers are undergoing training in West Germany

(iii) Indian Institute of Technology, Kanpur

The Indian Institute of Technology, has been registered as a Society under the Societies Registration Act, 1860, until it is incorporated by an Act of Parliament. A Governing Body under the Chairmanship of Dr. Sampurnanand, Chief Minister, Uttar Pradesh, has been set up.

It is proposed to start the Institute with 100—120 students in the first year of five-year integrated course in (i) Chemical Engineering; (ii) Civil Engineering; (iii) Mechanical Engineering; (iv) Electrical Engineering; (v) Metallurgical Engineering; and (vi) Textile Technology from July, 1960. The Institute will have a total student enrolment of 1,500—1,600 in under-graduate courses and about 400—500 at post-graduate and research level when fully developed.

The Government of Uttar Pradesh has offered 1,045 acres of land free of cost out of which about 610 acres had been handed over to the institute for the first phase of development. Pending the construction of institute's own buildings, arrangements are being made to start the courses at Harcourt Butler Technological Institute, Kanpur.

The Government of India in 1958 explored the possibility of securing technical assistance from the U.S.A. The T.C.M. authorities on behalf of the Government of U.S.A. agreed to co-operate with the Government of India in the establishment of Kanpur Institute. A team of 6 eminent engineering educators from U.S.A. visited the country during December,

1958—January, 1959. After visiting the various technical institutions and industrial establishment, the team submitted details regarding courses of study curriculum etc. to be started by the institute. The report is being examined by the Government of India and further discussions will be held regarding the manner in which assistance should be provided to the institute.

Pending an over-all agreement the Government of U.S.A. has agreed to give the following assistance under the normal programme of T.C.M. for the fiscal year 1959 for setting up the institute :—

(a) Five experts for 2 years

(b) Equipment and apparatus worth $ 100,000

(iv) Indian Institute of Technology, Kharagpur

On the basis of competitive entrance examination held at various centres in the country for admission to the Institute, 374 candidates were admitted to various under-graduate courses in 1959-60. The present student enrolment at the Institute is as given below :—

(i) Under-graduate courses	1,493
(ii) Post-graduate courses	203
(iii) Research scholars	39
(iv) Post-Doctoral fellow	1
	1,736

The post-graduate courses offered at the institute include : (i) Applied Botany; (ii) Farm Machinery; (iii) Soil and Water Conservation Engineering; (iv) High Polymer and Rubber Technology; (v) Technical Gas Reaction and High Pressure Technology; (vi) Synthetic Drugs and Fine Chemicals; (vii) Regional Planning; (viii) Combustion Engineering and Fuel Economy; (ix) Chemical Plan Design and Fabrication; (x) Structural Engineering; (xi) Dam Construction; (xii) Soil Mechanics and Foundation Engineering; (xiii) Highway Engineering; (xiv) Harbour Engineering; (xv) Municipal Engineering; (xvi) Electrical Machine Design; (xvii) Control System Engineering; (xviii) Radio Broadcasting Engineering; (xix) Ultra High Frequency and Microwave Engineering; (xx) Industrial Electronics; (xxi) Applied Geology; (xxii) Exploration Geophysics; (xxiii) Geochemistry; (xxiv) Non-linear Mechanics; (xxv) Plasticity; (xxvi) Machine Design; (xxvii) Industrial Engineering; (xxviii) Mechanical Handling; (xxix) Production Engineering; (xxx) Design of I.C. Engines and Gas Turbines; (xxxi) Refrigeration and Air-conditioning Plants Design; (xxxii) Foundry Engineering; (xxxiii) Ferrous Metallurgy; (xxxiv) Meteorology; (xxxv) Industrial Physics; (xxxvi) Regional Planning; (xxxvii) Industrial Psychology and Industrial Relation.

By the end of the First Five-Year Plan, the Institute spent a sum of Rs. 334 lakhs on buildings and equipment. A provision of Rs. 250 lakhs was made in the Second Five-Year Plan for the development of the Institute. This has since been raised to Rs. 335 lakhs.

The Reviewing Committee of the Institute submitted its report in January, 1959. The report is under the consideration of the Board of

Governors. After the Board has submitted its comments the report will be considered by the visitor.

(b) College of Engineering and Technology, Delhi

It was reported to the All-India Council at its last meeting held in April, 1959 that the college will be established with the assistance provided by the British Government and Federation of British Industries. Since then, steps have been taken to start the College from July, 1960, as an autonomous body. Steps are also being taken to acquire additional land for the college. Until its own buildings are ready the college will function at the Delhi Polytechnic. The college will offer five-year integrated courses in Civil, Mechanical, Electrical and Chemical Engineering and Textile Technology with Higher Secondary or equivalent as admission qualification. The college when fully established will cater for 1,250 students in the under-graduate courses and about 250 students in post-graduate courses. It will be a fully residential institution.

(c) Indian School of Mines and Applied Geology, Dhanbad

The admissions have been increased from 48 to 150 students (90 for Mining Engineering, 20 for Applied Geophysics and 20 for Petroleum Technology). Construction of additional buildings including hostels and staff quarters has been sanctioned. An expert in Metal Mining from U.K. has joined the school recently and a few more are expected shortly. Provision of additional staff and equipment has also been sanctioned.

(d) Expansion of Existing Technical Institutions

The scheme of expansion of selected Engineering Colleges and Polytechnics made satisfactory progress during the period under review. The total number of additional seats secured in 1957–58 and 1959 are as shown below :—

(A) Degree Courses

Additional intake approved:—2,458 in 19 selected Engineering Colleges.

Additional Admissions actually made year-wise:—

1957	1958	1959
2,096	2,413	2,473

(B) Diploma Courses

Additional intake approved :—4,370 in 41 selected Polytechnics.

Additional admissions actually made year-wise :—

1957	1958	1959
3,399	3,910	4,033

(e) Establishment of 8 Regional Engineering Colleges and 27 Polytechnics

The organisational and administrative details regarding the establishment of Regional Engineering Colleges were formulated and finalised at a conference of Chief Ministers of States held in May 1959. The Regional

College at Warrangal started functioning in July 1959. The remaining colleges except the one at Allahabad are expected to make admissions in the academic session 1960-61. The Engineering College at Allahabad is expected to start functioning during 1961-62.

As regards the 27 Centrally-sponsored polytechnics, their location has since been decided as shown below:—

Southern Region :—	Nizamabad, Proddatur (Andhra Pradesh); Nagercoil, Vellore (Madras); Raichur, Krishnarajapet (Mysore); Kottayam (Kerala).
Western Region	Bombay, Jalgaon, Porbandar (Bombay); Khandwa, Durg (Madhya Pradesh).
Northern Region	Kanpur, Faizabad and Mirzapur (U.P.); Kotah, Alwar (Rajasthan); Batala, Sirsa (location of third one to be decided), (Punjab).
Eastern Region	Purnea, Darbhanga (Bihar); Ultadanga, Barasat and Malda (West Bengal); Silchar (Assam).

Orissa was allotted one polytechnic but the State Government has not accepted the scheme. It has instead decided to establish a polytechnic at Kendrapara in the private sector.

All the polytechnics excepting the ones at Ultadanga, Kanpur, Bombay city, Purnea, Darbhanga and Barasat will have each an annual intake of 120 students in different branches of Engineering. The polytechnics at Kanpur and Ultadanga will have an annual intake of 240 each, the polytechnic at Bombay 300 and the remaining at Purnea, Darbhanga and Barasat will have an annual admission of 180 each.

The polytechnics in Madras and Andhra Pradesh have since started functioning.

(f) The Administrative Staff College, Hyderabad

Since its establishment in December, 1957, the College conducted six courses (each of three months duration) and trained 235 candidates. The seventh course is in progress with 53 candidates.

A non-recurring grant of Rs. 7.00 lakhs and an interest-free loan of 9 lakhs have been given by the Central Government so far. A recurring grant of Rs. 3.00 lakhs for the years 1957-58, 1958-59 and 1959-60 has also been paid.

(g) Loans for construction of students hostels

During the Second Five-Year Plan period an amount of Rs. 302.67 lakhs has been sanctioned up to the end of March 1960. Hostel accommodation for about 10,800 students has been or is in the process of being constructed.

(h) Grants-in-aid to Non-Government Institutions

For the various schemes of establishment of non-Government institutions and improvement and development of existing non-Government institution and for development of specialised courses as recommended by the A.I.C., the Government have sanctioned during 1959-60 (to the end of March, 1960) grants amounting to Rs. 110.40 lakhs. The total amount of grants-in-aid paid by the Central Government in the first four years of the current Plan period is of the order of Rs. 348.30 lakhs.

(i) Establishment of Technical Institutions by Private Enterprise

It was reported to the Council at its last meeting held in April, 1959, that during the current Plan period seven engineering colleges and 18 polytechnics have started functioning in the different parts of the country. Two more polytechnics have since started functioning at Kancheepuram and Latur. The locations of the institutions are as shown below :—

Name of the State	Engineering Colleges	Polytechnics
Madras	2. Coimbatore, Madurai.	8. Avadi, Pollachi, Salem, Tanjore, Annamalainagar, Virudhunagar, Talaiyuthu, Kancheepuram.
Kerala	1. Quilon	4. Quilon, Pandalam Alleppey, Vallapad.
Andhra Pradesh	1. Tirupathi (under Shri Venkateswara University).	3. Hyderabad, Tanuku Wanapathy.
Mysore	1. Gulbarga	3. Bhagalkot and two in Bangalore.
Punjab	1. Ludhiana	—
Madhya Pradesh	1. Gwalior	1. Bhilsa
Bombay	—	1. Lathur.

In addition to the above, the Co-ordinating Committee at its meeting held on 1st March, 1960, approved in principle two proposals for the establishment of two engineering colleges in the private sector, one at Calcutta and another at Palghat. The Committee also approved a scheme for the establishment of a polytechnic at Kendrapona (Orissa) in the private sector.

The question of establishment of an engineering college at Bombay, by the Bharatiya Vidya Bhawan considered by the All-India Council for Technical Education some time back, has not made any further progress since the financial aspects of the project have not been settled in accordance with the policies laid down by the Council.

(j) Practical Training

During the current year 2,150 places for practical training were secured in different establishments.

(k) Research Training Scholarships and National Research Fellowships Scheme

Hundred and nineteen additional research training scholarships were sanctioned and allocated to different universities/institutions. This brings the total number of Research Training Scholarships in force to 800, which is the target fixed for the Plan period. 23 National Research Fellows are working at present. A fresh batch of 27 candidates has been selected for the award of the Fellowships.

(l) Merit-cum-Means Scholarships Scheme

With a view to expanding state aid to meritorious but poor students in their technical studies a scheme of awarding Merit-cum-Means Scholarships has been finalised and implemented in the current year. Under the scheme, 692 scholarships have been instituted for students of degree courses and 347 scholarships for students of diploma courses. The value of each scholarship is Rs. 75 p.m. for degree courses and Rs. 50 p.m. for diploma courses exclusive of tuition fees.

Of the 692 scholarships for degree courses, 583 have been allotted to students studying in the first year and 109 to students in the higher classes. All the 347 scholarships for diploma courses have been allotted to students studying in the first year.

(m) Technical Teachers Training Scheme

The details of the scheme were finalised and a beginning was made with 109 candidates, who were sent to Indian Institute of Technology, Kharagpur, Bengal Engineering College, Roorkee University, Guindy Engineering College and Poona Engineering College for training.

Annexure I to Item No. 8

Engineering Colleges and Polytechnics included in the State Plans

State	Number of Engineering Colleges	Number of Polytechnics
1. Mysore	—	8—(*Gulbarga, *Karwar, *Tumkur, *Belgaum, *Chickmagalur, and *Cheunapatna. (Location of 2 yet to be decided).
2. Madras	—	—
3. Andhra Pradesh	1 (*Waltair)	4—(*Tirupathi, *Vizagapatnam, *Warangal and *Mahboobnagar).
4. Kerala	2 (*Trichur)	2 (*Trivandrum and *Cannanore).
5. Bombay ..	1 (*Nagpur)	4 (*Sholapur, *Karad, *Dohad and Patan).
6. Madhya Pradesh ..	1 (*Raipur)	5 (*Jaora, *Nowgong, *Ujjain, *Raigarh and *Jabalpur).
7. Punjab	1 (*Patiala)	2 (*Chandigarh and one in Hariana Prant).
8. Rajasthan	—	3 (*Ajmer, *Udaipur and Bikaner).
9. Uttar Pradesh	—	7 (*Bareilly, Jhansi, *Chandauli, *Handia, Khurga, *Nainital, *Hathras).
10. Jammu and Kashmir ..	—	1 (Jammu) @
11. West Bengal	—	4 (*Jhargram, *Murshidabad, *Purulia, *Belghuria).
12. Bihar	—	2 (*Patna and Gaya)
13. Orissa	1 (*Burla)	1 (*Bhadrak)
14. Assam	2 (*Gauhati and Jorhat).	1 (Nowgong)
15. Pondicherry	—	1 (Pondicherry)
16. Tripura	—	1 (*Agartala)
17. Himachal Pradesh ..	—	1 (Sundernagar)
Total	8	47

*(Indicates institutions which have started functioning).

(The Palghat College provided for in the Kerala Plan is being established in the privae sector).

@ (The Polytechnic started at Srinagar will be transferred to Jammu).

Annexure II to Item No. 8

Statement regarding the Junior Technical Schools included in the State Plans

Name of the State	No. of Schools originally included in the Plan	No. of Schools now proposed to be set up in the Second Five Year Plan	No. of Schools started up-to-date with location	
Northern Region				
1. Punjab	6	3	3	Kapurthala, Kangra, Gurgaon.
2. Jammu & Kashmir	Nil	Nil	Nil	
3. Rajasthan	4	Nil	Nil	
4. Uttar Pradesh	8	5	5	Jaunpur, Jhansi, Allahabad, Ghazipur & Daurala.
Southern Region				
5. Andhra Pradesh	Nil	3	Nil	
6. Madras	Nil	(Matter under consideration)	Nil	
7. Kerala	18	9	Nil	
8. Mysore	Nil	Nil	Nil	
Eastern Region				
9. Assam	Nil	Nil	Nil	
10. Bihar	6	2	Nil	
11. Orissa	2	2	Nil	
12. West Bengal	9	9	6	Rehra, Burdwan, Laudoha, Basa, Jhargram, Durgi.
Western Region				
13. Bombay	Nil	Nil	Nil	
14. Madhya Pradesh	13	7	5	Tikamgarh, Skahdol, Satna, Panna, Gwalior
Union Territories				
15. Pondicherry	Nil	1	1	
16. Tripura	Nil	Nil	Nil	
17. Manipur	Nil	1	Nil	
18. Himachal Pradesh	Nil	Nil	Nil	
TOTAL ..	66	42	20	

Annexure III Item No. 8

State Plans for Technical Education for 1960-61

Figures in Lakhs of Rs.

Name of the State	As recommended by Working Group	
	Revised Plan provision for 1956—61	Plan Budget for 1960-61
(1)	(2)	(3)
1. Andhra Pradesh	219·00	63·26
2. Assam	136·75	35·94
3. Bihar	230·68	75·44
4. Bombay	387·48	99·11
5. Jammu & Kashmir	25·93	14·00
6. Kerala	197·10	91·055
7. Madhya Pradesh	287·50	84·30
8. Madras	198·55	72·16
9. Mysore	287·06	102·22
10. Orissa	70·88	19·33
11. Punjab	274·13	73·01
12. Rajasthan	129·75	47·34
13. Uttar Pradesh	351·38	103·59
14. West Bengal	313·17	95·05
Union Territories		
1. Himachal Pradesh	—	4·16
2. Manipur	—	—
3. Pondicherry	—	—
4. Tripura	—	5·51
		985·475

The figures in Column No. 3 above represent the budget provision as recommended by the Working Group to be made in the budget of the State Governments and exclude the share of the Central Government on Centrally sponsored schemes of Technical Education.

Item No. 9 :—**To receive the report of the Working Group on Technical Education for the Third Five-Year Plan**

In pursuance of the recommendations of the National Development Council made at its meeting held on 8th and 9th November 1958, the Planning Commission appointed a Working Group on Technical Education and Vocational Training in February, 1959 with Prof. M. S. Thacker, as Chairman. The Working Group was asked to consider the

question of development of Technical Education in the Third and subsequent Plans in relation to the following questions among others :—

(i) to consider the general lines along which facilities for technical education and training should be expanded, provision made for facilities for practical education in industrial establishments and for facilities for scientific research, pure and applied ;

(ii) to assess the extent of development of facilities for technical education and the likely shortages at the end of the Second Five Year Plans ;

(iii) to estimate the probable requirements of engineering and technical personnel in supervisory and higher grades for implementing the Third Five Year Plan in the principal fields of national development, such as, building and road construction, railways, irrigation and power, development of oil and mineral resources, agricultural engineering etc ;

(iv) to review the existing facilities for practical training in industrial establishments ; including apprenticeship and to recommend measures for their expansion in cooperation with units both in the public and private sectors ;

(v) to recommend targets for the provision of training facilities for the Third Five Year Plan keeping in view the likely requirements for the next 15 years ;

(vi) to recommend the lines along which detailed programmes for the expansion of technical education should be worked out by Central Ministries and State Governments;

(vii) to recommend measures for the provision of adequate teaching personnel in technical training institutions at different levels;

(viii) to recommend measures for the full-utilisation of available technical manpower including these employed or under training abroad;

(ix) to make such other proposals as may be necessary.

The Working Group held a series of meetings to discuss the various aspects of technical education.

The following are the important recommendations of the Working Group :—

(a) The primary function of technical instruction remains and is likely to remain that of satisfying the needs of industry and commerce for (i) skilled craftsmen; (ii) engineering foremen and executives; and (iii) research workers even though content of technical education has been widening in the western countries in recent times.

(b) For the advance of technical and technological education and training at different levels appropriate action should be taken

by State Governments and the Central Government to emphasise in the curricular courses of elementary and secondary schools the importance of scientific courses and the use of tools and instruments that would train the hands and the eyes of the pupils at the appropriate stages of development.

(c) At the level of diploma courses the institutions may have to undergo such changes as may be required to be introduced in relation to the needs of industry and commerce and the changing educational system.

(d) The All-India Council for Technical Education should consider the question of the type of institutions required for the country from the view point of the types of technical personnel required for our industry and commerce.

(e) Necessary steps should be taken to provide in adequate numbers teachers to technical institutions during the Third Plan. The estimated requirements for teachers are, 1,654 for degree courses and 1,802 for diploma courses.

(f) Two or three training colleges for the training of teachers for polytechnics on the lines of similar colleges in the United Kingdom should be established.

(g) As a considerable amount of wastage of student talent is due to financial difficulties experienced by the students a general scheme of full scholarships and loans scholarships should be instituted in all technical institutions.

(h) In general, there may not be any shortage of personnel with degree and diploma qualifications in engineering during the Third Plan period but there may be shortages in certain particular fields. Therefore the present pattern of distribution of seats between the various fields should be re-examined.

(i) In order to meet the requirements of the Fourth Plan facilities should be increased by about 6,000 seats for degree courses and 15,000 seats for diploma courses during the Third Plan period.

(j) From the point of view of economy and efficiency the optimum size of a degree college should be for a student enrolment between 3,000 and 6,000.

(k) The location of engineering colleges and polytechnics should be as near industrial areas as possible.

(l) Practical training facilities for degree holders and diploma holders should be further developed.

(m) Increased facilities for technical education by way of apprenticeship training, sandwich courses, part-time and short-term courses and correspondence courses etc. should be provided.

(n) An organisation of teachers of engineering, known as the Indian Society of Engineering Teachers may be set up. Government should assist the organisation.

(o) The lists of equipment for degree and diploma courses prepared some time ago should be revised.

(p) Revised salary scales for teachers recommended by the All-India Council for Technical Education should be implemented by all State Governments and private institutions.

(q) Admissions to engineering colleges and polytechnics should be made on a competitive merit basis.

(r) One year's exemption may be granted to B.Sc. when admitted to the four-year degree courses in Engineering.

(s) Part-time courses should be organised in the existing polytechnics for those candidates preparing for the examinations of the Institution of Engineers.

(t) The basic admission qualification for diploma courses should be generally Higher Secondary Certificate or Pre-University examination and the courses should be of three years' duration. Until, the re-organisation of Secondary Education is completed the *status quo* should continue. At the same time whether the courses could be reduced to two years for those who have passed the Higher Secondary should be examined by the All-India Council for Technical Education.

(u) The question of large sized polytechnics may be examined and the present position in respect of the intake capacity of 180 students per polytechnic in Eastern region and 120 students per polytechnic in other regions has to be rationalised.

(v) With a view to coordinating the training courses provided at different institutions under different Ministries and industries and for the purpose of bringing into existence a coordinated structure of vocational education throughout the country, a sub-committee for coordination may be formed under the National Council for Vocation Education with representatives of the concerned Ministries like Railways, Defence, Commerce & Industry, Steel Mines and Fuel, Scientific Research and Cultural Affairs, Labour and Employment, etc. A secretariat may also be set up for the purpose in a coordinating agency like the Planning Commission.

Estimates of the requirements for Engineering personnel during the Third and Fourth Plan periods

For an investment of about 6,200 crores during the Second Plan, the Engineering Personnel Committee estimated the total additional demand for gradutes and diploma holders as about 28,000 and 49,000 respectively. These estimates did not include the requirements for personnel for a few undertakings in the private sector as the necessary data were not available. Taking also into account these requirements the total demand is of the order of 30,000 degree holders and 52,000 diploma holders. On the basis that the total investment for the Third and Fourth Plans would

be of the order of 10,000 and 14,000 crores respectively, the requirements for degree and diploma holders may be estimated as shown below :

	Third Plan	Fourth Plan
Degree holders	48,000	72,000
Diploma holders	82,000	1,24,000

On the basis of the schems of technical education approved and in the process of implementations, the output of graduates and diploma holders may be estimated as shown below :

	Third Plan	Fourth Plan
Degree holders	49,090	56,000
Diploma holders	76,162	81,250

It is observed that there will be no shortage of degree holders during the Third Plan. Some shortage is in respect of diploma holders. As regards the Fourth Plan, the demand and supply position will be as indicated below :

	Supply	Demand	Shortage
Degree holders	56,000	72,000	16,000
Diploma holders	81,000	1,24,000	43,000

The Working Group has suggested that it would be necessary to increase the admissions to degree courses by 6,000 and for diploma courses by 15,000 students in the course of Third Plan period. The additional intake for degree and diploma courses is proposed to be reached in the following manner :—

Degree courses	Additional Seats
1. Establishment of new institutions (15 engineering colleges each with an intake of 120 students)	1,800
2. Expansion of the capacity of existing institutions	3,200
3. Part-time courses	1,000
TOTAL ..	6,000
Diploma courses	
1. Establishment of new institutions (35 polytechnics intake of 180 each) ..	6,300
2. Expansion of existing institutions	3,700
3. Part-time courses	5,000
TOTAL ..	15,000

Keeping in view the recommendations of the Working Group the Ministry has estimated the financial requirements of Technical Education for the Third Plan period as Rs. 201 crores, which is made up of Rs. 110 crores for the completion of the schemes taken up during the current Plan period and Rs. 91 crores for the following new schemes :—

1. Increase in the admissions to degree and diploma courses
2. Full Scholarships and Loan Scholarships

3. Staff quarters
4. Part-time courses and correspondence courses
5. Diploma teachers training colleges
6. Establishment of 100 Junior Technical Schools as adjuncts to Polytechnics

The financial allocation proposed for each of the schemes is given at Annexure I.

The Planning Commission has suggested a tentative provision of Rs. 130 crores for Technical Education for various schemes of technical education as indicated in the statement at Annexure.

The Member (Education), Planning Commission, further discussed the matter with the Minister and suggested a revision of the estimates. The Ministry submitted revised proposals aggregating to Rs. 176.89 crores as shown in the statement at Annexure. For the revised estimates, the targets proposed are as given below :

(i) Completion of the schemes already taken up during the current Plan period

(ii) Implementation of the policies laid down by the Council regarding Technical Education, *viz.* introduction of 5-year integrated courses and provision of additional instructional facilities etc.

(iii) Increase in the admissions by 5,000 for degree courses and by 10,000 for diploma courses

(iv) Establishment of 50 Junior Technical Schools as adjuncts to polytechnics

(v) Organisation of part-time courses for degree and diploma so as to provide for 1,000 seats for degree and 5,000 seats for diploma courses

(vi) Establishment of four teachers training colleges for teachers of polytechnics

(vii) Construction of staff quarters for 20% of the staff of technical institutions

(viii) Provision of facilities for training in specialised subjects of importance

(ix) Provision of hostel accommodation for 50% of the students.

It may be pointed out that a minimum outlay of Rs. 110 crores is required for the completion of the schemes already undertaken in the current Plan period.

The National Developmental Council considered the matter at its meeting held in March 1960 and "noted the suggestions made by the Chief Ministers for increasing allotments for power, roads, village and small industries, rehabilitation and technical education".

A copy of the report of the Working Group will be circulated later.

Annexure to Item No. 9

Provision of financial allocation for technical education in the Third Plan

In Rs. crores.

Schemes	Original proposals of		Revised proposals of Ministry
	Ministry	Planning Commission.	
1. Indian School of Mines and Applied Geology ..	0·38	0·38	0·68
2. College of Engineering, Delhi	3·00	3·13	2·83
3. Delhi Polytechnic	0·60		
4. Indian Institute of Tech., Kharagpur	2·50	2·50	3·00
5. 6. 7. I.I.T., Bombay, Madras & Kanpur	19·00	18·25	18·50
8. Specialised Institutions	0·50	0·50	0·50
9. Practical Training stipends & hostels	1·92	1·92	1·92
10. Research Training, scholarships & fellowships ..	0·32	0·32	0·32
11. Teacher training, fellowships & hostels	1·78	1·78	1·78
12. (*a*) Centrally sponsored 8 Engineering Colleges ..	13·14	11·50	11·50
(*b*) Centrally sponsored 27 polytechnics	11·49	10·20	10·00
13. Ghosh-Chandrakant expansion	5·00	3·75	5·00
14. Non-Government institution development	3·50	3·50	3·50
15. Revision of salary scales of teachers	9·00	4·00	9·00
16. Loans for hostels	6·92	3·00	6·92
17. (*a*) Govt. institutions—development	6·00	6·00	6·00
(*b*) Junior Technical Schools	10·00	6·00	7·50
18. Five-year integrated course	3·00	3·00	3·00
19. Increase in price of equipment etc.	7·80	5·00	7·80
20. (*a*) Increase in admission—degree	27·64	14·28	16·50
(*b*) Increase in admission—diploma	23·19	10·63	17·50
21. Part-time courses	2·89	2·89	1·50
22. Architecture etc.	1·00	1·00	1·00
23. Diploma Teachers Training Colleges	0·60	0·60	0·60
24. P.G. Courses and Research	4·20	4·20	4·20
25. Staff Quarters	5·20	1·00	5·20
26. Deficit recurring grant	5·60	—	—
27. Scholarships	24·64	11·00	24·64
28. Provision for specialised courses	—	—	6·0
TOTAL ..	200·87	130·33	176·98

Item No. 10 :—**To consider the proposal of the Government of Orissa for starting a Regional Engineering College at Rourkela**

The Eastern Zonal Council at its fourth meeting held on the 12th November, 1959 at Bhubaneswar accepted the proposal of the Government of Orissa for the establishment of a Regional Engineering College at Rourkela in the Third Five-Year Plan period. The Council recommended that the State Government's proposal may be considered sympathetically. Relevant extracts from the proceedings of the meeting of the Zonal Council are given below :—

"Dr. Mehtab explained Orissa's need for such a college in order to meet their manpower requirements during the next Plan. He also pointed out that, as in the cases of the Regional Engineering Colleges, in Jamshedpur and Durgapur, Rourkela, with its Steel Plant and other ancillary industries, was an ideal site. Dr. B. C. Roy felt that Orissa had a strong case in the matter, and suggested that the matter should be taken up with the All-India Council for Technical Education.

The Council decided that the matter may be pursued accordingly, the All-India Council for Technical Education being requested to consider sympathetically the establishment at Rourkela of a Regional Engineering College."

A detailed note forwarded by the Government of Orissa in this connection may be seen in Annexure.

It may be submitted in this connection that the All-India Council for Technical Education at its earlier meeting held on 13th April, 1959 recommended that the proposal to establish Centrally-sponsored Engineering Colleges in the States of Kerala, Orissa, Punjab, Assam and Rajasthan may be considered in the context of the formulation of the Third Five-Year Plan.

The Regional Colleges, being established at present, at Warangal, Mangalore, Nagpur, Bhopal, Durgapur, Jamshedpur, Allahabad and Srinagar reserve a certain number of seats for students coming from other States. Although they are located at certain places, they are designed to serve the needs of the country as a whole; and the admissions are not to be restricted to students of the States where they are located.

The matter is now placed before the Council for consideration.

Annexure to Item No. 10

Proposal of the Government of Orissa for starting a Regional Engineering College at Rourkela

Government of Orissa have been pressing for some years past for the establishment of a Higher Institute of Technology at Rourkela, ever since the Government of India decided to locate the first State-owned Steel Plant there. In fact considering the advantageous location of Rourkela in the very heart of the most important mineral belt of India, and the special facilities that would be afforded in the most modern Steel Plant along with its ancillary industries, the late Dr. S. S. Bhatnagar, the then Chairman of the University Grants Commission, had suggested that a Higher Institute of Mineral Technology and Metallurgy should be located at Rourkela. The Engineering Personnel Committee set up in 1955 by the Planning Commission for assessing the supply and demand position of different types of engineering personnel required for the Second Five-Year Plan, had recommended the establishment of (i) 6 new Colleges in the Eastern Region with provision for 25 seats in Metallurgy in one of them and (ii) a new College with an intake capacity of 125 per year for producing Mining Engineers. Following these suggestions, the Utkal University appointed an Expert Committee which examined all aspects of the matter and recommended that an Institute of Mineral Technology of an all India Character should be established and that it should be established at Rourkela which would afford an ideal location for it. They submitted the scheme to the University Grants Commission on 1st December,1955. The State Government in their letter No. 2369/P, dated the 7th March, 1956 moved the Government of India pointing out the advantages of locating the Institution for Metallurgy and Mineral Technology at Rourkela and urging upon them to take early decision in the matter. Sri T. T. Krishnamachari, the then Central Minister of Commerce and Industry had also greatly favoured the establishment of such an institution at Rourkela. This proposal, however, was not accepted by the Government of India who decided that courses in Mining and Metallurgy should be started only in the established Engineering Colleges.

2. In the 11th meeting of the All-India Council held on the 24th of March, 1958 the State representative, therefore, raised the question that the Council should recommend the establishment of a full-fledged Engineering College at Rourkela, which besides courses in Electrical and Mechanical Engineering should also provide courses in Metallurgy, Mining and Chemical Engineering. The Council had just taken the decision for the establishment of an Engineering College at each of the Steel Cities of Durgapur and Tatanagar, because of the special facilities that would be available for engineering education and training in these Industrial areas. It was, therefore, urged that a full-fledged Engineering College should be located at Rourkela.

3. The Expert Committee appointed by the Planning Commission have already assessed the requirement of engineering personnel for the Third Five-Year Plan. On the basis of population, Orissa's total requirement of Engineers and Overseers for the Third Five-Year Plan and the annual required output is shown in the table below :—

All-India requirement		3rd Five-Year Plan reqirement of Orissa @ 4%	Annual output
Engineers	49,000	2,000	400
Overseers	76,000	3,040	600

To allow for casualties and failures during the 4 or 5 years course, the annual admission strength should be increased by 20% or so.

At present Orissa has got only one Engineering College with admission capacity of 120 students against the total requirement of about 400—500 admisssions per annum. The Engineering Personnel Committee appointed by the State Government to work out the supply and demand of engineering degree and diploma holders for the Third Plan have, therefore, strongly recommended the early establishment of an Engineering College at Rourkela with an initial admission capacity of 200 students per year.

4. Last year the Government of India established as many as 8 Regional Engineering Colleges for increasing the output of Engineers in the country. As Orissa has very much lagged behind in technical education, the State Government had very much hoped that the Central Government would show special consideration to Orissa and locate one of these institutions at Rourkela which would provide the best opportunities for training in certain branches of engineering and thereby help to bring up the level of technical education in the State to somewhat onto a par with the other neighbouring States which have progressed very far in this field. The State Government were greatly disappointed to find the claims of Rourkela and the needs of the State of Orissa were not at all taken into consideration.

5. The question was recently discussed with the Working Group of the Ministry when they visited Orissa for formulating the Third Plan requirements and it was unanimously agreed that a Regional Engineering College should be established in Rourkela and that immediate steps should be taken to start the preliminary work during the Second Plan period.

The State Government, therefore, urge upon the Council to consider the claims of Rourkela and the urgent needs of the State Government and recommend to the Government of India for the early establishment of a Regional Engineering College at Rourkela which besides provides facilities for training in (1) Electrical and (2) Mechanical Engineering should also provide facilities for training in (3) Metallurgy, (4) Mining and Mineral Technology (5) Chemical Engineering and (6) Ceramic and Refractory Technology. The State Government would be fully prepared to

co-operate with the Central Government and offer all necessary facilities in the matter of land, power and water-supply etc. for the early establishment of the Regional Institution at Rourkela.

Item No. 11 :—**To consider the Scheme of Establishment of a Foundry and Forging Institute.**

The All-India Council for Technical Education at its meeting held on 13th April, 1959 considered the question of establishment of a Foundry and Forging Training Institute and appointed an Expert Committee with the following composition and terms of reference :

Composition

1. Dr. A. Nagaraja Rao, Chairman, Heavy Engg. Corporation, Ranchi.	Chairman
2. Shri Pranlal Patel	Member
3. Shri J. V. Patel	Member
4. Shri S. Visvanathan	Member
5. Shri D. L. Deshpande	Member
6. Shri S. N. Iyengar, Asstt. Professor (Mech. Engg.), Indian Institute of Technology, Kharagpur	Member
7. A nominee of the All India Foundrymen's Association (Dr. B. R. Nijhawan.)	Member
8. A nominee of the Railway Board. (Shri R. Krishnaswamy)	Member
9. A nominee of the Ministry of Commerce & Industry (Dr. B. D. Kelelkar).	Member
10. Shri K. N. Sundaram, Assistant Educational Adviser (T), Government of India	Secretary

Terms of Reference

(i) To recommend the location of the centre at Ranchi or any other suitable place

(ii) To work out the details for the Foundry and Forging Training Centre

The Committee co-opted the following as members :—

(i) Prof. of Mechanical Engineering, Indian Institute of Science, Bangalore

(ii) Shri I. N. Dar, Chief Project Officer, Foundry Forge Project, Heavy Engg. Corporation Ltd., Ranchi.

(iii) Nominee of the Ministry of Defence (Shri D. R. Malik).

It held two meetings on 4th February, 1960 and 31st March, 1960. The main recommendations of the Committee are as given below :—

Location of the Institute

The Committee unanimously recommended that having regard to all aspects of the matter, Ranchi was the mose suitable place for the location of the Institute. The Institute can work in close collaboration with the Heavy Foundry and Forging plant that is being established there, and which will provide the necessary in plant facilities for the sandwich course proposed to be conducted. It is also important that an institute of this type should involve itself continuously with a large industrial unit since only then will it secure for the candidates the knowledge and the technical know-how relating to design, production, testing, research and other aspects. Ranchi also offers other facilities as for instance, land etc. for the location of the Institute.

Keeping in view the requirements of the Institute the Committee selected a site (at Ranchi) of approximately 30 acres and recommended that necessary steps be taken to acquire the same, as soon as possible.

Courses of Training to be conducted

(i) Post-Graduate courses for training Executive personnel

The course should be of 18 months' duration, conducted on a sandwich basis (6 months theory, 3 months practical; 6 months theory and 3 months practical work) and be open to graduates in Mechanical Engineering or Metallurgy. To start with 50 candidates may be admitted to the course.

(ii) Diploma course for training Supervisory personnel

The course should be of 18 months duration conducted on a sandwich basis, (of 6 months theory, 3 months practical work, 6 months theory and 3 months practical work) and be open to those candidates who possess a recognised diploma or equivalent qualification in Mechanical engineering. To begin with 100 candidates may be admitted to this course.

(iii) Refresher courses

Refresher courses for men in industry may normally be of 3 months duration which should include at least 4–6 weeks theoretical training. The details of the courses should be worked out to suit the requirements from time to time.

The curriculum of training prepared by the Committee for the first two courses is given at Annexure.

Estimates of Cost

The Committee has made the following tentative estimates for the establishment of the Institute at Ranchi :

	Rs. (in lakhs)
A. Non-Recurring	
(*i*) Building (65,000 sq. ft.)	9·0
(*ii*) Equipment	20·00
(*iii*) Furniture	1·0
(*iv*) Library	1·0
Total	31·0
B. Recurring	
(*i*) Staff	2·5
(*ii*) Maintenance, Scholarships etc.	1·5
Total	4·0
C. Hostel	
For 350 candidates (including furniture, equipment etc.)	15·0
D. Staff Quarters	
For about 75—80% of staff	5·0

The above estimates do not include the cost of land. The Committee expects that the State Government will provide the necessary land of 30 acres free of cost. The Committee suggested that the necessary request be made to the State Government.

Administration and Management

The Committee recommends that the Institute should be set up as an autonomous organisation. Necessary powers for the administration and management of the affairs and finances of the Institute should be vested in a Governing Body.

Foreign Aid

The Committee recommends that technical assistance should be obtained from abroad under any one of the foreign aid programmes, in the establishment and development of the Institute. The assistance may comprise equipment, a few experts in Foundry and Forge technology and facilities for the training of the Indian members of the staff abroad. The details of the assistance may be settled by the Central Government. In this connection, the Committee noted that the United Nations Special Fund provides for assistance being given to projects of this kind. "The aim of the Fund is to provide systematic and sustained assistance in the field essential to integrated technical, economic and social developments of the less developed countries and accelerate their economic development".

Annexure I to Item No. 11

Post-Graduate Course in Foundry Engineering
Post-Graduate Course in Forge Engineering
Curriculum of Studies*

	Hrs./week		Exam. Marks	
	L.	L.D.F.	Paper	Sessionals
First Term : Six months duration, Common to both courses.				
2001 Applied Maths.	2	3	100	100
2002 Chemistry of Sands, clays, Oils etc. ..	2	6	100	100
2003 Physical Metallurgy	2	6	100	100
2004 Combustion Engineering and Refractories.	2	3	100	100
2005 Strength of Materials	1	3	100	100
2006 Seminar	—	3	—	—
	9	24	500	500

Examination in all subjects after term

Second Term : Three months Training in Factory

Third Term : Six months

Foundry Stream

2007 Heat-treatment and Furnace Design	2	3	100	100
2008 Foundry Metallurgy	2	3	100	100
2009 Foundry Technology	2	6	100	100
2010 Foundry M/c & Equipments	1	6	100	100
2011 Industrial Engg. & Management ..	2	3	100	100
2006 Seminar	—	3	—	—
	9	24	500	500

Forge Stream

2007 Heat-treatment & Furnace Design ..	2	3	100	100
2012 Metallurgy of Plastic Working ..	2	3	100	100
2013 Technology of Plastic Working ..	2	6	100	100
2014 Forging machines & Equipments ..	2	3	100	100
2011 Industrial Engg. & Management ..	2	3	100	100
2006 Seminar	—	3	—	
	9	24	500	500

Examination in all subjects

Fourth Term : Three months duration. Project and Thesis.
Final Examination Viva Voce.

Total Students: 50 I term 1 batch lecture 2 batch practical, III term 2 batch lectures, 2 batch practical.

Load—23L+126 L.D.F.

(considering that a new batch will be taken during each year).

Seminar periods to be used if required for lectures by visiting professors and Engineers.

Diploma in Foundry Forge Technology
Curriculum of Studies *

First Term Six months duration.

		Hrs. Week		Exam. marks	
		L.	L.D.F.	Paper	Sessionals
1001	Engineering Maths.	2	3	100	50
1002	Chemistry	2	3	100	50
1003	Strength of Materials	2	3	100	50
1004	Workshop Theory	4	6	200	150
1005	Machine Drawing	—	6	—	200
1006	Seminar	—	3	—	—
		10	24	500	500

Examination in all subjects

Second Term Three months duration. Training in factory.

Third Term Six months duration.

1007	Foundry Technology	2	6	200	100
1008	Plastic Working of metals	2	6	200	100
1009	Jigs, fixtures		3	—	50
1010	Metallurgy & Heat-treatment	2	3	100	100
1011	Industrial Engg.	2	3	100	50
1006	Seminar	—	3	—	—
		8	24	600	400

Examination in all subjects

Fourth Term Three months duration. Training in factory.

Final Examination. Viva Voce.

Total number of students 100

Lecturers in one batch .. ..

L.D.F. in 4 batches of 25 each ..

Load 18L & (48×4)=192 L.D.F. ..

(considering that a new batch will be taken during each year).

Seminar periods to be used if required for visiting Professors and Engineers.

*(Subject to minor modifications in the light of comments from certain members on circulation).

Item No. 12 :—**To consider a note on the reservation of seats for Scheduled Castes, Scheduled Tribes and Backward Classes for admission to Engineering and Technological Institutions in the country**

The All-India Council for Technical Education at its meeting held on 13th April, 1959, considered the question of reservation of seats for Scheduled Castes, Scheduled Tribes and Backward Classes in Engineering and Technological Institutions in the context of admission of the right students for technical courses and reducing wastage as far as practicable. The concensus was that while measures were necessary to improve the condition of Scheduled Castes, Scheduled Tribes and Backward Classes and to provide to them adequate opportunities of educational advancement, it was also important to ensure that such measures did not lead to much wastage in the institutions. Opportunities should be afforded only to those who can profit by them. After discussing the matter, the

Council was of the view that before detailed recommendations were made in respect of reservation of seats, full data must be collected regarding the present position obtaining in technical institutions in the different States. The Council decided that the Secretariat should collect the necessary information and submit a note for consideration at the next meeting.

The present position regarding reservation of seats for Scheduled Castes, Scheduled Tribes and Backward Classes in technical institutions is as explained below :—

In view of the special obligations placed on the Government by the Constitution for improving the conditions of Scheduled Castes and Scheduled Tribes and bringing them up to the level of more advanced sections of the community, the Ministry of Education in November, 1954 suggested to the State Governments that the following concessions be given to students belonging to Scheduled Castes and Scheduled Tribes :—

(a) 20% of the seats should be reserved for students belonging to Scheduled Castes and Scheduled Tribes.

(b) Where admissions are restricted to candidates who have secured a certain minimum percentage of marks and not merely the passing of a qualifying examination, there might be 5% reduction in marks in favour of Scheduled Castes and Scheduled Tribes students provided that the lower percentage prescribed did not fall below the minimum required to pass the qualifying examination.

A similar suggestion was also made to the Universities in 1955.

The Backward Classes Commission in its report in 1956 recommended that 70% of the seats in Science, Medicine, Engineering, Agriculture, Veterinary and other technical and technological institutions of higher learning may be reserved for qualified students of Backward Classes till such time as accommodation can be provided for all students eligible for admission. The Commission also recommended that in making selections to the reserved quota of seats, qualified candidates from extremely backward classes should be taken into account and the balance of 30% of the seats as also the reserved seats unavailed of by backward classes should go to the rest of the candidates.

On the report of the Backward Classes Commission, the Ministry of Home Affairs suggested that seats may be reserved separately for Scheduled Castes, for Scheduled Tribes and Backward Classes and the quota may conform to the percentage of posts reserved or to be reserved for them in Government services. That Ministry also suggested that the reservation of posts for all the three groups in the services should not exceed 33-1/3%. The Ministry of Home Affairs, further suggested that 17-1/3% of the seats may be reserved for Scheduled Castes and Scheduled Tribes and 15-2/3% for Backward Classes.

The Ministry of Education after a consultation with other Ministries felt that its earlier suggestions viz. a reservation of 20% of the seats for

Scheduled Castes, Scheduled Tribes and Backward Classes would be sufficient. In view of the fact that a sufficient number of qualified candidates belonging to Scheduled Castes and Scheduled Tribes may not be available to fill the seats reserved for them, the Ministry recommended that the unutilised reserved seats may be filled by candidates belonging to other backward classes. This recommendation was communicated to Universities in June, 1958 by the Ministry of Education and to the State Governments by the Ministry of Home Affairs.

As decided by the All-India Council at its meeting held on the 13th April, 1959, the Secretariat issued a comprehensive questionnaire to all State Governments, Universities and Institutions to elicit detailed information on the following points :--

(a) Percentage of seats reserved separately or together for Scheduled Castes, Scheduled Tribes and Backward Classes

(b) Relaxation allowed in admission requirements

(c) Nature of other concessions given

(d) Pass percentage of students belonging to each of these three groups and the general pass percentage of the students of the Institutions as a whole

Replies to the questionnaire have been received from a number of institutions, State Governments and Universities. The replies from the rest are awaited. Based on the information received so far, a brief analyses of the actual position is given below :—

(a) Reservation of Seats

The percentage of seats reserved for Scheduled Castes, Scheduled Tribes and Backward Classes varies from state to state. In some states the order of reservation in Government institutions is different from the reservation made in non-Government institutions. The latter is decided in accordance with certain principles laid down by the State Governments concerned in their grant-in-aid code or in separate orders, issued by them. In some states, the seats are not reserved separately for Scheduled Castes, Scheduled Tribes and Backward Classes but for all the three groups together.

So far as State Government institutions are concerned, the percentage of seats reserved in each State is as shown below :—

State	Percentage of seats reserved			Remarks
	Scheduled Castes	Scheduled Tribes	Backward Classes	
(1)	(2)	(3)	(4)	(5)
1. Andhra Pradesh	——16%——		25%	
2. Assam	——20%——		—	The question of reservation of seats for Backward Classes is under consideration.

(1)	(2)	(3)	(4)	(5)
3. Bihar	7½%	8%	10%	
4. Bombay	7 to 15%			The question of introducing uniformity is under consideration.
5. Madhya Pradesh	15%	15%	Nil	
6. Madras	16%		25%	
7. Mysore	20%		45%	
8. Orissa	20%			In some institutions Backward Classes are also considered against the seats reserved for S.C. & S.T.
9. Kerala	5%		35%	
10. Punjab	19%		2%	
11. Rajasthan	20%			
12. Uttar Pradesh	20%			
13. West Bengal			No Reservation	

It will be observed from the above statement that out of 13 states, eight have reserved seats for Scheduled Castes and Scheduled Tribes together; two states separately for them. Two states have reserved seats for Scheduled Castes, Scheduled Tribes and Backward Classes together. One State viz. West Bengal has not made any reservation for Scheduled Castes or Scheduled Tribes or for Backward Classes.

The number of seats reserved for Scheduled Castes and Scheduled Tribes ranges from 5% to 30% but the extreme limits are confined to only 2 states viz. Kerala (5%) and Madhya Pradesh (30%). In the rest of the states the reservation is between 15 and 20%.

So far as Backward Classes are concerned, the position varies from state to state. In some states, seats are reserved separately for them and in some, reservation is made for all the three groups together. The number of seats reserved for Backward Classes where a separate reservation is made for them, ranges from 2% to 45%. The minimum limit is in the Punjab and the maximum in Mysore. In Mysore 20% of the seats are reserved for Scheduled Castes and Scheduled Tribes and 45% for Backward Classes.

So far as non-Government institutions are concerned, in some states the reservation follows the same pattern as at Government institutions. In some others, the pattern of reservation is in accordance with the orders of the State Governments concerned, issued separately for the purpose. Nevertheless, there is generally a reservation of up to 20% of the seats for Scheduled Castes and Scheduled Tribes in most institutions. In some states, a separate reservation is also made for Backward Classes which varies from 2% to 35%.

So far as University institutions are concerned, no uniform pattern is followed by all. A summary of the position in respect of Universities is given at Annexure I.

(b) Wastage

About 20 institutions have furnished information in respect of the performance of students belonging to Scheduled Castes, Scheduled Tribes and Backward Classes in the various examinations and the general performance of the students of the institutions as a whole. An analysis of the information received is furnished in the statement at Annexure II. The position varies widely from institution to institution and no general conclusions can be drawn for all the institutions on the basis of the present information. The information available cannot also be taken as a representative sample of the entire position. However, in some cases there is evidence that the performance of the students belonging to Scheduled Castes, Scheduled Tribes and Backward Classes is poor as compared to the general performance of all the students taken together in the concerned institutions. There is also evidence that in a few cases, the performance of the students of Scheduled Castes, Scheduled Tribes and Backward Classes is as good as that of the rest of the students.

(c) Relaxation of admission requirements

The relaxation allowed in respect of age limits varies from 1 to 3 years. Relaxation of marks up to 5% is also given in many cases. The information received so far is furnished at Annexure III.

Annexure I to Item No. 12

Summary of replies regarding reservation of seats for Scheduled Castes/ Scheduled Tribes and Backward Classes students as received from the Universities

Name of the University	Summary of the reply received
1. Agra	20% of the seats are reserved for Scheduled Castes students at the Technical institutions. In regard to the Engineering courses no rules and regulations have been laid down by the Government in regard to reservation of seats for Scheduled Castes and Backward Classes students.
2. Aligarh	Out of 120 seats in the 1st year B.Sc. Engineering class 2 seats are reserved for students belonging to Scheduled Castes and 2 to those of the other Backward Classes, subject to their obtaining minimum qualifying marks at admission tests. No seats are reserved for them at the Polytechnic. However, special consideration is given to them provided they are otherwise eligible for admission.
3. Andhra	20% of the seats are reserved for Scheduled Castes and Scheduled Tribes candidates.
4. Annamalai	16% of the seats are reserved for Scheduled Castes and Scheduled Tribes students.
5. Banaras	No seats are kept reserved for Scheduled Castes and Scheduled Tribes and Backward Classes.
6. Bihar	8% of the seats are reserved for candidates belonging to the Scheduled Castes and 7% belonging to Scheduled Tribes.
7. Bombay.	No preference is given to Scheduled Castes or tribes students for admission to the Department of Chemical Technology which is the only Technological Institution under the control of the University.

8. Calcutta	No special provision in the matter.
9. Delhi	20% of the seats in all the courses are reserved for applicants belonging to Scheduled Castes and Scheduled Tribes.
10. Gauhati	The Assam Engineering College affiliated to the University is Govt. College managed by the State Government. The University does not interfere with the internal management.
11. Jabalpur	15% of the total number of seats are reserved for Scheduled Castes students and 15% for Scheduled Tribes students.
12. Karnatak	Admission to Technical Colleges are regulated by the Government of Mysore.
13. Madras	No reservation of seats in the A. C. College of Technology for students belonging to Scheduled Castes and Scheduled Tribes, etc.
14. Baroda	7% of the total seats are reserved for Scheduled Castes, Scheduled Tribes and other Backward Classes students.
15. Nagpur	7% of the total number of seats are reserved for Scheduled Castes and Scheduled Tribes students.
16. Osmania	16% of the total number of seats are reserved for candidates belonging to Scheduled Castes and Scheduled Tribes.
17. Patna	7% of the seats are reserved for candidates of Scheduled Tribes, 8% for Scheduled Castes and 10% for other Backward Classes.
18. Rajasthan	The University has not made any reservation of seats under its rules in the Engineering Colleges affiliated to it.
19. Roorkee	20% of the total seats are reserved for the Scheduled Castes and Scheduled Tribes candidates provided they qualify in the entrance examination.

20. Saugar	As per regulations of the State Government in this behalf.
21. Venkateswara	University has not made any rule in the matter.
22. Kerala	Adimission to Engineering and Technical Institutions is controlled by the State Government.
23. Utkal	5% of the seats are reserved for admission of students of Scheduled Castes and Scheduled Tribes.

Annexure II to Item No.12

Performance of Scheduled Caste/Scheduled Tribes and Backward Classes students at the examinations after admission to Engineering and Technological Courses.

Sl. No.	Name of the Institution	Course Degree/ Diploma	Academic Year	No. of Scheduled Castes/ Scheduled Tribes and other Backward Classes candidates actually taken in the academic year indicated under Col. 4.	No. of S.C./ S.T./B.C. who could not pass the annual examinations other than the final in the 1st attempt	Pass percentage of S.C./ S.T./B.C. in the final examination after the completion of the course with the commencement of the academic year indicated under Col. 4.	General pass percentage in the final examination.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1.	College of Engineering, Nagpur	Degree	1956-57	S.C. 11	6	100%	85·71%
				S.T. 9	4	Nil	—
				B.C. —	—	—	—
			1957-58	S.C. 7	5	—	—
				S.T. 9	7	—	—
				B.C. —	—	—	—
			1958-59	S.C. 8	7	—	—
				S.T. 6	4	—	—
				B.C. —	—	—	—
2.	Government College of Arts & Architecture, Hyderabad.		1955-56	S.C. 5	—	100%	100%
3.	Shri Krishnarajendra Silver Jubilee Technological Institute, Bangalore.	Degree	1954-55	S.C. Nil	Nil	Nil	74·1%
				S.T.			
				B.C. 16	4	41·9%	
			other	B.C. 11	1	32·2%	
			1955-56	S.C. Nil	Nil	Nil	
				S.T.			
				B.C. 16	4	55·2%	68·9%
			other	B.C. 9	5	13·7%	

Annexure II—*contd.*

(1)	(2)	(3)	(4)
4.	Indian School of Mines and Applied Geology, Dhanbad.	Degree	1954-55
			1955-56
5.	Government Central Textile Institute, Kanpur	Degree	1955-56
6.	Engineering College, Anantpur	Degree	1954-55
			1955-56
			1956-57
			1957-58
			1958-59
7.	Govindram Sakseria Technological Institute, Indore.	Degree	1955-56
8.	Bihar College of Engineering, Patna	Degree	1954-55
9.	L. D. College of Engineering, Ahmedabad ..	Degree	1954-55
10.	Madras Institute of Technology, Madras ..	Diploma	1954-55
			1955-56
11.	M.B.M. Engineering College, Jodhpur ..	Degree	1954-55
			1955-56
12.	College of Engineering, Osmania University, Hyderabad.	Degree	1954-55

(5)		(6)		(7)	
S.C.	Nil		Nil	100%	1
S.T.	Nil				
B.C.	3				
S.C.	Nil				
S.T.	Nil		Nil	100%	97·4%
B.C.	3				
B.C.	1		Nil	100%	100%
S.C.	5		—	20%	73%
S.T.	Nil		—	—	—
B.C.	20		18	38%	—
S.C.	7		6	57%	—%
S.T.	2		—	50%	—
B.C.	20		13	65%	—
S.C.	4		—		
S.T.	Nil		—		
B.C.	20		10		
S.C.	3		—		
S.T.	1		—	The students will complete their Final examination after 1960.	
B.C.	33		16		
S.C.	8		—		
S.T.	—		—		
B.C.	27		13		
	1		—	100%	51·1%
S.C.	3	S.C.	Nil	100%	
S.T.	—	S.T.	—	—	92%
B.C.	4	B.C.	2	100%	—
S.C.	2	S.C.	1	50%	—
S.T.	—	S.T.	—	—	69%
B.C.	3	B.C.	1	66%	—
	2		—	100%	91%
	5		3	60%	80%
	2		—	100%	83·5%
	2		—	100%	100%
B.C.	5	B.C.	5	B.C. 80%	50%
S.C.	5			S.C. 20%	—

13.	National Institute of Engineering, Mysore ..	Degree
		Diploma
14.	B.D.T. College of Engineering, Devanagore	Degree
15.	University of Roorkee, Roorkee	Degree
		Diploma
16.	Jadavpur University, Calcutta	Degree
17.	Engineering College, Dayalbagh	Degree
18.	College of Engineering, Kakinada	Degree

1955-56	B.C.	26	B.C.	7	B.C.	57%	44%
	S.C.	8	S.C.	8	S.C	0%	—
1956-57	B.C.	27	B.C.	14		—	—
	S.C.	7	S.C.	7		—	—
1954-55	S.C.	Nil		—		—	—
	S.T.			—		—	—
	B.C.	15	B.C.	5		83%	75%
1955-56	S.C.	Nil		—		—	—
	S.T.			—		—	—
	B.C.	23	B.C.	1		66·6%	74·3%
1954-55	S.C.			—		—	—
	S.T.			—		—	—
	B.C.	15	B.C.	10		80%	92·8%
1955-56	S.C.	Nil		—		—	—
	S.T.			—		—	—
	B.C.	21	B.C.	7		75%	78·6%
1956-57	S.C.	Nil		—		—	—
	S.T.			—		—	—
	B.C.	7	B.C.	5		62%	70·6%
1954-55		49		14		42%	60·4%
1955-56		69		23		55%	76%
1956-57	S.C.	1		Nil		100%	100%
	B.C.	3		—		—	—
1954-55		1		Nil		100%	100%
1955-56		2		Nil		100%	100%
1956-57	S.C.	1		—		—	—
	B.C.	3		Nil		100%	100%
1955-56		—		—		—	—
Mechanical & Electrical Engg.		4		Nil		75%	80%
Chemical Engg.		1		Nil		100%	85%
1954-55	B.C.	7		4		100%	100%
1955-56	S.C.	6		3		100%	100%
1954-55	S.C.	13				100%	—
	S.T.	5	Information not given			100%	79%
	B.C.	33				82%	—
1955-56	S.C.	14				66%	—
	S.T.	8				—	74%
	B.C	.29				83%	—

(1)	(2)	(3)	(4)	(5)		(6)	(7)	(8)
		Diploma	1955-56	S.C.	1		Nil	
				S.T.	2		50%	90%
				B.C.	24		83%	
			1956-57	S.C.	Nil			
				S.T.	2		100%	91%
				B.C.	17		100%	
19.	Thangal Kunju Musaliar College of Engineering, Quilon.		1958-59		44	2	—	—
20.	Muzaffarpur Institute of Technology, Muzaffarpur.		1954-55	B.C.	1	Nil	100%	100%
			1955-56	B.C.	1	Nil	100%	98%
21.	College of Textile Technology, Berhampore	Degree	1958-59		2	1 (left)	—	—

NOTE :—S.C. stands for Scheduled Castes.
S.T. stands for Scheduled Tribes.
B.C. stands for Backward Classes.

Annexure III to Item No. 12

Summary of replies received from State Governments regarding relaxation of marks, age allowed to Scheduled Castes/Scheduled Tribes and Backward Classes for their admissions to Technical Institutions

Punjab

Relaxation in marks to the extent of 5% is admissible to them.

Admission is made on the basis of merit of the University examination result but Scheduled Castes, Scheduled Tribes and Backward Classes candidates are considered for admission against reserved seats in order of merit within their own group. Relaxation of age by 3 years is also allowed.

Rajasthan

Relaxation of marks to the extent of 5% admissible to them. Relaxation of age by 3 years is also allowed.

For admission to Diploma Courses they are given a concession of 5 marks over others.

Bihar

Certain relaxation in merits is made for these students on the basis of percentage of marks secured at the Secondary and Intermediate Examination.

Relaxation of age limits up to 2 years is also given.

West Bengal

Relaxation of age by one year is allowed for these students.

Summary of replies received from Universities regarding relaxation of marks and age allowed to Scheduled Castes/Scheduled Tribes and Backward Classes in the matter of admissions.

Serial No.	Name of the University	Relaxation in marks	Relaxation of age
1.	Annamalai University	Candidates getting even garde 'C' in the Pre-University Examination are considered eligible	3 years
2.	Banaras University	15% weightage is given	
3.	Delhi University	5%	
4.	Jadavpur University	.. .. ..	3 years
5.	Osmania University	Seats are allotted to them on the basis of merit among the applicants from each of the categories	
6.	Patna University	Some relaxation is admissible to them	

Summary of replies received from Technical Institutions regarding relaxation of marks and age allowed to Scheduled Castes/Scheduled Tribes and Backward Classes in the mater of admissions

Serial No.	Name of the Institution	Relaxation in marks	Relaxation of age
(1)	(2)	(3)	(4)
1.	Guru Nanak Engineering College, Ludhiana	Selection on merits among the candidates of these castes	
2.	Technological Institute of Textile, Bhiwani	Minimum qualification for such students is at least 2nd class I.Sc.	
3.	M.B.M. College of Engineering, Jodhpur	5%	3 years.
4.	Birla College of Engineering, Pilani	Admission in all other cases is on merit by open competition but in the case of these students the best among them who satisfy the minimum qualification are admitted.	
5.	Indian Institute of Technology, Kharagpur	5%	3 years.
6.	M.B.C. Institute of Engineering and Technology, Burdwan	Additional credit of 6% of marks for Scheduled Tribe and 4% is allowed for Scheduled Caste.	
7.	Purulia Polytechnic, Purulia ..	—	1 year.
8.	Ramakrishna Mission Shilpamandira, Belurmath (District Howrah)	—	1 year.
9.	Sri Ram Krishna Shilpa Vidyapith, Suri, (West Bengal)	—	1 year.
10.	The School of Printing Technology, Raja Subodh Mullick Road, Jadavpur	—	1 year.
11.	Victoria Jubilee Technical Institute, Bombay-19	Selection for reserved seats for students belonging to the Backward Classes, Scheduled Caste/ Scheduled Tribe is made irrespective of their position in the pass list of qualifying examination, if they are otherwise eligible, but in order of merit '*inter-se*'.	6 years.
12.	Alagappanagar Polytechnic, Alagappanagar (Kerala State).	The condition that the applicant should have secured 100 marks in Mathematics and Science together is relaxed in their cases so that a pass in S.S.L.C. is considered as the necessary and sufficient minimum qualification for admission to them.	
13.	Annamalai Polytechnic, Chettinad	They are admitted even though they have not obtained good marks relating to other students.	
14.	Madras Institute of Technology, Madras	While awarding marks in personal interview weightage is given to these students.	
15.	National Institute of Engineering, Mysore	They are admitted in the order of merit within their own group.	
16.	Engineering College, Gulbarga (Mysore State)	5%	

Item No. 13:—**All India Boards of Technical Studies**

(a) Matters for Report

A. Board of Studies in Engineering & Metallurgy

Meetings

The first meeting of the re-constituted Board of Technical Studies in Engineering & Metallurgy was held on the 24th March, 1960. Shri N. K. Mitra was re-elected as Chairman for the new term upto 31st December, 1962. Dr. D. N. Prasad, Dr. P. K. Kelkar, Prof. B. Sen Gupta and Shri N. D. Sundaravadivelu were co-opted as members.

Duration of National Certificate Courses

2. The Board considered a suggestion that the duration of the National Certificate Courses in Engineering be increased from three to four years in order to raise the standard and content of the course. The Board expressed the view that since secondary education was in a process of reorganisation and the passing of the Higher Secondary Examination will hereafter be the minimum admission qualification to the National Certificate courses, it was not necessary to increase the duration of the courses from three to four years. The necessary improvements in the standards, if any, could be brought about within the present three-year courses.

B. Chemical Engineering Board

Meetings

3. The first meeting of the re-constituted Board was held on 9th April, 1960. Dr. G. P. Kane was re-elected as Chairman for the new term up to 31st December, 1960. Dr. G. S. Laddha, Dr. M. Narasinga Rao and Dr. N. R. Kamath were co-opted as members.

Expansion of facilities for Chemical Engineering Studies

4. The Board considered the question of further expansion of facilities for training in Chemical Engineering and decided that a Sub-Committee consisting of the following members should be appointed to hold detailed discussions with the Planning Commission regarding the scope of development of chemical industry under the Third and subsequent Plans and the requirements for technical personnel of various categories:

Sub-Committee

(i) Dr. G. P. Kane
(ii) Dr. G. S. Laddha
(iii) Dr. P. S. Mene
(iv) Dr. M. D. Parekh

On the basis of these discussions, a scheme should be formulated for the expansion of Chemical Engineering training facilities in the country.

5. The Board decided that pending the formulation of the above scheme, the proposal of Karnatak University, Dharwar, for starting degree course in Chemical Engineering should be deferred.

(b) Matters for decision

A. Board of Studies in Engineering & Metallurgy

Duration of Practical Training

The National Certificate Courses in Engineering consist of three years' instruction at an institution followed by two years' practical training in a recognised establishment. The certificate is to be awarded to candidates only after they have completed satisfactorily the prescribed practical training.

The Board reviewed the question of the duration of practical training and reiterated the view that two years' practical training should be prescribed for the award of the National Certificate. Having regard to the present employment position and the practical training facilities available, the Board, however, recommended that the training received by a candidate during employment, if found satisfactory, may be counted for the two years' practical training required for the award of the certificate. The Board also recommended that the State Boards of Technical Education be requested to lay down two years practical training or an equivalent period of training in employment as a necessary condition for the award of the State diplomas.

Diploma Course in Automobile Engineering

The Coordinating Committee at its meeting held on 3rd December, 1957 accepted the recommendations of the Board that Automobile Engineering should be offered after the Diploma Course in Mechanical Engineering and that it should be of one year's duration. An Expert Committee of the Board has prepared detailed curriculum and syllabus for a one-year Automobile Engineering Course. The Committee has also prepared the details of equipment and other instructional facilities required for conducting the course. The scheme is given at Annexure I. The Board recommended the scheme for approval. The Board also decided that if the Syllabus Committee for Mechanical Engineering suggested any revisions in the existing National Certificate Course, the question of making consequential changes in the Automobile Course may be considered in due course.

Draftsmanship Courses

In pursuance of the recommendation of the All-India Council for Technical Education made at its meeting held on 30th October, 1954, a Joint Committee of the Boards of Technical Studies in Engineering and Metallurgy and Architecture and Regional Planning was set up to prepare a detailed scheme for Draftsmanship training in Civil. Mechanical and Electrical Engineering and in Architecture. The Joint Committee has now prepared a scheme which is given at Annexure II. The scheme provides for two distinct and separate courses in Draftsmanship—one in Civil Engineering and Architecture and another in Electrical and Mechanical Engineering. The duration of both courses is two years with S.S.L.C. or equivalent as the minimum admission qualification.

The Board at its meeting held on the 24th March, 1960 approved the scheme prepared by the Joint Committee. The Board also recommended that the State Boards of Technical Education may make minor modifications in respect of the Syllabus for Mathematics and Science to suit the local variations in the curriculum and syllabus of matriculation courses.

Draftsmanship courses are at present being conducted at a number of polytechnics on the recommendations of the All-India Council for Technical Education/Coordinating Committee. The Ministry of Labour also is conducting Draftsmanship courses at various craftsmanship training centres and the National Council for Vocational Trades is awarding Craftsmanship Certificates to candidates who are trained at those centres. The question for consideration is whether the All-India Council for Technical Education or the National Council for Vocational Trades should be responsible ultimately for coordinating training in Draftsmanship, laying down of standards and other related aspects. The Board decided that this matter should be considered by the All-India Council for Technical Education.

B. Chemical Engineering Board Five Year Integrated Course

The Board finalised a scheme for a five-year integrated degree course in Chemical engineering, together with a model list of equipment, staff, accommodation etc. required for conducting the course. The scheme is given at Annexure–III.

Annexure—I to Item No. 13

All-India Council for Technical Education

Detailed Syllabus for National Certificate Course in Automobile Engineering.

Admission Qualification: A pass in the examination for National Certificate Course in Mechanical Engineering or equivalent.

Duration: One year

1. Engines

Petrol engine theory. Petrol and other alternative fuels. Phenomena of combustion, flame propagation, detenation and pre-ignition. Octane number, determination of Octane number of a fuel, doped fuels. Forms of combustion chamber, location of valves and sparking plugs. Efficiency, speed, power output and rating. Single and multi-cylinder engines, firing order and crank arrangements.

Four stroke and two stroke engines. Engine details, timing gear, cam shafts, different types of valves and valve actuation.

Carburetters, theory of carburetion, compensation: Manifolds and factors affecting distribution. Dual manifolds; air heating and exhaust jacketing. Principles of main, compensating, pilot and power jets; accelerating pumps. Types of carburetters. Throttle, choke and controls. Tuning of carburetters. Petrol feed, gravity, vacuum pump and electric lifts.

Ignition, basic theory, spark plugs. Spark-plug and contact breaker gaps, their effect on efficiency.

High speed compression ignition engine, theory, comparison of the high speed compression ignition engines and petrol engines. Fuel technology, high speed diesel oil and other alternative fuels. The phenomena of combustion, flame, propagation, detenation and pre-ignition. Combustion chamber forms. Location of valves and atomisers. Efficiency, speed, power output and rating.

Four stroke and two stroke compression ignition engines, single and multi-cylinder engines. Firing order and crank arrangements. Engine details, valves and valve gears, scavenging and scavenging systems.

Fuel injection system. Fuel pumps; types for single and multi-cylinder engines, Fuel pump drive and couplings. Injection advance. Injection valves, nozzles, pipe lines, governors and controls. Fuel filters.

Normal aspiration, altitude effects supercharging and super-charges.

Cooling systems. Air, water and oil cooling. Anti-freeze mixtures. Radiator construction. Honey comb, corrugated strips and gilted tubes.

Thermo syphon and pump circulation, Thermostats and temperature control.

Lubrication splash, low pressure and high pressure systems. The oil sump and dry sump methods. Oil filters and coolers. Specifications for lubricating oils, Physical and Chemical properties of lubricating oils. Effect of temperature and altitude under running conditions. Lubrication diagram.

II. Chassis and Transmission

Rolling, air and gradient resistances, propulsive forces required, Power and torque characteristics of power units for a specified road performance. Power weight ratio.

Classification of vehicles, layout and construction of chassis for different types of vehicles. Loads on frames. General consideration for strength and stiffness. Engine suspension and mounting attachment of transmission members and springs.

Body as a stress carrying component. Qualitative treatment of chassisless construction.

Various types of springing and suspension systems, steering geometry and mechanism. Turning radius Gamber-toe-in-caster angle steering knuckles—arrangement for steering gear—Types of steering gear—Worm-gear types—Cam and lever types—Circular ball types—Power steering. Steering for crawler type tractor.

Torque in successive elements of transmission system from engine to axle shafts; reactions and anchorage.

Clutches, wet and dry; cone clutches, automatic clutches; centrifugal vaccum operated and compressed air operated—fluid flywheel and over-running clutches gear boxes, sliding, constant mesh, synchro mesh, opi-cyclic and pre-selective gears. Gear actuation. Engine suspension and mounting; Position of gear box and gear lever. Quadrant and gate changes. Transmission systems and universal joints. Torque rods and torque tubes. Front wheel drive and four wheel drive. Bevel, werm spiral and chain transmission.

Shock absorbers. Wheels; artillery, disc and wire wheels, Tyres, rims and accessories.

Principles of breaking and breaking mechanisms. Vacuum serve and hydraulics breaking systems. Dynamics of braking; effects of braking on steering.

Lubrication systems. Physical properties of lubricants suitable for various duties considered in relation to speed load, boaring materials temperature, and protection.

Problems arising in cornering and breaking. Qualitative treatment of pitching, rolling and front and vibration.

III. Electrical Equipment in Automobile

Ignition systems of a spark ignition engine. Timing of spark Induction coil, distributors Coil Ignition, Magneto Ignition. Types of magnets. Advancing and retarding of spark, automatic advance and retard mechanism, spark gaps. Spark plugs. Testing of coils Magnetos and sparking plugs. Ignition faults.

Types of storage batteries. Charging and discharging, Hydrometers, Effects of overcharging. Sulphation and desulphation. Topping up. New and idle batteries. Adjustment of charging current. Capacity of cells and batteries. Voltage drop. Faults. Tests for polarity and batterycharge. Care and maintenance of Storage Batteries.

Charging generators, shunt generator, effect of third brush. Three brush generator, setting of third brush, cut outs, reverse current relays. Generator trouble, Voltage regulators.

Battery-motor starting systems. Behaviour during starting. Torque. Conditions of starting. Starting circuit, series motor, Starting current. Effect of voltage drop. Size of motor and gear ratio. Commutator brushes, Dynamotor.

Earth and insulated return systems. Cables, diagrams, Tests for faults in the electrical system.

Bulbs. Head lamps. Horns. Fuel pumps. Signalling devices. Wind screen wipers. Petrol and other electrical gauges. Instrument Panels, electrical currents.

IV. Automobile Design

Materials used in construction of the automobiles. Calculation, design and drawing of various engine details such as combustion chamber cylinders, liners, pistons, connecting roads, valves and valve gears, bearing and crank-shaft, flywheels carburetters, fuel pump, fuel nozzle, ignition systems, clutches radiators, gear boxes etc.

Dynamics of vehicles, calculation of bending moment and stresses due to torque reactions. Calculation, design and drawing of various components of transmission, chassis and suspension such as torque tube, universal joint, differentials, axles, springs, shock absorber, brakes, chassis frames and body.

Note:—Every student will have to submit as his term work at least two designs each under 27 and 28 complete with calculation and working drawing.

V. Motor Transport organisation and Service Station Layout

General Garage, Service Station, Expenditure. Breakdown Service Display and Storage. Repair Shop fittings, Compressed Air Supply. Lubrication Service, lifting tackle. Cleaning equipment. Plug cleaners. Folding Plant. Sundry Welding equipment. Cutting torch. Brazing Bending

and tempering. Power and Machine Tools. Extractors and presses. Small tools. Mechanics tool kit. Measuring instruments. Air operating gauges. Time lost Service. Body Repair and Paintings.

Layout of the above equipment. Organisation of Staff. Estimating, Costing and invoicing of Repair wall.

Buying of plant. Checking overhead charges. Dealing with customers requirements. Storing and handling of fuels and lubricants.

Stores organisation and store keeping. Stock control, location of stores—Bins—Shelter—Racks—inflammable material.

The chain of responsibilities—Duties of foreman—works managers, working conditions—casual customer—replacement service—customer record.

Vehicle selling—Distribution policy—qualifications of distributors—Sub-dealers—Service after sales—Spare parts—Purchase facilities.

Motor vehicles Act—Salient features and implications on the customer, users and operators.

VI. Automobile Laboratory Practice

Testing of Petrol and compression ignition engines under various conditions of loads and speeds. Testing of fuels to determine their constitutions, physical property, calorific value and fuel air ratio. Testing of lubricants, their physical properties and properties as a lubricant, Gas plant testing, Engine analyser and its use.

VII. Automobile Workshop Practice

Automobile Workshop and garage equipment. Hoists, lifts jacks. Cylinder boring, grinding and lapping machines. Instruments for measuring cylinder bores, finish etc. Connecting red aligners, crankshaft turning and truing machines. Valve seat and face cutters. Jigs and tools for gear box, differential, back axle and wheels.

Repair, reconditioning and overhaul, checking cylinder, bore, reboring, fitting over size pistons and rings, checking crankshaft, renewing main bearing and big end, decarbonising, valve facing and grinding and refitting. Overhauling and repairing gear boxes and clutches. Overhauling and repairing front axle, steering universal joints, propeller shafts, back axles, and brakes. Checking track of wheels, castor angle and toe in. Repairs to chassis, body, unpholstery and top. Location of faults and minor repairs. Adjustments and timing road tests. Ignition, starting and lighting systems. Location of faults, overhaul and repairs. Rewiring. Carburetters; adjustment and tuning. Repairs to manifolds. Induction and exhaust pipe. Servicing and lubrication, Ordinary servicing, check up servicing and specialized servicing.

VIII. Outside practice or practical training in an Automobile Engineering factory or establishment for a period of 6 months (26 weeks). Every student will have to submit a log book of their daily work during

outside practice duly certified by the person incharge of the establishment or the factory and will in addition have to submit a thesis on any subject of his choice relating to Automobile Engineering with which he was connected during his outside practice.

Examination and Instruction Scheme for Automobile Diploma

Entrance Qualification—Pass in National Certificate Course Examination in Mechanical Engineering or equivalent

33 weeks of 35 hours or equivalent working arrangement

Subject	No. of hours of instruction per week	Schemes of examination Paper Duration hours	REMARKS Theory	Practical	Terms work
1. Automobile Engineering (Engines).	3	3 (1st paper).	100	—	—
2. Automobile Engineering (Chasis & Transmission).	3	3 (2nd paper).	100		
3. Automobile Engineering (Electrical equipment of Automobiles).	2	2 (3rd paper).	50	—	—
4. Automobile Design ..	8	4 (4th paper).	100	—	50
5. Motor Transport Organisation and Service Station lay-out.	2	2 hours.	50	—	—
6. Automobile Laboratory Practice.	15	4 hrs. (Practical Examination incl. *viva-voce*	—	50+25 *viva-voce*	25
7. Automobile Workshop Practice.		3 hours practical examination	—	50+25 *viva-voce*	25
8. Automobile Practice (outside practice). :					
(*a*) Log Book			—	—	50
(*b*) Thesis			—	—	50
TOTAL ..	33		400	150	200
GRAND TOTAL ..				750	

Standard of Passing

(i) Not less than 40% of the marks in each of the papers of the written examination.

(ii) Not less than 40% of the marks in each of the practical examination.

(iii) Not less than 40% of the total marks allotted to home work, class work and periodical examinations.

(iv) Not less than 50% of the aggregate marks.

Schedule of Staff, accommodation and Equipment required by an Institution for introducing Post-Mechanical Diploma Course in Automobile Engineering

Staff requirements

In an institution already having the full complement of Mechanical Engineering staff (as per the All-India Council for Technical Education standards) for courses equivalent to National Certificate Course, the Committee recommends essential additional teaching staff as below. The proportionate office and menial staff to be added, can be calculated for each institution, depending upon its existing office and workshop sanctions. However, the post-diploma course will require at least the minimum additional office staff and menial staff noted below :—

Additional Teaching Staff	No. of posts	Scale of pay
1. Head of the Automobile Section-I	1	Same as for Head of Mechanical & Electrical Department
2. Lecturer in Automobile Engineering	1	Same as for lecturer in Mech. Engineering
3. Assistant Lecturer in Electrical Engineering-I ..	1	As recommended for National Certificate Course
4. Draftsman Electrical	1	200—10—300
Mechanical	1	200—10—300
5. Supdt.-in-charge of Workshop and Laboratory	1	Same as for lecturer in Mech. Engineering
6. Demonstrators (Instructors in Automobile Engineering. Including Electrical repair Mechanical Instructor).	3	Rs. 150—10—250
7. Motor driving Mechanic	1	Rs. 0—5—130 or equivalent.
Office & other Staff		
1. Store clerk	1	Rs. 0—5—120—10—240.
2. Lower Division typist	1	Rs. 60—3—1—4—120—5—130.
3. Helpers in the laboratories and Workshops ..	4	Rs. 30—50nP.—35

Maintenance

Rs. 5,000 per annum for a general instruction purposes plus Rs. 5,000 p.a. additional for petrol, oil and consumables when driving forms part of the course.

Accommodation for Post Mechanical Diploma Course in Automobile Engineering

In addition to the accommodation, as per All-India Council for Technical Education Standard for the Mechanical Engineering Course (National

Certificate Course), the following will be required :—

Buildings

Administrative :

Class Rooms—2-450 sq.ft. each		900 sq. ft.
Drawing Hall		1,000 sq. ft.
Store		600 sq. ft.
Model Room		300 sq. ft.
Sectional library		300 sq. ft.
Staff Common Room		500 sq. ft.
Head of the Department		200 sq. ft.
Other Staff (3 Nos. teaching)		600 sq. ft.
		4,400 sq. ft.
Add 1/3 for walls and passages		1,460 sq. ft.
		5,860 sq. ft.
	SAY	6,000 sq. ft.

Laboratory & Workshop ;

Automobile Laboratory		2000 sq. ft.
Factory garage unit		2000 sq. ft.
Auto-Workshop		6000 sq. ft.
		10,000 sq. ft.
Add 1/3 for walls and passages		3,300 sq. ft.
		13,300 sq. ft.
	SAY	14,000 sq. ft.

Equipment (for Post-Mechanical) Diploma Course in Automobile Engineering

Particular of equipment (1)	No. (2)	Total cost (Rs.) (3)
I. General		
1. Wood Benches	8	2,400
2. Locker for delicate Instruments	1	500
3. Class Room furniture for 2 class rooms of 30 boys each	Lump sum	6,000
II. Special		
1. Brake Tester	1	5,000
2. Engine Analyser	1	7,000
3. Engine Four Cylinder similar to Jeep—with dynamometer	1	8,000
4. Diesel fuel pump calibrating and testing table with accessories	1 set	16,000
5. Four or six Cylinder with O.H. Camshaft	1	2,500
6. Air Compressor 3 H.P. 10-9 C.ft.	1	2,800
Carburettors. Stromberg, Carter Zenith of different types, Calaudel Hobson, Ball and Ball Marvel. Tillotson, Amal, etc.	1 set	1,000
8. Tuning Light set	1	100
9. Arbor Press 40 ton capacity	1	4,000
10. Electrical Test Bench Universal	1	7,000
11. Diesel Nozzle grinding and lapping equipment	1 set	3,000
12. Carburettor Test Bench	1	300
13. Temperature gauges of types	1 set	1,000

(1)	(2)	(3)
14. Fluid Fly wheel working model Automatic Transmission ..	1 set	2,500
15. Second hand Car Models of different types	1 set	10,000
16. Cross sectional engine complete with gear box and clutch, dynamo, self starter, fuel and water pump, radiator, driven with suitable A.C. Motor.	1	7,000
17. Lathe (Sliding, surfacing and screw cutting) 7″ centre × 6,10½″. Lathe admitting between centres 3-0″. Motor driven 440 Volts A.C., 3 phase, 50 cycles with chucks.	1	10,000
18. Bench grinder drive by A.C. Motor single phase 230 volts A.C. 1/5 H.P.	1	120
19. Valve lifter and spring compressor	1	45
20. Connecting rod aligner	1	1,200
21. Connecting rod twisting tool	1	
22. Bearing and steering wheel puller complete range	1 set	350
23. General purpose type inflating gauge with air chuck ..	1	300
24. Stud. Extractor	1	30
25. Piston Pin Remover	1	120
26. Pressure Bleeder	1	150
27. Wheel cylinder Hones	1 set	150
28. Spark plug cleaner and tester (testing under pressure) ..	1 set	1,500
29. Greasing guns, Adapters, Nipples etc., with garage Tools ..	1 set	500
30. Vaccuum gauge and compressor for diesel and petrol engine	1 set	500
31. Honing set..	1	200
32. One Micrometer set—each size 0-6″ outside and inside—one each.		1,000
33. Magnets Stovers—1	set	25
34. Carburettor (Universal)	1	100
35. Set of wheel spanners	6	2,000
36. Torque wrenches—2 sets (upto 200 ft. lbs. and upto 100 lbs respectively.	2 set	500
37. Adjuster Remover set suitable for Automobile	1 set	150
38. Brake Spring Remover Tongs	1 pair	50
39. Set of Spark plug wrenches 10 m.m 14 m.m 1 m.m. ..	1 set	50
40. One set Tyre Lever & accessories		100
41. Special Tappet Adjustment set	6 pieces	50
42. One set of Standard wrenches size upto 1¼″		50
43. Rubber cups for valve lapping one, tap and die set complete 6 mm to 24 mm; 1/16″ to 1″ BSF).		250
44. Feeler gauges—	2 sets	50
45. Lump sum provision for instruments and mechanical tools not available for constant use from other laboratories.		3,000
		108,795
Say Rs. ..	1·1 lakhs.	

Annexure—II to Item No. 13

Courses of study and syllabus for common Draftsman Course: Civil and Architecture as approved by the Joint Syllabus Committee.

Courses of study (1st Year) Common

Syllabus No.	Subject
A	Mathematics
B	Printing lettering & Geometric Projections
C	Building Materials
D	Building Construction
J	Surveying
M	Freehand and Measured Drawing
F	

Course of study (Second Year)

(Common)

E	Services
I	Design of Buildings
N	Estimating & Specifications

(Civil)

Roads, Bridges & Culverts

H	Hydraulic Structures
O	Earth work

(Architecture)

P	Perspective Drawing
K	Architectural Drawing
L	Visual presentation & Model Making

A. Mathematics

Simultaneous equations, quadratic equations; plane and solid geometry, mensuration; trigonometry; elementary applied mechanics. Use of mathematical tables.

B. Printing, lettering & Geometric Projections

Principles of modern lettering and typography. Freehand lettering and ornamental lettering. Conventional signs and symbols. Sketching, inking, colouring and shading. Construction of ordinary scales, vernier and diagonal scales.

Geo-metric Projection : Development of surfaces and interpere tration solids. Projection of simple solids. Plan, elevation and sections of three dimensional objects. Iso-metric view of simple objects.

Description, use and maintenance of drawing instruments (including plani-meter and pentograph).

C. Building materials

Traditional and new materials, their characteristics and uses. Properties and uses of building mortar, paints, varnishes and distempers.

D. Building Construction

Details of grillage, raft and pile foundation. Dam proof course. Bending in brickwork. Stone masonary. Stone joints, various types of floor and roof-constructions. Expansion joints. Partition and stair-cases. Details of fireplaces, chimney stocks, columns, Stanchions and girders, roof trusses, lintels and arches. Details of door and windows. Shuttering and centering. Details of showing. White and colour washing.

E. Services

Principles of water supply and sanitation. Distribution pipes, pipe fittings, and pipe joints. House connections.

System of collection and removal of refuge. Details of septic tank, sanitary fittings, manholes, screening chamber etc. House wiring, Specifications for internal wiring simple description of switches, cut-outs and other equipments for the purpose. Uses of simple measuring instruments and their sketches. Heating and ventilation.

F. Tracing and Ferro-printing

Tracing of building plans, sanitary fittings, structural details, bridge details etc. on cloth. Ferro-printing of drawings.

G. Roads, Bridges and Culverts

Roads; History and development; Alignment; Cross-sections; Gradients; Curves; Crossing; Grade Separations; Road signs; traffic circle. Drainage, maping of soil profiles. Details of tar macadam bitumen and concrete roads.

Bridges and culverts; various types of bridges and culverts. Details of bearings, piers, abutments and wing walls. Details of foundation, flooring and structural connections, sheet piling and coffer dams.

H. Hydraulic structures

Details of dams, headworks, sluices, wires, canal head regulators, canal lining, temporary bunds, level crossing, aqueducts. Spillways, siphons and drainage.

I. Design of Building

General principles of design of buildings, Design of slabs, floor beams, columns, room trusses, lintels, footings etc. from simple formulas. Preparation of drawing from sketches of the same showing all working details.

Use of civic and architectural handbooks and guides. Building by-laws.

J. Surveying

Surveying a building site or road alignment with a chain and level, Selection of stations. Field book entries. Plotting the survey. Measurement of angles and bearings with prismatic compass. Measurement of horizontal and vertical angles with theodolite. Use of plan table. Plotting of contours. Reading and enlarging of maps. Laying out verticle, horizontal, reverse, compound and transition curves by different methods.

K. Architectural Drawing

History of architecture, Uses of materials in the structure during different periods and in different places.

Preparation of plans, elevations, sections and other details of buildings.

L. Visual presentation and Model Making

Presentation of data and statistics. Preparation of models from building plans. Selection of materials for making models. Selection of scale. Detailing. Finishing and get up of the Model.

M. Freehand and Measured drawing

Study of shapes and forms in pencil. Black Board Drawing with an aim to develop freedom of treatment. Making outdoor sketches of buildings, dams, culverts, trees, etc.

Preparing drawing (to scale) from sketches and field measurements; sub-structure, superstructure, roof details structural connection, joints etc.

N. Estimating and Specifications

Taking off quantities required for engineering and architectural structures. Abstracting and Building, Estimating requirements of materials and labour.

Plinth and cubical content estimates. Writing out specifications for different items of construction.

O. Earth work

General Principles. Calculation of earthwork by method of unit areas. Volume of prismoid. The end area formula and the prismoidal formula. Estimating out and fill from contour maps. Calculation of earthwork from cross-sections of canals, railroads and highways.

Draughtsmanship Course : Civil & Architecture

Break-up of time between Lecture Classes and Studio-sessions

Course : Second Year (Common)

No.	Subject	Lecture classes per week (1 hour)	Studio Sessions per week (2½ hrs.)
1.	Mathematics	3	—
2.	Printing, Lettering and Metric Projns	—	3
3.	Building Materials	2	—
4.	Building Construction	2	1
5.	Surveying	2	2
6.	Freehand and Measured drawing	—	2
7.	Tracing and Ferro-Printing	—	2
	TOTAL	9 hours	10 sessions (10×2½) =25 hours
	TOTAL	34 hours.	

Course Second Year (Civil)

No.	Subject	Lecture Classes Per week (1 hour)	Studio Session per week (2 1/2 hrs.)
1.	Services*	2	1
2.	Design of Buildings*	2	2
3.	Estimating and Specifications*	2	—
4.	Roads, bridges and Culverts	2	4
5.	Hydraulic Structures	1	2
6.	Earth work	1	1
	TOTAL	10 hours	10 Sessions (25 hours)
	TOTAL	35 hours	

Course : Second Year (Architecure)

No.	Subject	Lecture Classes per week (1 hr.)	Studio Session per week (2½ hrs.)
1.	Services*	2	1
2.	Design of buildings*	2	2
3.	Estimating and Specifications*	2	—
4.	Perspective Drawing	1	2
5.	Architecture	2	3
6.	Visual Presentation and Model making	—	2
		9 hours.	10 sessions (25 hours)
	TOTAL	34 hours	

*Common to Civil and Architectural Draftsmanship Course

Draughtsmanship Course : Civil & Architecture

Scheme of Examination

First Examination (Common)

No.	Subjects	Examination		Sessional Records and tests Marks
		Duration hours	Maximum Marks	
1.	Mathematics I (Algebra, plane and solid Geometry and Trigonometry).	3	50	15
2.	Mathematics II (Mensuration and Applied Mechanics).	3	50	15
3.	Building Materials and Construction	3	100	30
4.	Surveying Theory	3	100	40
5.	Surveying Practice	3	100	—
6.	Drawing I (Printing, Lettering and Metric Projections).	—	—	100
7.	Drawing II (Free hand and Measured Drawings)	—	—	100
8.	Draughting Practical (Tracing and Ferro-printing etc.).	—	—	100
	TOTAL MARKS		400	400
	AGGREGATE MARKS	800		

Second Examination Civil Draughtsmanship

Scheme of Examination

No.	Subjects	Examination		Sessional Records and Test Marks
		Duration (Hours)	Maximum Marks	
1.	Services	3	100	30
2.	Design of Buildings (Theory)	3	100	30
3.	Estimating and Specifications	3	100	30
4.	Roads, Bridges and Culverts	3	100	30

(1)	(2)	(3)	(4)
5. Hydraulic Structures and Earth Work	3	100	30
6. Drawing I (Buildings)	—	—	150
7. Drawing II (Roads and Bridges and Culverts) ..	—	—	100
8. Drawing III (Irrigation Works)	—	—	100
TOTAL MARKS		500	500
AGGREGATE MARKS ..		1,000	

Third Examination Architectural Draughtsmanship

Scheme of Examination

No.	Subject	Examination		Sessional Records and Tests (mark)
		Duration Hours.	Maximum Marks.	
1.	Services	3	100	30
2.	Design of Buildings (Theory)	3	100	30
3.	Estimating and Specifications	3	100	30
4.	Architectural Theory	3	100	30
5.	Perspective Drawing	3	100	30
6.	Drawing I (Building)	—	—	150
7.	Architecural Drawing	—	—	100
8.	Visual Presentation	—	—	100
	Total Marks		500	500
		AGGREGATE—1000		

Surveying Instruments for 60 Students

(30 in Civil Draftsmanship and 30 in Architectural Draftsmanship)

Serial No.	Description of Surveying Equipment	Quantity	Rate	Amount
			Rs.	Rs.
1.	Transit Theodolites—Ordinary type—with all accessories.	5	2,000	10,000
2.	Transit Theodolite—Precision type—with all accessories.	3	2,500	7,500
3.	Engineers' Level (Carl Zeiss Jena 030) with accessories.	2	2,000	4,000
4.	Wye Level with accessories	3	1,500	4,500
5.	Dumpy Levels, Solid type—ordinary with accessories.	10	900	9,000
6.	Sopwith Levelling staff, 14′-0″ long—Telescope type.	15	100	1,500
7.	Plane table with all accessories like alidade, trough compass etc.	12	200	2,400
8.	Plane table with telescopic alidade and other accessories.	1	3,100	3,100
9.	Prismatic Compass 4″ dia. with tripod etc. ..	12	500	6,000
10.	Prismatic compass—pocket size	1	20	20
11.	Metallic Tape, Chesterman 100′ long	12	100	1,200
12.	Metallic Tape, Chesterman 50′ long	12	75	900

(1)	(2)	(3)	(4)	(5)
13.	Steel Band 100′ 3/8 wide	3	70	210
14.	Steel band 50′ long 3/8′ wide	3	50	150
15.	Cross –Staff —open type—with brass head ..	6	40	240
16.	Ranging rods 8′ high—Teak-wood with iron shoes painted etc.	60	30	1,800
17.	Cross –staff—octagonal type with brass head ..	6	70	420
18.	100′ Chain	12	70·50	846
19.	Optical square	2	45	90
20.	Box Sextant	2	300	600
21.	Abney's Level with vernier micrometer screw etc.	1	150	150
22.	Burrell's hand level	1	150	150
23.	Indian Clinometer	1	200	200
24.	Pantagraph—36″	2	1,500	3,000
25.	Amsler polar plainmeter of sliding bar type ..	4	400	1,600
26.	Magnifying glass with handle & case	4	30	120
27.	Stop watch (with 100 divisions)	2	250	500
28.	Spirit Levels	12	20	240
29.	Surveying Field work Umbrellas 36″ diameter..	8	80	640
30.	Steel arrows 1′-0″ long pointed at one end and hook at the other.	12 doz.	10 per doz.	120
	TOTAL			60,116

Printing Equipment etc.

	Rs.
1. Printing frame (portable) and Ammonia Box	500
2. 2″×2″ and 352 slide Projector etc.	800
3. Tracing table with tubelight fittings	300
4. Drawing instrument boxes 2 at the rate of 300	600
5. Railway curves, set squares, parallel ruler, french curves etc.	1,000
6. Leroy, U.N.O., graphos and other lettering sets and stencils	1,000
7. Slides and models	2,000
	6,200

Syllabus for Common Draughtsmanship Course in Mechanical and Electrical Engineering (2-Year Course)

SUMMARY

Subjects to be taught:

First Year:

1. Mathematics
2. Workshop Technology, including Electrical Laboratory practice
3. Strength of Materials
4. Elementary principles of Electrical and Mechanical Engineering
5. Engineering Drawing—I
   (a) Geometrical and Machine Drawing
   (b) Tracing and ferro-printing

Second Year:

6. Mechanical Engineering
   or
   Electrical Engineering
7. Workshop Technology
   or
   Electrical Wiring & Lighting of Buildings
8. Estimating and Costing
9. Engineering Drawing—II
   Machine Drawing
   or
   Electrical Drawing
10. Tracing and printing

Detailed Syllabus for Mechanical and Electrical Draughtsmanship Courses

1. Standard of admission	Matriculation or equivalent
2. Duration	Two years
3. Minimum hours of instruction	Thirty-three weeks of approximately 36 hours per week or equivalent

First year (Common for both the courses)

Mathematics—I

Algebra:—Simultaneous equations, Quadratic Equations—Logarithms Ratio and Proportion—Indices—Progressions—Binominal Theorem, Use of Slide Rules.

Mensuration:—Areas of Plane Figure Surface and Volumes of solids and their sections; use of the planimeter.

Trigonometry:—Trigonometrical Ratios of angles and multiple angles —Simple Identities—Solution of Triangles—Problems of heights and distances involving simple Trigonometrical Equations.

Mathematics—II

Scalar and Vector Quantities—Laws of Motion—Resolution of a Force —Parallel Forces—Couples—Equilibrium of Forces—Reactions in simple Beams and Trusses.

Graphic Statics :—Coplanar Forces—Concurrent and non-concurrent—Parallel and Non-parallel—Triangle and Polygon of Forces—Reaction of Beams—Bows Notation—Determination of stresses by Stress Diagram.

Friction:—Equilibrium involving friction—Simple problems involving Wedge and Block and Screw Jack.

Rectilinear motion:—Displacement, Velocity and acceleration, freely falling bodies. Uniform motion along circles—Centripetal Force Super elevation of curved roadways and tracks—Rotary Motion.

Work, Energy and their relation to translatory motion under constant force.

Linear impulse and momentum—Principles of conservation of linear momentum.

Workshop Technology

(a)Theory :—Knowledge, composition and use of following metals used in engineering practice; pig iron, cast iron, wrought iron, steel and non-ferrous metals. Various kinds of timbers, seasoning and preservation. Refractories. Description of hand tools used in carpentry and pattern making, allowances in pattern making, various types of patterns. Foundry, general principles of moulding, description of foundry tools. Sand and loam moulding cores and core boxes, description and operation of cupola. Forging operation description of smiths tools.

Welding, soldering and brazing. Wiring and cables, electric wiring materials—Use of Meggar—Insulators and conductors Voltage and current relationships—Fuses and protective devices, Switches and earth devices.

(b) Practice:—Preparation of wooden patterns and core boxes of simple machine parts, preparation of simple carpentry joints.

Simple exercises in moulding and forging.

Demonstration in welding, soldering and brazing.

Electrical Wiring and jointing.

Term Work:—Each candidate shall submit to the examiners, the term work as mentioned below which will be allotted marks up to a maximum of 50, with a certificate from the head of his institute that it was completed by him in a satisfactory manner within the walls of the institute.

1. Pattern Making—at least 4 different jobs. Electric Fitting and Wiring.
2. Wiring of a switch, Lamp circuit, Low and high.
3. Forging—at least 4 different jobs.
4. Notes taken while attending demonstrations in workshop processes in soldering, brazing and welding.

Strength of Materials

Stress, strain, elasticity, Hooks Law, elastic constants, ultimate stress, safe stress, factor of safety. Stresses in pin joints, revetted joints, thin cylindrical shell subjected to internal pressure.

Beams, bending moment and shearing force, bending modulus of section for simple beam sections. Carriage springs.

Torsion, torsion in shaft transmitting, stresses in shaft subject to torsion. Shaft couplings, helical springs, columns and struts, application of Euler and Rankine formula for columns. Stresses in short column and torsion members under eccentric loading.

Elementary Principle of Mechanical & Electrical Engineering

Mechanical Engineering

Bolts and nuts—Keyed and collared joints—Power transmission by belts, pulleys, ropes, clutches, etc.

Electrical Engineering

Nature of electricity, E.M.F., Current, resistance, Ohms Law, Units of electric power and energy. Effects of electric current. The electric circuit. Series and parallel arrangement of resistors and batteries. The magnetic circuit. Electric field and condensers. Electrolysis. Primary and Secondary cells. Diodes, Triodes, Pentodes and Photo cells—Characteristic curves. A.C. Single and three phase circuits. Power, Power factor and KVA.

Engineering Drawing—I

Geometrical and Machine Drawing

(a) *General :* Instruments and their use, standard sizes of drawings, types of lines for drawing. Construction of scales, use of scales. Method of setting common angles with a pair of set squares. Lettering and dimensioning.

(b) *Plane Geometry*:—Construction of plane figures and curves used in engineering practice. Parabola, ellipse, hyperbola, arches of various shapes, cycloids, involute of circles.

(c) *Solid Geometry :* Projection of points lines and planes; projection of simple solids such as prism, pyramids, cylinder and cones, Sections on different planes of simple solids. Development of surfaces, isometric scale and projection, isometric view.

(d) *Machine Drawing :* Machine drawing and its place in engineering. Principal planes, orthographic projection. First and third angle methods. Reading of drawing. Conventions used in drawing. Drawing elevation, plan; and elevation and sections of simple shaped blocks. Bolts, nuts and washers. Screw threads, whitworth, American standard square, acme and buttress, single, double or treble threads, conventional methods of showing threads on drawing, foundation bolts, rivets and revetted joints. Looking devices, keys and cotters. Drawings of machine elements such as knuckle joints, simple bearings, bracket bearings, plummer bearings, footstop bearings, face plate, couplings etc.

Term Work : Each candidate shall submit a set of at least eight complete working drawings with details of machine parts and sketches certified by the head of the institute that they have been executed in a satisfactory manner within the walls of the institute. These drawings and sketches shall be counted as term work which shall be submitted to the examiners and allotted marks up to a maximum of 50.

Practice : (Tracing and Ferro-printing)

Lettering, inking, tenting, colouring and shading—use of instruments and printing and tracing materials.

Syllabus for Common Draughtsmanship Course for Mechanical and Electrical Engineering (2 Years' Course)

Mechanical Draughtsmanship Syllabus

Final Year

Mechanical Engineering

Descriptives working of boilers, steam engines and internal combustion engines; bearings and lubrication; pumps–different kinds of Air compressors–two stage and three stages.

Workshop Technology

(a) *Theory* :–Description of lathes. Simple turning between centres, use of driving plates, chuck, work, face plate work, screw cutting, taper turning etc. Lathe tools, their shape, grinding of tools. Speeds and feeds. Turret and Capstan lathes.

Description of planning, shaping, slotting, drilling and milling machines. Operations on each of these machines. Shaping planning and slotting tools, milling cutters.

Fitters' tools such as hammers, chisels, filles etc. Instruments such as scales, callipers, micrometers etc. Fitting work. Tapping and threading. Mass production, interchangeability of parts, jigs and fixtures. Limits and fits, tolerance; limit and other gauges

(b) *Practice*:–Plain turning, taper turning, screw cutting; exercises on planning, shaping, slotting and milling machine work. Drilling and tapping. Exercises in chipping and filing, simple fitting exercises.

Demonstration on different machine tool operations should be given to the students to give them a clear idea of marking out, setting up the job on a machine, speed, different operations and tolerances.

Term Work : Each candidates shall submit at least three jobs in each of the following :–

1. Plain metal turning
2. Taper metal turning
3. Screw cutting–internal and externa
4. Fitting

With a certificate from the head of the institute that they were completed by him in a satisfactory manner within the walls of the institute and will be allotted marks up to a maximum of 50.

Further each candidate shall submit a certificate from the head of the institute that he has completed in a satisfactory manner the course in the operation and use of shaping, planning slotting, drilling and milling machines.

Estimating and Costing

Estimating of materials for domestic and factory installation and other wiring—Labour charges and costing—Stores maintenance and requisitioning.

Engineering Drawing II

Preparing working drawings from the sketches prescribed above under Freehand Sketching. Preparing detailed drawings from assembled drawing and *vice versa*. Tracing in ink on tracing cloth and tracing paper. Printing on Ferro-Prussiate and other types of printing paper, exposure in sun or artificial light. Printing machine. Developing, washing and drying.

Estimating and specification, standard method of drawing, drawing office system, numbering of drawings and standard parts. Use of handbooks and standard specifications.

Term Work

Each candidate shall submit a complete set of drawings of not less than 8 sheets of imperial size certified by the head of the institute that they have been prepared within the walls of the institute in a satisfactory manner.

The drawings shall consis of :—

At least 4 sheets of working drawings of details from models of machine parts such as eccentrics, connecting red ends, valves, cylinders, lathe head stocks, bearings etc. One of the sheets will be linked on tracing paper or cloth and a blue print taken out on a ferro-prussiate paper.

2. At least three sheets of assembly of the above machine parts.

3. At least one sheet of working drawing from design of a simple machine parts mentioned in the syllabus under Machine Design.

The design, drawings and sketches shall be counted as term-work which shall be submitted to the examiners and allotted marks up to a maximum of 50.

A candidate must obtain 5 per cent of the full marks in each theoretical subject and 40 per cent of the full marks in each practical subject and term work separately for passing.

Detailed Syllabus for Electrical Draftsmanship Course

SECOND AND FINAL YEAR

Electrical Engineering

Relation between Electrical, Mechanical and Thermal units.

E.M.F. and potential difference. Simple magnetic circuits—Electro magnets—Electromagnetic induction—Self and mutual and automatic. Voltage regulators. Starters Controllers and field regulators. Trans-

formers Basic Principles. Star, Delta, Zig-zag and Scott-connection. Three-phase generators. Panel diagrams of wiring of generators. Three-phase squirrel cage and slipring Induction Motors—Different types of starters for induction motors. The synchronous motor and rotary convertor. Various methods of starting—Wiring diagrams. The mercury arc rectifier, ignition systems, circuit diagrams of polyphase installations. Selsin units. Single-phase induction and repulsion type motors.

Measurement

Electrical instruments commonly used :—Ammeters, Voltmeters, Watt-meter p.f. meters, Synchroscope and energy meters. Methods of connecting the instruments with potential and current transformers in electric circuits.

ELECTRIC WIRING AND LIGHTING OF BUILDINGS

Illumination

Incandescent and discharge lamps with their associated circuits.

Electronic Devices

Timer circuit, Switching Circuit, Electric Motor control.

Plans

Standard Symbols. Residence Wiring, lighting circuits, Factory wiring, power circuit plans. Car wiring plans. Static and rotary substation plans.

Interpretation of Standard Specifications.

Estimating and Costing (Electrical)

Estimating of materials for domestic and factory installation and other wiring—Labour charges and costing—Stores maintenance and requisitioning. Preparation of contracts. Articles of agreements.

Engineering Drawing II

Conventions in Machine Drawing, Pipes and pipe joints, Tees, Elbows, Reducers, etc., Taps.

Simple line drawings of central heating equipments and air conditioning units, lifts.

Conversions and symbols in welding practice—simple drawings of welded parts.

Electrical Drawing

Wiring Diagrams :—Conventions, different types of wiring, typical wiring diagrams, estimation of electrical quantities and their cost—simple calculations.

Power Wiring

Wiring diagrams for motors. Poles and Towers—different types—Sub-station diagrams—Transformer stations.

Electrical Installations

Panel Boards, Knife switches—Lighting Installations—Indoor and out-door lighting fixtures. Tele-Communication equipment, Wiring diagrams. Typical relay, inter-communication and radios circuits. Special circuits sketches.

Tracing and Printing

Technique of inking, tracing and colouring in detail, principles of Ferro-printing, and photo-printing including the description and use of the equipment.

ELECTRIC AND MECHANICAL DRAFTSMANSHIP COURSE

Break-up of time between Lecture Classes and Studio-Session.

Course : First Year (Common)

No.	Subject	Lecture classes per week (1 hour)	Studio sessions per week (2½ hrs.)
1.	Mathematics	3	—
2.	Printing, Lettering and Metric Projections	—	5
3.	Workshop Technology	2	5
4.	Strength of Material	2	—
5.	Elementary concepts of Electrical and Mechanical Engineering	1	—
6.	Geometrical and Machine Drawing	2	10
7.	Tracing and Ferro-Printing	—	5
	TOTAL	10	25
	Course : Second Year (Electrical)		
1.	Electrical Engineering	2	5
2.	Electric Wiring and lighting of buildings	2	2½
3.	Electrical Estimate & costing	2	—
4.	Engineering Drawing (Elec. I)	2	5
5.	Engineering Drawing II (including Tracing and Printing)	2	7½
	TOTAL	10	20
	Course : Mechanical Draftsmanship—Second Year		
1.	Mechanical Engineering and Workshop Technology	2	5
2.	Heating and Air Conditioning	2	2½
3.	Estmating and Costing	2	
4.	Engineering Drawing—I (Machine Drawing)	4	12½
5.	Engineering Drawing—II (including tracing & printing)		
	TOTAL	10	20

DRAUGHTSMANSHIP COURSE—ELECTRICAL AND MECHANICAL

SCHEME OF EXAMINATION

First Examination (Common)

Sl. No.	Subject	Examination: Duration in hour	Examination: Maximum Marks	Sessional Records Test Marks
1.	Mathematics I (Algebra, plane and School Geometry and Trigonometry)	3	50	50
2.	Mathematics II (Mensuration and Applied Mechanics)	3	50	50
3.	Strength of Materials	3	100	—
4.	Elementary Principle of Electrical and Mechanical Engineering	3	100	—
5.	Workshop Technology	3	50	50
6.	Geometrical and Machine Drawing	4	150	50
7.	Tracing and Printing	—	—	100
			500	300

Aggregate : 800

SCHEME OF EXAMINATION

Final Year (Mechanical Draughtsmanship Course)

Sl. No.	Subject	Examination		Sessional Records test marks
		Duration in hour	Maximum marks	
1.	Mechanical Engineering	4	100	—
2.	Workshop Technology (Theory)	3	50	50
3.	Estimating and Costing	3	100	50
4.	Engineering Drawing II	6	150	50
5.	Tracing and Printing	—	—	50
			400	200

Aggregate Marks : 600

Minimum of 40% in each subject and 50% on the aggregate is required for a pass.

FINAL YEAR

Scheme of Examination—Electrical Draughtsmanship

Sl. No.	Subject	Examination		Sessional records & test marks
		Duration in hour	Marks	
1.	Electrical Engineering	4	100	—
2.	Electrical Wiring and lighting of building	3	50	50
3.	Estimating & costing	3	100	50
4.	Engineering Drawing II	6	150	50
5.	Tracing & printing	—	—	50
			400	200

Aggregate Marks : 600

Minimum of 40% in each subject and 50% on the aggregate is required for pass.

Schedule of Accommodation and List of Equipment for Draftsmanship Courses in Mechanical and Electrical Engineering

**Accommodation*

Two class Rooms at 450 sq. ft. each to accommodate 30 students in a class	900 sq. ft.
Drawing Hall, four members each to accommodate 30 students of 1,200 sq. ft. each	4,800 sq. ft.
TOTAL	5,700 sq. ft.

**Staff*

Staff	Number	Scale of pay
Head of the Department	1	Same as for Head of the Department in any branch of Engineering in the Polytechnic.
Instructors (one for each class)	4	As for lecturers in Engineering subjects in the Polytechnic.
Store-keeper-*cum*-clerk	1	Upper Division Clerk in the Polytechnic.
Helper	2	As for similar staff in the Engineering Workshop and laboratories.

Furniture

Drawing Hall furniture	.. lump sum	12,000
Class Room furniture ..	.. lump sum	6,000
Total ..		18,000

*Similar schedules of Accommodation, Staff and Furniture may be provided for Draftsman Course in Civil and Architecture Draftsmanship.

Equipment

Sl. No.	Description of Surveying Equipment	Quantity	Rate	Amount
			Rs.	Rs.
1.	Transit Theodolite—Ordinary type with all accessories	5	2,000	10,000
2.	Transit Theodolite—Precision type with all accessories	3	2,500	7,500
3.	Engineer's level (Carl Zeiss Jena 030) with accessories	2	2,000	4,000
4.	Wye level with accessories	3	1,500	4,500
5.	Dumpy Levels, Solid type—ordinary with accessories	10	900	9,000
6.	Sopwith Levelling staff, 14'-0" long—Telescopic type	15	100	1,500
7.	Plane table with all accessories like alidade, trough compass etc.	12	200	2,400
8.	Plane table with telescopic alidade and other accessories	1	3,100	3,100
9.	Prismatic Compass 4" dia. with tripod, etc. ..	12	500	6,000
10.	Prismatic compass—pocket size	1	20	20
11.	Metallic Tape, Chesterman 100' long	12	100	1,200
12.	Metallic Tape, Chesterman 50' long	12	75	900
13.	Steel Band 100' long 3/8" wide	3	70	210
14.	Steel Band 50' long 3/8" wide	3	50	150
15.	Cross—Staff—open type—with brass head ..	6	40	240
16.	Ranging rods 8' high—Teakwood with iron shoes, painted etc.	60	30	1,800
17.	Cross—staff—octagonal type with brass head ..	6	70	420
18.	100' Chain	12	70·50	846
19.	Optical square	2	45	90
20.	Pantagraph—36"	2	1,500	3,000
21.	Amsler polar planimeter of sliding bar type ..	4	400	1,600
22.	Magnifying glass with handle and case	4	30	120
23.	Stop watch (with 100 divisions)	2	250	500
24.	Spirit Levels	12	20	240
	Add for Electrical and Mechanical Courses			
1.	Assorted list of aids for instructional purpose			350
2.	Standard Tool Kit for students pattern makers scale—30 sets			2,000
*3.	W.I. Anvils 3 8 number			2,500
*4.	Blacksmith's forges 8 ,, ...			2,500
*5.	Blower for forges complete with motto—1 No.			3,000
6.	Assorted tool for instructional and students such as Vernier calipers, Dial Gauges, V. Block, Steel rules etc.—1 set			5,000
7.	Tool Kit for students—30 sets			3,000
*8.	Hand tools such as Hammer Chisels, Taps and dies,—10 sets ..			3,000
	Foundry equipment as per list attached			17,600
	Welding equipment as per list attached			4,100
	Electrical components and models			5,000
	Mechanical components and models			5,000

It is not envisaged that institution will run the Mechanical or the Electrical Draftsmanship course except in a combination in the interest of economy.

It is also not expected that these courses will be running for isolation but in well-established Polytechnic.

Models are expected to be such as to guide in making drawings and not necessarily illustrative operation of parts.

Items in the list shown with the * are the maximum requirements in case a polytechnic equipment is not capable of time share.

Requirements of these equipments in addition to polytechnic equipment should be considered only after a careful study of such time sharing.

Details of Welding and Foundry equipment

Welding

No. of students working at a time : 10

1. Electrical welding D.C. Motor-Generator set ..	1 set		4,000	4,000
2. Electrical Welders standard Tool Kit	1 set		100	100
Total ..				4,100

Foundry

Floor space required : 2,000 sq. ft.

No. of students working at a time : 40

1. Blacksmith's Forges	20	250	5,000
2. W.I. Anvils with stands	20	200	4,000
3. C.I. Swage Blocks with stands	6	100	600
4. Electrically driven centrifugal blower	2	2,000	4,000
5. Blacksmith's standard tool kit	20	50	1,000
6. Miscellaneous tools like Sledge Hammers, flatterners, top and bottom tools, cold and hot sets, swages, punches etc.	L.S.		3,000
			17,600

Annexure—III to Item No. 13

Scheme of Five Year integrated course for the first Degree in Chemical Engineering

Working Days per year 200
Working Hours per year 36

First Year

Sl. No.	Subject	Technical Stream			Science Stream		
		Theory	Practical	Tutorial	Theory	Practical	Tutorial
1.	Humanities & English ..	4	—	1	4	—	1
2.	Mathematics—I	5	—	2	—	—	—
	Mathematics—II	—	—	—	4	—	2
3.	Physics—I	3	6	1	—	—	—
	Physics—II	—	—	—	2	4	1
4.	Chemistry—I	2	6	1	—	—	—
	Chemistry —II	—	—	—	2	4	—
5.	Drawing—I	—	3	—	—	—	—
	Drawing—II	—	—	—	—	6	—
6.	Workshop—I	—	2	—	—	—	—
	Workshop—II	—	—	—	—	6	—
	Total ..	14	17	5=36	12	20	4=36

Second Year

Sl. No.	Subject	Theory	Practical	Tutorial
1.	Humanities & English	2	—	—
2.	Mathematics	3	—	1
3.	Physics	2	2	—
4.	Chemistry	2	3	—
5.	Elementary Electrical Engg. (Electro-Technics)	1	2	—
6.	Heat Engines	2	—	—
7.	Mechanics	3	—	1
8.	Surveying	—	2	—
9.	Drawing	—	6	—
10.	Workshop	—	4	—
	Total ..	15	19	2=36

Third Year

Sl. No.	Subject	Theory	Practical	Tutorial
1.	Mathematics	3	—	1
2.	Physical Chemistry	2	3	1
3.	Organic Chemistry	2	3	—
4.	Electrical Engineering	2	3	—
5.	Heat Engine	1	3	—

(1)	(2)	(3)	(4)
6. Strength of Materials and Structure	3	2	—
7. Theory of Machines	2	—	—
8. Chemical Engineering	2	—	—
9. Drawing	—	3	—
Total ..	17	17	2=36

Fourth Year

Sl. No.	Subject	Theory	Practical	Tutorial
1.	Applied Mathematics	2	—	1
2.	Physical Chemistry	2	—	—
3.	Stoichiometry	3	—	1
4.	Chemical Engineering Thermodynamics	3	3	—
5.	Heat Transfer & Evaporation	2	3	—
6.	Fuels, Furnaces & Refractories	2	—	—
7.	Fluid Mechanics	2	3	1
8.	Materials for construction	1	—	—
9.	Technical & Instrumental Analysis	—	6	—
	Total ..	17	12	3=32

Fifth Year

Sl. No.	Subject	Theory	Practical
1.	Inorganic Chemical Technology	3	—
2.	Organic Chemical Technology	2	—
3.	Size reduction, separation and other mechanical operations	2	3
4.	Mass Transfer —I (Principles of diffusional operations Crystallization, Drying, Gas-liquid and Gas-solid interaction)	3	3
5.	Mass Transfer—II (Absorption, Distillation, Extraction and Absorption)	3	
6.	Instrumentation & Process Control	1	
7.	Industrial Economics and management	2	
8.	Plant Design	6 hours	Total
9.	Project work (Under guidance)		3
10.	Seminar & Group Discussion	1	—
	Total ..	17+6+9=32	

N.B. — 1. One hour per week may be taught on the latest advances in Physics in the third year.

2. 200 additional hours may be devoted to elective subjects in the 4th and 5th Year of the Five-Year integrated course according to the facilities available in the individual institutions.

Syllabus of Five Year Integrated Course for the First Degree in Chemical Engineering

FIRST YEAR

I–1 **Humanities & English** (Theory–4 hours and Tutorial–1 hour per week) Common for Technical and Science stream:

English Composition : To train students to write and speak correctly and effectively. Topics to be covered–Punctuation, common errors of grammar and idiom, graduated exercises in precis writing and other forms of composition (essay, letter, report); appreciation of selected literary passages; spoken English; accent and enunciation, oral composition.

Principles of Government : The purpose of the State, Theories of the State (Socialism, Communism, Synidicatism, Fascism). Theory of Government, Functions of modern State, Democracy, Citizenship, Electorate, Public Opinion, Political Parties, World order. The United Nations, Constitution of India, Great Britain, U.S.A., France, U.S.S.R. with special emphasis on the constitution of India.

English literature : The course will comprise of certain passages from English writers dealing specifically with evolution of Art and Science.

I–2 **Mathematics–I** (Theory 5 hours, Tutorial 2 hours per week) Technical Stream:

Algebra : Ratio and proportion, Summation of series, Permutation and combination, Bionomial theorem, Exponential, Logarithm, Matrices–their addition and multiplication, Determinants and their applications to solutions of equations.
Coordinate Geometry : As in I–2–Mathematics II.
Trigonometry : Circular functions and their inter-relation, graphs of circular functions, addition formula and their corrolaries. Elementary properties of triangles, solution of triangles, Argands Diagrams, Demoivers theorem.

Elementary Calculus : Differentiation and integration of elementary functions with simple applications.

Mechanics : Kinematics of motion in straight line, displacement, parallelogram law (introducing basic idea of vectors), parallelogram law of velocity and acceleration, relative velocity, Force, Newton's Laws.

I–2 **Mathematics–II :** (Theory 4 hours, Tutorial 2 hours per week) Science Stream:

Algebra : Binomial Theorem (any index) Exponential, Logarithm, Matrices–their addition and multiplication. Determinants and their applications to solutions of equations.

Co-ordinate Geometry : The advantages of the method, Rectangular cartesion co-ordinates, straight line, circle, elipse, parabola, Hyperbola.

Trigonometry : Argands Diagrams, Demoivers theorem.
Elementary Calculus : Differentiation and integration of elementary functions with simple applications.

Mechanics : Kinematics of motion in a straight line, displacement —parallelogram law (introducing basic idea of vector parallelogram law of velocity and acceleration—relative velocity. Force—Newtons laws.

1—3 **Physics I** (Theory 3 hours, Tutorial 1 hour per week) Technical Stream :

Mass, weight, specific-gravity, density, Archimedes principle, work and energy, conservation of energy and momentum; circular motion. Pressure in a fluid. Pascal's law, measurement of pressure, barometer; stability of floating bodies, pumps. Surface tension and its measurement.

Moment of inertia, rotational and translational motions, Hooke's law, Elasticity.

Simple harmonic motion, combination of S.H.M.'s Beats; free force and damped oscillations. Resonance. Simple and compound pendulum. Progressive and stationary waves, sound waves, Gravitation. Stream line flow of liquids. Viscosity, measurement of coefficient of viscosity, commercial viscometer. Expansion of solids, liquids and gases, Gas law. Specific heat. Hygrometry.

Mechanical Equivalent of heat, conduction, convection and radiation. Isothermal and adiabatic, expansion and compression. Liquifaction of gases.

Measurement of temperature using thermometers and pyrometers.

Magnetic lines of forces, potential, equipotential surface, Faraday's Experiment; capacity—specific inductive capacity, condenser, Static electricity, forces and energy between magnets, force on body in a magnetic field, Earths magnetism, Electricity—Primary and Secondary cells, combination of cells, measurement of current, ammeter, Voltmeter, Watt Meter, galvanometer. Electrolysis, Faraday's Laws of Electrolysis, Electromagnetic Induction, Induction coil, self and mutual inductance, discharge tube phenomena, cathode rays, X-rays.

Physics Practical (6 hrs. per week)

Physics Practical—Experiments based on the Syllabus in 1—3

I–3 **Physics–II :** (Theory 2 hours. Tutorial 1 hour per week) Science stream :

Work and energy; Conservation of energy and momentum; circular motion pressure in a fluid–measurement of pressure, stability of floating bodies, surface tension and its measurement.

Moment of Inertia, Rotational and translational motion. Hooke's Law, Elasticity.

Simple harmonic motion; combination of S.H.M.'s Beats, free forced and damped oscillations, resonance, simple and compound pendulum, progressive and stationary waves, sound waves.

Gravitation, Stream line flow of liquids, Viscosity, measurement of coefficient of viscosity, commercial viscometers.

Mechanical equivalent of heat, conduction, convection and radiation, Gas Laws, sp. hts. of gases, Isothermal and adiabatic compression and expansion. Liquifaction of gases.

Measurement of temperature by thermometers and pyrometers.

Physics Practical (4 hours per week)

Experiments based on the syllabus in I–3 above.

I–4 **Chemistry I :** (Theory 2 hrs. Tutorial 1 hour per week) Technical Stream :

General Chemistry : Gas laws and the behaviour of gases, Dalton's theory, laws of chemical combination, Boyles and Charle's laws, Dalton's Law, Graham's law of diffusion, Avagadro's hypothesis, Atomic weight, equivalent weight, and molecular weight. Structure of atoms, elementary particles. Classification of elements, periodic system, electronic theory of valency and Chemical bonding. Radio activity, isotopes.

Inorganic Chemistry : Empirical formula, molecular formula, Chemical equations and Chemical calculations.

Chemistry of important ferrous and non-ferrous metals in the light of the periodic classification–Hg. Cu, Ag, Au, Mg, Zn, Al, Ti, Sn, Pb, Cr, Mo, Mn, Co, Ni.

Brief survey of important non-metals like–N, P, C, S, O, H and halogens.

Chemistry Laboratory : Technical Stream (6 hours per week)

Preparation of gases like O2, N2, H2, NO, NH3, SO2 and H2S.

Simple volumetric and gravimetric estimations.

Chemistry II : (Theory 2 hours per week) Science Stream.

General Chemistry : Periodic Classification of elements. Electronic theory of valancy and chemical bonding. Radio activity.

Inorganic Chemistry : Empirical formula, molecular formula, Chemical equations and Chemical calculations.

Chemistry of important ferrous and non-ferrous metals in the light of the periodic classification—Hg, Cu, Ag, Au, Mg, Zn, Al, Ti, Sn, Pb, Cr, Mo, Mn, Co, Ni.

Brief survey of important non-metals like—N, P, C, S, O, H and halogens.

Chemistry Laboratory : (4 hours per week) Preparation of No, NH3, SO2, H2S. Simple volumetric and gravimetric estimations.

I–5 **Drawing I :** (Practical 3 hours per week) Technical Stream :

Mathematical curves, orthographic projection, location of planes, traces, inclination of planes, distance of lines and planes, intersection of planes. Section and interpenetration of bodies, Development surfaces.

Drawing II : (Practical 6 hours per week) Science Stream :

Lettering, scales, mathematical curves, isometric and oblique views, orthographic projection, sketching, convention and dimensioning, lines and planes, representation of plane figures and solids, edge views and true shapes, Location of planes, traces, inclination of planes, distance of lines and planes, intersection of planes. Section and interpenetration of bodies, Development of surfaces.

I–6 **Workshop I :** (Practical 2 hours per week) Technical Stream :

Training and practice in turning and welding shops.

Workshop II : (Practical 6 hours per week) Science Stream :

Training and practice in carpentry shop, fitting and turning shop, foundry-shop, smithy and welding shop.

SECOND YEAR

Humanities and English

(Theory 2 hours per week)

II–1 **English :** Candidates should be able to write an essay on a topical subject and also be able to give precis and explanations from an unseen passage.

Social and Moral Science : Principles, structure and function of community life—its influence on personality formation. Individual and social behaviour. Social and moral codes. Social evolution and progress. Impact of science and technology on social changes. **History :** A brief survey of the history of civilisation, covering ancient, mediaeval and modern.

II—2 **Mathematics:** (Theory 3 hours, Tutorial 1 hour per week)

Calculus—Limits and convergence, Taylor's series. Applications to Geometry and mechanics. Ordinary differential equations of first and second order.

Geometry—Systems of co-ordinates. General method of finding tangent, normal curvature, length etc. of curves. Study through calculus and otherwise of conics, cycloids and other curves of Engineering interest. Elements of solid Geometry.
Trigonometry—Expansion of trigonometrical functions and their inverse, hyperbolic functions. Summation of trigonometrical series.
Mechanics—Fundamental axioms of statics, Basic theorems of three dimensional statics, virtual work, Equilibrium of heavy strings.

II—3 **Physics:** (Theory 2 hours per week)

Theories of light, Huyghen's principle. Interference, diffraction, polarisation, scattering of light, Optical instruments.

Potential and field, gauss's theorem and simple applications, Laplace and Poisson's equation, dipoles, Dielectric polarisation, condensers, magnetic properties of matter.

Kirchoff's law, simple networks, storage cells, standard cells.

Thermo electricity, poltier effect Seeback and Thomson effects, thermister, transisters.

Practical—(2 hours per week)

Experiments based on the syllabus in II—3

II—4 **Chemistry:** (Theory 2 hours per week)

Organic Chemistry: Nature of organic compounds and their nomenclature.

Aliphatic compounds—General theory, methods of preparation and important properties of alkanes, alkenes and alkynes. Alcohols and high alcohols. Ethors. Halgon compounds. Aldehydes, kotones and mono carboxylic acids. Amines.

Physical Chemistry—Elementary thermo Chemistry, Kinetic theory of PVT relations, Continuity of state. Corresponding states, Critical states; liquifaction of gases. Vapour pressure and vapour-density. Surface tension and surface energy. Viscosity. Dilute solutions and their colligative properties. Osmosis.

Heat of solution and Honry's laws.

II—4 **Chemistry Laboratory:** (Practicals 3 hours per week)

Organic—Detection of elements in an organic compound. Identification of the following:

Benzene, toluene, methyl alcohol, ethyl alcohol, glycerol. Acids —Formic, acetic, oxstic, tartaric, citric, benzoic, sallcylic, pathalic and suecinic acids.

Phenol naphthols, resourcinol, formaldeyde, accetaldehyde, acetone, benzaldehyde.

Glucose, sucrose, Starch. Nitrobenzens, aniline, urea.

Physical : Determination of density, viscosity, estimation by refractometry, surface tension, colorimatic estimation of PH, elevation and depression of boiling and freezing points.

II–5 **Elementary Electrical Engineering :** (Theory 1 hour per week) (Electro-Technics)

Introductory study of electric and magnetic fields and AC & DC circuits, Ammeters, Volt-meters, energy meters. Wiring. Lamps and illumination. Elements of power generation transmission and distribution.

Electrical Engineering Practical : (2 hours per week)

A course of laboratory experiments in electrical machine performance and measurements.

II–6 **Elementary Heat Engines :** (Thermodynamics), (Theory 2 hours per week)

Thermodynamics principles governing the various forms of heat engines.

Adiabatic, Isothermal and poly tropic expansion Carnot's and other cycles, Reversible engines. Internal combustion engine cycles, use of steam tables, entropychart, Mollier chart. Flow of steam through nozzles and orifices, Conversion of Pressure energy into kinetic energy P.V. and entropy diagram for expansion through nozzles.

II–7 **Mechanics**–(Theory 3 hours, Tutorial 1 hour per week including demonstration)

Elementary vector algebra; composition and resolution of forces parallel forces, moments, couples, equilibrium of forces, friction, principles of virtual work with applications to frame work, centre of gravity, stable and unstable equilibrium strings.

Speed and velocity; acceleration; force, momentum and laws of motion, work power and energy, repulsive forces, impact of elastic bodies, projectiles, motion in a circle, small oscillations, motion in a resisting medium; tangential and normal acceleration, constrained motion on simple curves, moments of inertia, products of inertia, motion about a fixed axis, simple cases as two dimensional motion compound pendulum, application to problems in Engineering. Plano motion of a rigid body, D'Alembert's principle.

II–8 **Surveying :** (Practical 2 hours per week)

Principles and practice of chain and compass surveying and plotting, plane table surveying; two and three point problems. Use and adjustment of instruments; levelling; contours and sections; Setting out of buildings, measurements of earthwork, Planimeter, its theory and use. Field practice.

II–9 **Drawing :** (Practical 6 hours per week)

Conventional Science and practices for temporary and permanent fastenings, brazed and glued joints, press, shrunk and friction joints, bolts and nuts, rivetted and welded joints. Drawing of castings, Screws for power transmission. Pipe connections and valves. Axles and shafts. Drawing of bearings.

II–10 **Workshop practical :** (4 hours per week)

Training and practice in fitting shop, welding shop, machine-shop.

THIRD YEAR

III–1 **Mathematics :** Theory–3 hours per week
Tutorial–1 hour per week

Numerical Analysis :–Determination of empirical formulae with two or three constants.

Types of graphical representations :–(a) Rectangular co-ordinates. Scale factors. Use of semi-log and log-log scales for exponential and power functions. Scale modifications to avoid trial and error computations. (b) Trilinear system of coordinates. Calculations involving the composition of a mixture of two or more ternary Compositions ($X+Y+Z=K$).

Graphical computations :–Functional scales, Slide Rules and Network charts. Their setting up and use. Alignment charts or Nomographs, Simple equidistant parallel scales. General use of three parallel scales. Compound Nomographs with pivot lines. N charts, Fan charts. Exercises in setting up nomographs e.g. for friction drop in pipes, analytical calculations from titration readings, transfer coefficients, gas densities, etc. Graphical methods of integration and differentiation.

Evaluation of observations :–Absolute and relative errors.
Differential equations :–Solutions of ordinary differential equations and some of their applications.

III–2 **Physical Chemistry :** (Theory–2 hours per week)
(Tutorial–1 hour per week)

Laws of thermodynamics, thermodynamic functions ; Chemical equilibria, free energy changes ; activities and fugacities ; effect temperature on Chemical equilibrium.

Electric conductance, the Ionic theory, transfer number, ionic conductance.

Equilibria inelectrolytes; Ostwald's Dilution law, application of solubility product.

Galvanic cells, electrode potentials. Chemical and Electrical energy. E.M.F. of a cell. Concentration cells. Reference electrodes and glass electrode. pH and its determination. Electronalysis, Electrolysis. decomposition voltage, polarization, deposition potential, over voltage. Corrosion and passivity. Secondary cells.

Absorption on solid surfaces, liquid surfaces and surface of solutions. Gibbs adsorption equation. Chromatography. Films of soluble and insoluble substances. Emulsions. Emulsification. Wetting and detergency.

Colloids: Their nature, properties, classification and preparation.

Photochemistry: Lambort and Bens Laws. Einstein's law of photochemical equivalence. Hydrogen-chlorine reaction. Radio activity and sub atomic phenomena. The disintegration theory. The properties of Alpha and Beta rays. Fajan's and Soddy's displacement law.

Laboratory: (3 hrs. per week)

Determination of vapour density, distribution coefficient. Kinetics of Uni and bimolecular reaction; rate of hydrolysis of an ester; heat of neutralisation of a strong acid by a strong base; verification of adsorption isotherms; preparation of some colloidal suspension and emulsions; conductometric experiments on specific conductance, acid base titrations and solubility of sparingly soluble salts; potentiometric measurements of the pH of a buffer solution, titration of a monobasic strong acid by the strong monoacidic base and evaluation of the standard potential of a redox system.

III–3 **Organic Chemistry:** (Theory–2 hours per week)

Dicarboxylic acids and keto acids. Synthesis and uses of malonic and aceto acetic esters and organometallic compounds. Hydroxy acids. Tautomerism.

Stereo Chemistry: Optical isomerism. Racemic modifications. Recemization. Walden inversion. Geometrical isomerism. Configuration of maleic and fumaric acids.

Carbohydrates: Structure of hexoses. Osazones. Configurations. Oxide structure. Synthesis of glucose and fructose. Sucrose. Cellulose. Starch.

Ring Formation: Baeyer strain theory. Closure of Alicyclic Wings. **Aromatic Compounds:** Structure of ben zene. Hydrocarbons. Aromatic substitutions. Nitro compounds. Sulphonic acids. Amines Diaze compounds. Phenols. Halgen. Compounds. Carbeylic acids.

Aldeydes and ketones. Quinones. Napthalene—its structure and derivatives. Polynuclear.

hydrocarbons—Phenanthrene and anthra-cene and their important derivatives.

Heterocyclic compounds.—Pyrole, pyridine, quinoline, iso-quinoline, furan and thio-phene.

Laboratory : (3 hours per week).

Organic preparations—Acetamide, iodoform, nitrobenzene, acetanilide, sulfanilamide, cinamic acid.

Estimations of halogens, nitrogen, sulphur and glucose in organic compounds.

III—5 **Electrical Engineering** (2 hours per week)

Circuits and networks, Measuring instruments. Transformers A.C. machines. Powerstations, Systems of transmission and distribution. Electric furnaces.

Electrical Engineering Practical: (3 hours per week)

Magnetisation curves of a separately excited D.C. generator and shunt excited D.C. Generator; load test on shunt, compound D.C. Generators ; Running of D.C. Motors ; Study of an A.C. Series and parellel circuit ; Measurement of power in a single phase and three phase circuits, Load tests on transformers; open circuit characteristics of alternator. Synchronising an alternator ; tranformer connections, Running of an induction rotary convertor.

III—Heat Engines: (Theory—1 hour per week)

Properties of steam; sketch and description of various types of boilers, Boiler fittings and accessories, Heat balance, Steam calorimeter; Steam traps and fittings.

Steam Engines: A general knowledge of steam engine installation Rankine cycle ; principles of working of steam engines and turbines Indicators I.H.P., B.H.P. condensing Plant; methods of engine governing.

Internal Combustion Engines. Otto and Disel cycles ; Description of four stroke, two stroke engine ; Ignition systems ; carburettors, fuel pumps, automisers determination of horse power, heat balance. Valve timing diagrams; Engine lubrication; Selection and maintenance of engines.

Heat Engines practical: (3 hours per week)

(1) Heat Balance of steam generator
(2) Steam throttling and separating calorimeter
(3) Steam injector
(4) Performance of modern steam engine
(5) Performance of steam turbine

III—6 **Strength of materials & Structure:** (Theory—3 hours per week)

Elastic stress and strain; Mechanical properties of materials; strain energy and strength; Bending moments and shearing forces,

stresses in beams; Deflection of beams, Constrained beams, Flosural strain energy; Direct and bending stresses; Torsion, pipes, cylinders and plates and shells; Framed structures; Stress in frames; Design of simple beams; columns, Retain storage lines and chimneys'.

Strength of Materials and structures: (Practical 2 hours per week)

Tests on mild steel, cast iron, Brass, copper, gun metal wood etc, for tension, compression and torsion. Determination of elastic constants. Use of strain measuring device tests on fatigue of metals bending, hardness and impact tests. Tests on wires, ropes, springs, chains and insulators.

III–7 **Theory of Machines:** (2 hours per week)

Analysis of Motion, Synthesis of a Machine, Vector Diagrams, Trains of wheels, Belt and Rope drives, Turning moment diagram, Balancing.

III–8 **Chemical Engineering:** (3 hours per week)

Detailed syllabus will be added later.

III–9 **Drawing:** (Practical 3 hours per week)

Pipe fittings and valves such as gate valves, globe valves, plug-cock, relief valves, etc. Expansion joint for pipes, pulleys and bearings. Assembly and detailed drawings of simple machine parts, stuffing boxes and glands Jacketed vessels and reaction vessels.

FOURTH YEAR

IV–1 **Applied Mathematics:** Theory–2 hours, Tutorial 1 hour/week

Dimensional Analysis. Units and dimensions. Conversion of Units. Dimensionless Numbers. Dimensional Similitude. Application to Chemical Engineering Problems.

Differential equations and partial different equations. Application to Chemical Engineering Problems. Statistical methods of quality control. Use of control charts. Application to manufacturing and Inspection operations.

IV–2 **Physical Chemistry:** (Theory–2 hours per week)

The phase rule. One and two component systems, solid solutions, binary alloys, three component systems.

Chemical Kinetics: Order and molecularity of reactions, Rate equations for simple and complex reactions.

Study of a complex reaction. Heterogeneous reactions. Theory of reactions rate. Elements of catalysis, Chain reactions, explosions.

Chemical Thermodynamics. Affinity and its measurement, reaction isochore, isotherm, the third of law of thermodynamics, the chemical constant, absolute values of entropy and free energy and their applications to actual reactions.

IV–5. **Stoichiometry :** (Theory–3 hours, Tutorial–1 hour per week)

Stoicheometric and composition relations. Behaviour of ideal gases. Vapour pressure. Humidity and saturation. Solubility and crystallization. Material balance. Thermophysics. Thermo-Chemistry. Absorption. Fuels and combustion. Heat and material balances of a few chemical metallurgical petroleum and ceramic processes.

IV–[illegible] **Chemical Engineering Thermodynamics :** (3 hours per week)

Principles of Thermodynamics, Second Law of Thermodynamics. Energy functions, Inter-conversion of the energy functions.

Equations of State, Thermodynamic functions of actual gases, Construction of Thermodynamic Charts, Expansion and Compression of Fluids–multi-state compression. Compression and vacuum plump steam jet ejecter, Refrigerator.

Criteria for physical equilibrium, Typical examples of Vapour –Liquid, Liquid-Liquid, Gas-Liquid, Solid-Liquid, and Gas-solid systems under equilibrium.

Criteria for Chemical Equilibrium. Standard metal entropy, enthalpy, free energy changes and equilibrium constant. Effect of temperature and pressure on equilibrium conversions.

IV–[illegible] **Heat Transfer & Evaporation:** (Theory–2 hours per week)

Heat transfer by conduction: Conduction in the steady state, Fourier's Law, Conduction of heat through several bodies in series. Concept of resistance to heat conduction, Log mean area. **Heat** transmission by conduction in unsteady state.

Heat transfer by convection: Film concept. Individual film coefficients and factors affecting them. Overall coefficients. Dimensional analysis applied to heat transfer, condensation of vapours, Boiling liquids, Effect of non-condensible gases.

Heat transfer by radiation: Concept of black body. Kirchoff's Law. Allowance for non-black and re-radiating surfaces. Radiation from non-luminous gases, clouds of particles. Radiation from flames. Radiation errors in pyrometry.

Relation between fluid friction and heat transmission through boundry films of liquids and gases. Introduction to heat transfer studies through packed and fluidized beds, Design calculation of heat transfer equipment for specific performance.

Evaporation: Classification of types and the fields of applications of evaporators, operation of single and multiple effect evaporators under different feed conditions, Design calculations.

IV–6 **Fuels, Furnaces and Refractories:** (Theory 2 hours per week)

Fuels, Review of the world's fuel resources and the principal economic use thereof. Chemical composition and the comparative values of principal solid liquid and gaseous fuels. Calorific value.

Solid fuels—Wood, charcoal, coal etc., Origin and classification. Characteristics and distribution of Indian coals. Proximate and ultimate analysis of coal. Pulverised coal. Coal briquettes. Storage. Spontaneous ignition, coal washing. Manufacture of metallurgical coke and its characteristics. Destructive distillation of wood and coal carbonisation.

Liquid fuels; Petroleum and its derivatives coaltar, shale oil, synthetic liquid fuels.

Gaseous fuels, Coal gas, Water gas, Producer gas—mechanism of gasification. Combustion, burning of coal on grates. Hand and mechanical firing.

Refractories: Different types, physio-chemical properties, resistance to erosion, high temperature, temperature variation, molten metal and slag; Expansion, contraction, specific heat, porosity, permeability, thermal and electric conductivity; Preparation of refractory materials, their uses in the manufacture of fire bricks, silica bricks etc., Refractory materials used in different types of furnaces. Insulating materials.

Furnaces—Fuel economy in the operation of furnaces. Different industrial furnaces. Solid, liquid and gas fired furnaces. Heat balance calculations. Thermal efficiency of furnaces. Design and construction of Chimney.

IV–7 Fluid Mechanics. (Theory—2 hours, Tutorial—1 hour per week)

Hydrostatics, Properties of fluids, pressure of fluid on plane and carved surfaces, buoyancy and meta centre, Hydrodynamics; Equation of continuity, Bornoulli's theorem; Reynolds Number, Critical Velocity, Turbulence; Elements of boundary layer theory; friction factor; formulae for flow in pipes and channels distribution of flowing fluid through branched pipes Hydrolic gradient, loss of heat due to friction, bends etc. Flow of fluids through packed beds. Dimensionless groups and their significance in study of fluid flow problems.

Measurement of fluid flow; orifice and venturimeter; Pitot tubes Rotameters; Anomometers, etc.

Design and operating characteristics of reciprocating and centrifugal pumps, compressors; blowers; fans and other equipments used for fluid handling. Diaphram, rotary and positive displacement pumps. Kinds of valves and cooks.

Fluid Mechanics Practical: (3 hours per week)

Measurement of flow of fluids orifices meters, venturimeters, rotameters, weirs and pito tubes. Calibration of flow meters. Flow of fluids through bends; loops and other fittings. Estimation of friction losses. Fluid flow through packed beds. Efficiency of centrifugal, Rotary and diaphragm pumps.

IV–8 **Materials of Construction Theory** (1 hour per week)

Metals & alloys: Cast iron, mild steel, high carbon steel, stainless steel high silicon steels and other alloy steels.

Molybdenum and Tungsten steels; Copper Aluminium, lead, nickel and chromium. Tin, Brass, Bronze, Monel.

Nonmetals etc.: Glass, enamel, silica abrasives, Refractories, Graphites, Wood, plastics, rubbers, Ebonites etc. Corrosion and its prevention.

IV–9 **Technical & Instrumental analysis:** (Practicals 6 hours per week)

Analysis of water, oils, soap, sugars, pigments, paints, cement, iron & steel, alloys and ores.

Proximate and ultimate analysis of coal, calorific value of coal, determination of caking index, Gas analysis.

Instrumental Analysis: PH meters, visual calorimetry, Photoelectric instruments, calorimetric analysis, Pyrometry, Polarimeter, Refractometry, Potentiometry.

FIFTH YEAR

V–1 & 2 **Chemical Technology** (Inorganic & Organic) Theory 3 hours per week

Industrial Chemical processes under Chemical Technology (Inorganic & Organic) should be studied from the point of view of both the chemical reactions forming the basis of the process and the plant necessary to carry out these reactions. Interrelationships of various industries with respect to raw materials, products and costs should be emphasised and applications of chemical engineering principles stressed.

Inorganic: Technology of water.

Basic Chemical Industries: Common salt, hydrochloric acid, soda, ash, salf cake, Caustic soda, chlorine, bleaching powder and hypochlorites, sodium and potasium chlorates, Synthetic ammonia, nitric acid and nitrogenous fertilisers, sulfur and sulfuric acid.

Phosphate Industries: Phosphorous, Phospheric acid and superphosphates.

Industrial Gases: Hydrogen, Oxygen, Carbondixoide.

Miscellaneous Inorganic Chemicals: Sodium, Sodium peroxide, Sodium sulphide, Sodium thiosulphate, Sodium hydrosulphite, Chlorine–dioxide and sodium chlorite, Sodium Cyanide, hydrogen peroxide, bromine, sodium and potassium dichromates, Potassium salts and potash fertilizers, Alum, Graphite and Industrial Carbon, Silicon carbide, calcium carbide, calcium cyanamide.

Silicate industries, Portland Cement, Glass, Ceramic, Pigments and paints.

Organic Chemical Technology: (2 hours per week)

Wood distillation, Pulp and paper. Coal & Coaltar. Petroleum. Starch, Sugar, Glucose, Leather, Gelatine, Glue, Fermentation industries, Synthetic and natural fibres, Rubber, Plastics Dyestuffs. Oils, fat and soap. Industrial solvents.

V–3 **Size Reduction, Separation and Other Mechanical Operations:** (Theory 2 hours per week)

Solids, properties of solids, Size reduction, types of crushers and grinders and disintegrators for coarse, intermediate and fine grinding. Power requirements. Close and open circuit grinding, law of crushing.

Size separation: Particle size analysis. Screening; Industrial screening equipment, Elutriation settling, classification, floatation Electrostatic and magnetic separation, Centrifugal separation.

Mixing and agitation: Fundamentals of mixing and characteristics of mixing equipment, Power consumption and efficiency.

Filtration: Batch and centinuous filtration equipment, theories of filtration and washing, industrial practice; filter aids, centrifuges.

Conveying: Mechanical and pneumatic Conveying Elevators etc. Storage of solids.

Fluidization: Flow of fluids through proprous media.

Sedimentation: Free and hindered settling type of thinkers, Batch and continuous settling chambers, cyclones and their design Dusts and fumes.

Size Reduction, Separation and other Mechanical Operations:

Practicals (3 hours per week)

Crushing and grinding of substances of different hardness in Jaw crushers crushing roll, ball mill etc. Verification of grinding laws relating the performance to energy spent.

Mechanical Separation: Mineral Separation by Wilfley Table and hydraulic Jig. elutriator. Concentration of minerals by froth flotation. Filtration–leaf filter–Oliver filter–filter press.

V–4 Mass transfer: I (Theory–3 hours per week)

Mass transfer: Mass transfer by molecular diffusion, Analogy between momentum, heat and mass transfer, Mass transfer co-efficients and their correlation. H.T.U. & N.T.U. Concepts, J.D. JH factors.

Hygrometry: Wet and dry bulb adiabatic saturation temperature. Construction of humidity charts. Methods of humidification, dehumidification and air conditioning equipments used, cooling towers.

Drying: Different types of driers used in industry–Drying characteristic of materials, theory and mechanism of drying. Estimation

of drying rates, Design and performance of continuous and batch driers.

Crystallisation: Nucleus formation and crystall growth, Theory of crystallisation, batch and continuous crystallisers, Design calculation of crystallisers.

V–5 **Mass Transfer II.** (Theory 3 hours per week)

Absorption: Theory of gas absorption. Design and operation of packed towers, concept of H.E.T.P. and H.T.U. Absorption coefficients, flooding and loading points, packing materials. An elementary idea of simultaneous absorption and chemical reaction.

Adsorption : Recovery of solvent vapours properties of absorpent materials, Theories of adsorption, Industrial adsorbents.

Extraction: Sold liquid extraction, Liquid-liquid extration, Batch and continuous extraction, Design of extraction units, Equipments for leaching.

Distillation: Vapour liquid transfer operation, calculation by enthalpy concentration diagrams, stripping and rectifying columns, Entrainment, Methods of distillation: Batch, continuous, flash steam, Vacuum, molecular, azeatropic and extractive distillation, multicomponent distillation, Ponchon Savarit and Mecabe. Thiele methods, Design and control of, distillation columns.

Practicals for V-3, V-4 and V-5 6 hours per week

Drying: Rate of drying in a tray drier under atmospheric pressure and vacuum. Operation of rotary, double drum and spray driers. **Crystallisation:** Operation of a crystalliser and study of heat and material balance.

Absorption: Study of absorption in wetted well and packed column.

Extraction: Continuous liquid–liquid extraction.

Distillation: V-L Equilibria batch distillation, verification of Releighs equation. Rectification in bubble cap plate column. Distillation in packed column, steam distillation. Ozeotrofic and extractive distillation.

V–6 **Instrumentation & Process Control:** (Theory–1 hour per week)

General principles of industrial instrumentation based on mechanical, pneumatic, electrical and electronic devices. Process control principles. Measurement and control of temperature, flow of fluids, liquid level, pressure, humidity, gas concentration, specific gravity. Lags inherent in instruments. Indicating recording and controlling instruments commonly used in the process industries. Choice of controlling instruments.

V–7 **Industrial Economics and Management:** (Theory–2 hours per week)

Business organisation and finance partnership and companies raising of capital in various forms, laws of commerce in India, Industrial administration and laws, Industrial psychology, labour problems, wage systems, production control, safety methods and welfare work, Incentive and Bonus. Factory legislations; Factory acts on insurance wages hours of employment, labour disputes, Cost accounting and factory control. Maintenance, repair, capital, depreciation, interest etc., Estimating, factory records and book keeping, balance sheet, graphical and statistical control, Purchasing stores organisation, marketing, Patent's law, Factory lay out and construction.

V–8 **Plant Design:** (6 hours total for Theory & Practicals)

The design of Chemical Engineering equipments with special reference to functional efficiency, ease of control and maintenance, Design and workshop drawing of simple units of plant such as Heat Exchangers, Stills and reactors, dryers etc., to meet specified requirements.

V–9 **Project Work:** (3 hours per week)

(Under guidance).

Each student is required to submit a project report on the designing of a Chemical plant, selecting the best process with optimum equipment sizes and operating conditions.

The object of this project work is to test the ability of student to coordinate the entire knowledge of Chemical Engineering principles, to judge his originality and capacity in the application of laboratory data in the designing of Chemical Plant and to determine the level of his profession at the end of the course.

V–10 **Seminar & Group Discussions:** (1 hour per week)

Students will be required to carry out under the supervision of the staff members, a literature search, and will prepare essays or review papers on selected advanced topics. Every student will present a critical review of an assigned subject in Chemical Engineering which will be followed by discussions.

Model List of
Buildings, Equipment, Staff etc.
For
An Engineering Institution Offering Degree Courses in Chemical Engineering

(Annual intake—30 students)

Buildings

	Approximate floor area (sq. ft.)	Total approx. floor area (sq.ft.)
A. *General*		
1. Head of the Department's room	200	
2. Staff common Room	600	
3. Office	200	
4. Library & Reading Room	1,200	
5. Stores	1,500	
6. Toilets	300	4,000
B. *Class Rooms*		
1. Drawing and Lecture Halls	2,500	
2. Tutorial Rooms (2 × 360)	720	
3. One Lecture room	750	3,970
C. *Laboratories*		
1. Chemical Engineering Laboratories, including staff rooms	10,000	
2. Gas plant and Boiler House	1,200	
3. Technical Analysis Laboratory	2,400	
4. Staff Research Laboratories	3,000	16,600
Total floor area		24,570
Add 40% for walls, passages etc.		9,828
Total plinth area		34,398
D. Maintenance Workshop	1,000	
Add 15% for wall	150	
Total Plinth Area	1,150	

Equipment

	Approximate cost (Rs.)
1. Chemical Process Engineering	5,00,000
2. Technical Analysis Laboratory	50,000
3. Drawing Hall Equipment	4,000
4. Maintenance Workshop	50,000
Total cost	6,04,000
Cost of installation of equipment etc. Lump sum (For installation of equipment and Special services like vacuum, steam and pressure line)	25,000
Total cost of equipment & its installation	6,29,000

Furniture, Library and Audio-visual Aids

	Rs.
A. *Furniture* (For Class Rooms, Drawing Halls, Laboratories, Library, Stores, Office, Common rooms and Staff Rooms)	40,000
B. Library	25,000
C. Audio-visual Aids	5,000
Total	70,000

Staff

Post	Number
A. *Teaching Staff*	
1. Professor and Head of the Department	1
2. Readers	2
3. Lecturers	2
4. Instructors	2 (In the grade of Rs. 300 —560)
B. *Laboratory and Workshop Staff*	
1. Senior mechanic	1
2. Boiler man	1
3. Mechanics	2
4. Draftsman	1
5. Laboratory Attendants	4
6. Boiler Attendant	1
C. *Library and Office Staff*	
1. Librarian	1
2. Steno-typist	1
3. Storekeeper	1
4. Library Attendant	1
5. Store Attendant	1
6. Clerk	1
7. Sweepers	2

Working Expenses Per Year

	Approx. cost in Rs.
1. Chemicals, Glassware, Hard-ware and other consumable apparatus, Power, light & water@Rs. 200/- per student (200 × 150)	30,000
2. Library books and Journals	5,000
3. Contigencies, Office expenses, Student's tour etc	3,000
Total	38,000

Equipment

I. CHEMICAL PROCESS ENGINEERING LABORATORY

A. Mechanical Operation Laboratory
(Ore-Dressing, Filtration, Mixing and Centrifugation)

Sl. No.	Description of Equipment	No. required per batch of students
(1)	(2)	(3)
	(a) Ore-Dressing:	
1	Hydro-classifier Dorr type 30" dia. with tanks, stirrer etc.	1
2	Flotation cells	2
3	Ball Mill	1
4	Hammer Mill	1
5	Wilfley Table	1
6	Jaw Crusher	1
7	Roll Crusher	1
8	Jar Mill	1
9	Double Deeh Vibrating Screen	1
10	Rotap Testing Sieve Shaker with one set of standard sieve	1
11	Thickner	1
12	Bowel Classifier (Dorr)	1
13	Cyclone Separator	1
14	Elutriator	1
	(b) Filtration	
1	Filter Press with accessories	1
2	Rotary Filter with accessories	1
3	Sweet land Filter with accessories	1
4	Steam Lined Filter	1
5	Vacuum Filtration equipment	1 set
	(c) Mixing	
1	Paddle Mixer	1
2	Propellor Stirrers	6
	(d) Centrifugation	
1	Basket type centrifuge with variable speed	1
2	Sharples Super Centrifuge	1
3	De-Leval Centrifuge	1

B. Fluid Mechanics Laboratory

1	Channel with wires	1
2	Flow of fluids experiment for pressure drop through various types of pipe fittings	1 set
3	Centrifugal Pump set up for studying pump characteristics	1 set
4	Rotary Pump	1
5	Steam Pump (double acting)	1
6	Gear Pump	1
7	Compressor for the laboratory as well as for studying the efficiency of a compressor	1
8	Rotameter, Orifice meter and venturimeter for calibration experiment	1 set
9	Equipment for experimental work on flow of fluids through porous media	1 set
10	Equipment for experimental work on fluidization	1

(1)	(2)	(3)
	C. Mass Transfer Operation Laboratory	
	(Crystallisation, Extraction & Leaching & Absorption)	
	(*a*) *Crystallisation*	
1	Vacuum Crystalliser	1
2	Swenson Walker Crystalliser	1
	(*b*) *Extraction and Leaching*	
1	Liquid Extraction Column—Stirrer type	1
2	Liquid—Liquid Extraction Column—Packed type	1
3	Continuous Leaching Equipment	1
4	Batch Type Leaching equipment	1
5	Equipment for equilibrium data studies	1 set
	(*c*) *Absorption*	
1	Wetted Wall column for absorption studies	1
2	Ion—Exchange Unit	1
3	Colling Tower	1
	D. Heat Transfer Laboratory	
1	Boiler—Fire tube vertical type or Multibular locomotive type—100 ft./sq. in., evaporation 1000 ft./hr., coal and/or oil firing equipment complete with feed pump and injector	1
2	Shell and Tube type Heat Exchanger	2
3	Double Pass Heat Exchanger	2
4	Double Pipe Heat Exchanger	1
5	Finned Tube Heat Exchanger	1
6	Studies on reaction losses	1
7	Cooling and heating coils	1 set
8	½ ton experimental refrigeration unit with accessories for studies in refrigeration	1
9	Jacketed Pans	2
	E. Vaporization, Process Laboratory	
	(Evaporation, Distillation and Drying)	
	(*a*) *Evaporation*	
1	Long Tube (Climbing Film) Evaporator	1
2	Double Effect Evaporator with one effect force circulation type or second effect natural circulation type	1
	(*b*) *Distillation*	
1	Bubble Cap Distillation Column	1
2	Packed Distillation Column	1
3	Tubogrid Column	1
4	Sieve plate Column	1
5	Batch Distillation Unit	1
6	Equipment for Equilibrium Studies	2 sets
	(*d*) *Drying*	
1	Cabinet Dryer	1
2	Rotary Dryer	1
3	Vacuum Tray Dryer	1
4	Vacuum Drum Dryer	1
	F. Instrumentation Laboratory	
	Different types of temperature controller, pyrometers, electronic relays, thermoregulators, variable transformers, gas meters, liquid meters etc. for study of instrumentation and automatic control	1 set

(1)	(2)	(3)
	G. Miscellaneous Equipment for Chemical Process Engineering Laboratory	
	Small portable pumps, general fractional H.P. motors and Stirrers, Volt ohm, ammeters, reducing gears, expansion valves, thermometer, thermostats, hydrometers, pressure gauge, compound gauges, Freon gas Cylinders, tools etc.	
	H. Unit Process Equipment	
1	Sulphonator	1
2	Nitrator	2
3	Hydrogenator	1
4	Auto Claves	3
5	Colloid Mill	1

II. TECHNICAL ANALYSIS LABORATORY

Sl. No.	Description of Equipment	No. required per batch of students
1	Standard Sieves with vibrator	2 sets
2	Platinum Crucibles	5
3	Hot air Ovens	2
4	Vacuum Drying Oven	1
5	Steam Oven	2
6	Muffle Furnace	1
7	Crucible Furnaces	2
8	High Vacuum Pumps	2
9	PH Meter	1
10	Spectroscope	1
11	Microscope	1
12	Refractometer	1
13	Flash Shaker	1
14	Laboratory Stirrer	2
15	Photo Electric Calorimeter	1
16	Photo Electric Turbidimeter	1
17	Redwood Viscometer	1
18	Falling Spheres Viscometer	1
19	Flash point Apparatus	1
20	Bomb Calorimeter	1
21	Gas Calorimeter	1
22	Haldane Gas Analysis Apparatus	1
23	Pan Scales	2
24	Balances with weight boxes	10
25	Laboratory Hard Ware	
26	Laboratory Gass Ware.	

III. DRAWING HALL EQUIPMENT

Models and Drawing Instruments **Rs. 4,000**

IV. MAINTENANCE WORKSHOP

1 Precision Lathe
2 Shaping Machine
3 Milling Machine
4 Tool & Cutter Grinder
5 Drilling Machine
6 Power Hacksaw
7 Plumbers Tools & Dies
8 Welding sets (Gas & Electric)
9 Precision Hand tools, Carpenters Tool Kits

Item No. 14: **Regional Committees**

(A) Matters for Report

(B) Recommendations for Consideration.

Northern Regional Committee

(A) Matters for Report

(a) Meetings

1. The Committee held a meeting on 24th April, 1960.

(b) Redistribution of seats

2. The Committee approved the proposals of the Director of Technical Education, Punjab and Principal, Ramgarhia Polytechnic, Phagwara regarding redistribution of seats between the different branches of engineering at the Punjab Engineering College, Chandigarh and Ramgarhia Polytechnic subject to the condition that it will not involve any additional expenditure. The redistribution is as shown below :—

Punjab Engineering College, Chandigarh

Branch of Engg.	Existing Intake	Proposed Intake
Civil Engineering	120	90
Mechanical Engineering	60	75
Electrical Engineering	60	75
	240	240
Ramgarhia Polytechnic, Phagwara		
Civil Engineering	120	90
Mechanical	30	45
Electrical Engineering	30	45
	180	180

(B) Matters for Decision

(a) Government Central Textile Institute, Kanpur

The Coordinating Committee at its meeting held in June, 1955 approved the development of the Institute for (i) full-time National Diploma course in Textile Manufacture and Textile Chemistry with an annual intake of 30 students and (ii) part-time National Certificate course in Textile Technology with an annual intake of 50 students. The estimated cost of the development was as shown below :—

	Rs.
Buildings (23,160 sq. ft. plinth)	2,78,000
Equipment, Furniture & Library	5,57,800
TOTAL	8,35,800
Recurring (Additional)	56,000
Hostel Loan for 60 seats	1,20,000

Instead of the National Diploma course, the Institute has started w.e.f. 1958-59, Degree course in Textile Manufacture and Textile Chemistry and has been affiliated to the University of Agra for this purpose. As regards part-time course, the institute could not start it owing to a poor response

from the students and requested the Regional Committee to permit it to conduct a full-time National Certificate course.

The All-India Council at its meeting held on 13th April, 1959 approved the recommendations of the Regional Committee that a full-time National Certificate course in Textile Technology be organised at the Kanpur Institute.

The Government of Uttar Pradesh approached the Regional Committee in July, 1959 for the provision of certain additional instructional facilities at the institute which the affiliation Committee of Agra University had suggested in addition to those approved earlier. The request of the State Government has been examined by the Regional Committee. The Regional Committee has made the following additional estimates for the proper conduct of Degree and full-time certificate courses at the Institute:—

	Rs.
Non-recurring	
(*a*) Buildings	Nil
(*b*) Equipment	2,36,614
Recurring	
For salary of additional staff	88,650

The Visiting Committee has, however, recommended that the State Government may provide additional teaching accommodation of 2,500 sq. ft. in lieu of a Ceremonial Hall of equal area constructed out of the developmental grants. The readjustment of accommodation allotted for various sectors has also been emphasised.

(b) Centrally sponsored Polytechnics in Rajasthan

Under the Centrally-sponsored scheme of establishment of Regional Engineering Colleges and Polytechnics, 2 Polytechnics have been allotted to Rajasthan State. The Regional Committee in consultation with the State Government has recommended Kotah and Alwar for the location of the Polytechnics. The Committee has also made the following estimates of cost for each of the polytechnics at Kotah and Alwar which will have on admission capacity of 120 students each:—

	Rs.
Non-recurring	
Buildings (53,800 sq.ft. plinth)	8,07,000
Equipment	8,00,000
Library	50,000
Furniture	35,000
TOTAL	16,92,000
Recurring (Nett)	2,63,300
Hostel Loan for 180 students	4,96,800

The above estimates of the Regional Committee in respect of buildings and equipment vary from the approved standards of the Council by only 10% which is within the limits set by the Co-ordinating Committee. The variations in respect of staff are as shown below.

The Staff recommended by the Regional Committee and that approved by the Council are as under:—

Designation	As approved by the Council	As recommended by the Regional Committee
Principal	1	1
Heads of Departments	3	3
Lecturers	5	7
Senior Drawing Instructors	2	2
Workshop Superintendent	1	1
Instructors (Maths. and Science)	2	3
Demonstrators	7	10
Workshop Instructors	7	10
Drawing Instructors	3	5

It is observed that the staff to student ratio as approved by Council is about 1 : 12 whereas that recommended by the Regional Committee comes to 1 : 8 (taking into account the staff down to Demonstrators and Workshop Instructors).

(c) Government Polytechnic, Bikaner

The establishment of this Institution is included in the State's Second Five Year Plan. The Regional Committee has now furnished the following estimates of cost for the institution which will have an admission capacity of 120 students (Civil 30, Mech. 45 & Elect. 45) :—

Non-recurring

	Rs.
Buildings (53,800 sq. ft. plinth)	8,07,000
Equipment	8,00,000
Library	35,000
Furniture	50,000
TOTAL	16,92,000
Recurring (Nett)	2,63,300
Hostel Loan for 180 students	4,96,800

Here also the Regional Committee's estimates in respect of staff vary from the All-India Council for Technical Education standards. The variations are the same as explained in the case of Polytechnics at Kotah and Alwar.

(d) Audio Visual equipment for Polytechnics

The All-India Council for Technical Education standards for diploma institutions with an annual intake of 120 students provide for Audio-Visual equipment at an estimated cost of Rs. 8,000. Prior to the formation of the standards however, audio-visual equipment was not recommended for certain institutions, whose development plans were approved by the Council. The institutions concerned are: Technical College, Dayalbagh, Agra, S.D. Polytechnic, Baijnath and Mehar Chand Polytechnic, Jullundur. The Regional Committee has recommended that each of these three institutes may be provided with Audio-Visual equipment at an estimated cost of Rs. 8,000 in order to bring them up to the same level as other institutions.

(e) Ajmer Polytechnic, Ajmer

The establishment of a polytechnic at Ajmer is included in the State Second Five Year Plan. The All-India Council at its meeting held in March, 1958 approved inter-alia a building estimate of Rs. 3,96,800 (33,066 sq. ft. plinth) for Civil Engineering diploma course with an annual intake of 60 students. Subsequently, the Coordinating Committee at its meeting held on 1st March, 1960 approved an additional estimate of Rs. 3,21,015 (21,401 sq. ft. plinth) for buildings for the introduction of diploma courses in Mechanical and Electrical engineering with an intake of 30 students each.

The Polytechnic is at present housed in a small incomplete building, and practically the entire new buildings recommended have to be constructed. The Director of Technical Education, Rajasthan requested the Regional Committee that owing to an increase in the cost of construction a building rate of Rs. 15 per sq. ft. may be sanctioned. The first phase of development was approved at a rate of Rs. 12 per sq. ft. while the second was at Rs. 15 per sq. ft.

The Regional Committee considered the request and recommended an additional building estimate of Rs. 99,190 for the first phase of development. With this increase the total estimate for buildings (plinth area 54,467 sq. ft.) comes to Rs. 8,17,005.

(f) Proposal of Uttar Pradesh Government regarding conversion of ceremonial Halls into Drawing Halls

The Regional Committee at its meeting held in April, 1958 considered an inspection report on the institutions under the administrative control of Director of Industries, Uttar Pradesh and noted that a part of building grants recommended for the development of Government Technical Institute, Gorakhpur and Government Central Textile Institute, Kanpur had been utilised for the construction of Ceremonial Halls. Since the development grants of the Central Government could not be utilised for such purposes the State Government was informed that the entire cost of construction of the Ceremonial Halls has to be met by them.

The State Government informed the Regional Committee that they would convert these Halls into Drawing Halls and therefore the Central Government should participate in the cost of construction of the halls. The Regional Committee had the matter further examined by a Visiting Committee and on the recommendations of the latter has recommended that the Ceremonial hall (100 ft x 40 ft) constructed for the Gorakhpur Institution may be converted into Drawing Halls by providing wooden partitions, and the expenditure incurred on the hall may be regarded as an admissible item for Central grants. As regards Central Textiles Institute, Kanpur, the Committee decided that the Ceremonial Hall there could continue as a regular auditorium and the State Government may construct a separate Dye House for the Institute at their own cost.

(g) Suggestions of the Director of Technical Education, Punjab, regarding (i) reservation of seats in non-government technical institutions for students belonging to backward areas; and (ii) eligibility of diploma holders for admission to degree courses in engineering.

(i) Reservation of seats in technical institutions

In Punjab, seats in Government Technical institutions are reserved for Scheduled Castes, Scheduled Tribes and Backward Classes. In addition, seats are also reserved for candidates who belong to certain areas declared specifically 'backward' by the Punjab State Government. The Director of Technical Education, Punjab has now suggested that non government technical institutions in the State also should reserve seats for backward areas in addition to seats reserved for Scheduled Castes/ Tribes and Backward Classes.

At present, one of the conditions subject to which Central Government sanctions grants to non-government institutions is that all admissions shall be made on merit and there shall be no reservations of any kind except for Scheduled Castes and Scheduled Tribes and other backward classes.

The Regional Committee has suggested that since reservation of seats for backward areas is a matter of principle, the All-India Council may consider it.

(ii) Admission of diploma holders to degree courses in engineering and technology

According to the present regulations, the minimum qualification for admission to degree course (4 years duration) in engineering and technology in engineering colleges affiliated to the University of Punjab is F.Sc. with 50% marks. The Government of Punjab has had under consideration the question of admission of some of the top students possessing State Diplomas to regular degree courses for bettering their qualifications. The Director of Technical Education, Punjab has referred the matter to the University for consideration and has also sought the views of the All-India Council.

The Co-ordinating Committee at its meeting held in October, 1958 recommended that in view of the need for providing opportunities of further education to those who had completed State Diploma Courses equivalent to National Certificate course State Boards of Technical Education should formulate Advanced Diploma Courses on the pattern of National Diploma course. The Committee also recommended formulation of Degree courses by Universities for the benefit of those who had completed courses equivalent to National Certificate in engineering and the degree courses should be available both on full-time and part-time basis. The Committee also approved the scheme of Jadavpur University for the institution of part-time degree courses for the benefit of diploma holders.

The Regional Committee has suggested that the matter may be considered by the Council since the proposal of the State Government raises

a new issue viz., admission of diploma holders to regular degree courses and not institution of a separate degree course as recommended by the Co-ordinating Committee, earlier.

(h) Additional recurring grants for Polytechnics

The Regional Committee had observed some time back that the grants recommended to certain diploma institutions prior to the formulation of All-India Council for Technical Education standards were very low as compared to the standards. The cases of eleven such institutions were re-examined in the light of the standards and the Regional Committee recommended additional Non-recurring grants to them. The recommendations were approved by the All-India Council in February, 1957.

The Regional Committee has now reviewed the cases of these institutions in respect of recurring estimates and has recommended the following revised estimates:

Name of the Institution	Intake	Course/s offered.	Recurring grant previously recommended	Revised recurring estimates	Remarks
			Rs.	Rs.	
1. Technical College, Dayalbagh, Agra.	90	Elect. & Mech. Engg.	72,000	1,07,000	
2. P. M. V. Tech. Institute, Mathura.	(*a*) 40	Mech. Engg.	34,000	86,640	Applicable so long as the Inst. offers Mech. Engg. course only with an intake of 40 students.
	(*b*)120	Civil, Elect. & Mech. Engg.	2,26,550	2,47,550	Applicable when the Institute starts offering Civil, Elect. & Mech. Engg. courses with intake of 120 students.
3. Hewett Engg. School, Lucknow.	(*a*)120 (*b*)120	Civil Engg. Civil Elect. & Mech. Engg.	30,000 2,01,990	78,800 2,12,990	Applicable on the introduction of Elect. & Mech. Engg. courses.
4. Civil Engg. School, Lucknow.	(*a*)120 (*b*)120	Civil Engg. Civil, Elect. & Mech. Engg.	27,000 2,01,990	78,800 2,12,990	Do.
5. Guru Nanak Engg. College, Ludhiana.	120	Civil Elect. & Mech. Engg.	33,900	70,000	For the year 1956-57 only, this is the grant originally recommended by the Visiting Committee for diploma courses in Civil, Elect. & Mech. Engg. and degree course in Civil Engg. only. In 1956-57 the college was offering these courses.

(1)	(2)	(3)	(4)	(5)	(6)
6. National Instt. of Engg., Hoshiarpur.	120	Civil, Elect. & Engg.	61,000	2,12,990	
7. Ramgarhia Polytechnic, Phagwara.	180	Civil, Elect. & Mech. Engg.	*	2,46,490	*The Visiting Committee had stated in its report that the salary scales of the staff should be revised and suitably qualified staff should be appointed. However, the Visiting Committee made no recommendations regarding the recurring grants.
8. Mehr Chand Poly., Jullundur.	120	Civil Elect. & Mech. Engg.	75,000	2,12,990	—
9. S. D. Polytechnic, Baijnath.	60	Civil Engg.	30,300	83,100	—

The above revised recurring estimates have been worked out on the basis of the standards fixed by Northern Regional Committee. These would require a further examination in the light of All-India Council for Technical Education standards.

(i) Gurunanak Engineering College, Ludhiana

(a) Increase of Hostel Loan

Central Government sanctioned in 1958 a loan of Rs. 6.44 lakhs for a hostel for 230 students studying in degree classes. The College subsequently informed the Regional Committee that the actual cost of the hostel per students came to Rs. 3,098 and requested that the hostel loan should be increased to Rs. 6,90,000. The Regional Committee after an examination of the matter has recommended that an additional loan of Rs. 46,000 may be sanctioned.

(b) Increase of Building grants

This college conducts both degree and diploma courses in Civil, Mechanical and Electrical Engineering with an annual admissions of 120 students for degree courses and 120 students for diploma courses. The activities of the college have been developed in stages—first for diploma courses and subsequently for degree courses. For this purpose, the All Indian Council on the recommendations of the Regional Committee has approved inter-alia a total estimate of Rs. 15.736 lacs for buildings (1,37,800 sq. ft.).

The College provides common facilities for workshops and laboratories for diploma and degree courses. But the facilities of class rooms, Drawing Halls, office rooms and staff rooms etc. are to be separately provided for

the two courses. For this a separate building of 27,407 sq. ft. plinth area is being put up for the Polytechnic which has been approved by All India Council for Technical Education. The present rate of construction is Rs. 12 per sq. ft. while the rate previously sanctioned was Rs. 10 per sq. ft. The Regional Committee have recommended that to meet the increased cost an additional estimate of Rs. 54.814 may be approved.

Item No. 15:—**To consider a note on the standard of candidates admitted to Technical Institutions**

The All-India Council for Technical Education at its last meeting held on the 13th April, 1959 considered the question of admission to Engineering & Technological institutions in the country. After a long discussion at which different views were expressed, the Council came to the conclusion that sufficient data was not available on the basis of which it could make any definite and detailed recommendation on the problems pertaining to admissions including the reservation of seats for any specified classes or categories of candidates. The council desired that its Secretariat should collect the required information and submit a detailed note at its next meeting.

As regards reservation of seats for Scheduled Castes, Scheduled Tribes and other backward classes a separate note is submitted to the Council under item No. 12 of the agenda. This note deals with the general question of the standards of candidates admitted to Technical Institutions. An analysis of the position in each region is given below:—

Northern Region

Admissions are generally made on the basis of marks obtained by candidates in the qualifying examinations and their performance at an interview held for the purpose. The relative weightage given to the qualifying examination, marks and interview performance varies from institution to institution. In some cases it is 4 : 1; in others, 3 : 1. At one institution viz., Banaras Hindu University 5 to 15% weightage is given to Scheduled Castes, sons of employees, ex-students of the University and players selected for State University teams. Three institutions viz. University of Roorkee, Roorkee, Technological Institute of Textiles, Bhiwani and College of Engineering and Technology, Aligarh hold separate admission tests and select candidates on the basis of the results of those tests and/or interviews.

Eastern Region

In a number of institutions in the region, admissions are made on the basis of marks secured by the candidates at the I.Sc. or other equivalent qualifying examination. In some cases interviews are held and in others not. The Indian Institute of Technology, Kharagpur, Bengal Engineering College, Sibpur, Indian School of Mines and Bihar College of Engineering, Patna hold separate admission tests and interviews. The relative weightage for the admission tests and interview is of the order of 4 : 1.

Western Region

In a large number of Engineering Colleges admissions are made on the basis of the marks secured by the candidates at the qualifying examination. Some weightage is given for sports, extra-curricular activities, N.C.C. etc. As for example, at the College of Engineering, Poona, 30 marks for sports, extra-curricular activities, 10 marks for N.C.C. and 10 marks for distinction. 30 marks are given for passing S.Sc. (Tech). At Walchand College of Engineering, Sangli, 5% for sports, 3% for N.C.C. and 3% for S.Sc. (Tech.) are allowed. The second in the line are those institutions which make admission on the basis of marks at the qualifying examination plus interview. The weightage for interviews and marks at the qualifying examination is not uniform at all the institutions. As for instance, at Government Engineering College, Nagpur 80% marks are given for the qualifying examination and 5% each for higher degree, interview, N.C.C. and drawing examination. At Madhav Engineering College, Gwalior, the weightage for interview is 10% of total marks.

There are very few institutions where admissions are made on the basis of separate admission tests held for the purpose. At one institute, viz., Faculty of Technology and Engineering, M.S. University of Baroda, admissions are made by interviewing the candidates and also by modifying the marks of the qualifying examination for seats reserved for ex-students of Baroda University and 7% seats reserved for Scheduled Castes/ Scheduled Tribes students for Universities in Bombay State. To the marks of the qualifying examination 1% for N.C.C., 1% for sports, 1% for distinction, 2.5% for interview and 3% for S.C. (Tech). For the remaining seats admission is made on the basis of an admission test consisting of 4 papers in General Knowledge, English, Mathematics and Viva-voce.

Southern Region

The method of admission to institutions in the Southern Region varies from State to State as indicated below:

Kerala

40% of the seats reserved for the Backward classes etc. are filled on a State-wise basis, in the order of merit from these communities. The rest is distributed to various districts, on the basis of population. Merit is assessed on the basis of the previous academic record of the candidates. 30 marks are allotted for an interview held to assess the general knowledge, athletics, personality etc. Finally, candidates are ranked district wise according to the academic-cum-interview marks.

Mysore

The seats are distributed as 20% for Scheduled Castes, Scheduled Tribes 45% for Backward classes and 35% for General pool. Selection is made to the general pool first: candidates are called for interview and selection is made on merit on the basis of marks obtained by candidates in the optional subjects, unless a cadidate is rejected at the interview due to poor health.

Andhra Pradesh

The admissions are made on the basis of marks in the optional subjects including Mathematics and Physical Sciences and at the interview. The marks are adjusted against a maximum of 300 only those getting 50% in the optionals are considered. 100 marks are allotted for interview. No minimum is prescribed for Scheduled Castes/Scheduled Tribes.

Madras

A common selection Committee selects candidates for all government engineering colleges and to 80% of the seats available at non-government colleges. Only those who have passed the qualifying examination with grade "B" or higher in both Mathematics and Physical Science or with "D" in either Mathematics or Physical Science, are considered. Only the grades in these two subjects serve as the basis. 75 marks are kept for the interview. Special consideration is shown for candidates with outstanding merit in athletics, games and sports.

Final Analysis

The above analysis of the methods adopted in different states for the selection of candidates for admission to engineering colleges brings out the following main points:—

(a) There is no uniform method adopted in the country as a whole. A limited number of institutions hold separate admission tests and select candidates on the basis of their performance at these tests. A few institutions, though hold admission tests, do not seem to hold interviews before making the final selection;

(b) Most institutions depend on the marks secured by the candidates at the Qualifying Examination *viz.* Intermediate in Science or Higher Secondary or pre-University etc. In a large number of cases, interviews are also held and the performance of the cadidates at the interviews is taken into consideration in making the final selections. In some cases, selections are based exclusively on the marks obtained at the qualifying examination;

(c) Wherever selections are made on the basis of marks secured at the qualifying examinations (with or without interviews held) a minimum percentage of marks is laid down in some cases and in others no minimum is prescribed;

(d) Wherever interviews are held, the relative weightage given to examination marks and interview marks varies widely from institution to institution. In several cases, the proportion of examination marks to interview marks is as high as 3 : 1. The examination marks are computed against a maximum of 300 and interview marks against a maximum of 100. In one particular State, 75 marks are allotted for interviews after restricting eligibility to only those candidates who have secured a minimum grade in the qualifying examination.

(e) In a number of cases, weightage is given to such factors as Proficiency in athletics, N.C.C., sports, etc. Special weightage is also given to candidates who have passed Qualifying Examination from the same University or institution.

The Secretariat has collected and analysed information from each state regarding the standard of students admitted to degree courses in 1958-59. The analysis is furnished at Annexure I. The number of students admitted who had secured 60% and above marks at the Qualifying Examination, varied form State to State and the range was 13.3% to 74.9% of the total admissions. The All-India average was however 55.1% of the total admissions. The range in respect of students who have secured 50 to 60% marks at the Qualifying Examination was 16% to 58% of the total admissions. The All-India average was 31.6%. The range in respect of candidates who had secured less than 50% marks at the Qualifying Examination was 2.6% to 30%. The All-India average was 13%. The analysis at Annexure I also furnishes information regarding the number of candidates securing less than 50% marks who were admitted against open general seats; seats reserved for Scheduled Castes and Scheduled Tribes and backward communities and seats reserved for other categories.

ANNEXURE I

Statement Showing the Nature of Admissions to Degree Courses in Engineering and Technology During 1958-59

(Item No. 15)

Name of State	Total sanctioned intake	Total No. of students admitted	Total No. of students admitted to seats reserved against		No. of students admitted with 60% marks or more at the qualifying examination	No. of students admitted with 50%—60% marks at the qualifying examination	Total No. of students admitted with less than 50% marks at the qualifying examination against			TOTAL
			S.C./S.T. & B.C.	Other categories if any			Open seats	Seats reserved for S.C./S.T. & B.C.	Seats reserved for other categories if any	
Andhra Pradesh	706	715	184	—	382(53·3)	293(41·2)	6	34	—	40(5·5)
Kerala	450	450	199	—	260(57·8)	149(33·1)	12	29	—	41(9·1)
Mysore	950	950	463	—	412(43·4)	300(31·6)	69	169	—	238(25·0)
Madras	973	973	329	29	728(74·9)	156(16·0)	35	54	—	89(19·1)
Madhya Pradesh	678	676	14	60	130(19·2)	392(58·0)	129	10	15	154(22·8)
Bombay	2,033	2,040	106	40	1,337(65·5)	448(22·0)	218	31	6	255(12·5)
Uttar Pradesh	970	940	14	20	507(54·0)	352(37·4)	78	2	1	81(8·6)
Punjab	510	512	53	53	346(67·6)	152(29·7)	2	9	3	14(2·7)
Rajasthan	425	427	21	2	317(74·2)	110(25·8)	—	—	—	—
Delhi	200	193	13	11	130(67·4)	58(30·0)	3	2	—	5(2·6)
West Bengal	1,277	1,349	26	1	742(55·0)	357(26·5)	237	13	—	250(18·5)
Bihar	890	912*	64	30	295(38·0)	362(46·6)	82	30	7	119(15·4)
Orissa	120	120	4	5	16(13·3)	68(56·7)	32	2	2	36(30·0)
Assam	120	120	—	—	(Break up not available with the institution)				—	—
TOTAL ..	10,296	10,377†	1,470	251	5,602(55·4)	3,197(31·6)	903(8·9)	385(3·8)	34(0·3)	1,322(13·0)

N.B.—*Break up of 136 candidates at the Indian School of Mines & Applied Geology, Dhanbad is not available with the institute.

The figures in bracket indicate the percentage with reference to figures in column 3 exclusive of the number for which break up is not available.

†The total of the break ups available, on the basis of which the percentages have been worked out is: 10121.

Item No. 16 :—**To consider the proposals received from the Government of Andhra Pradesh regarding various aspects of Technical Education**

(a) To consider the views of Commodore B. N. Lele, Managing Director, Hindustan Ship Yard (Private) Ltd., Visakhapatnam, on the sandwich course in Mechanical Engineering for Training of Foremen as prepared by the Government of India.

Note received from the Government of Andhra Pradesh

Commodore B. N. Lele, Managing Director, Hindustan Shipyard (Private) Ltd., Vishakapatnam has certain definite views regarding the training of Foremen and Supervisors for Industry. He does not agree with the Preamble to the Sandwich Scheme which states the objects and aims of the course. He is strongly of the opinion that the 4-year sandwich course envisaged under the scheme will not produce the type of foremen required by the Industry. It will on the other hand give a wrong idea to the trainees that at the end of the course they are eligible to be appointed as Foremen. He has further pointed out that it will take 10 to 15 years to process a Foreman in the Industry. The basic requirements in the beginning will be a high degree of skill in the concerned trades or processes which will help the trainee ultimately to gain the confidence of workers under him. Hence, he argues that if candidates possessing the minimum academic qualifications and having the necessary trade experience in the industry are selected for this course (after they have undergone at least 3 to 4 years training in the industry) and given a further part time training of 1½ years to 2 years while still being employed in the industry they will be better fitted to start as Chargemen and work their way upto that of a foreman. The period that might lapse between these two positions will depend on the individual and the skill and confidence and the respect he commands of the people working under him.

Therefore, the scheme as envisaged by the Government of India does not appeal to Commodore Lele and he is strongly of the opinion that it will not be possible for him to actively participate in such a scheme. Further he is also of the view that no diploma need be given to such candidates. It is enough that they possess a certificate of training as may be given by the industry. He feels strongly that the diploma holders are always tending to occuy white colar jobs and that tendency will spread if a person who is trained to occuy the position of a Foreman on the shop floor is given a diploma bringing thereby a very unhealthy psychology and outlook. Hence, he is strongly opposed to the award of a diploma after the completion of such a course.

The council may kindly consider Commodore Lele's views.

Note from the Secretariat of the Council

The sandwich scheme has been formulated by All-India Council for Technical Education in consultation with experts and has been organised

at two important centres viz., at Madras and Calcutta where industrial concerns are taking keen interest in the matter and are actively co-operating in the scheme.

As regards Vishakhapattam, the establishment of a training centre there was decided upon, after a discussion with the Shipyard authorities and the State Government. The then Managing Director of the Shipyard (Mr. C. R. Reddy) supported the scheme.

The Scheme has been welcomed generally by industry. The Engineering Industries Association in Bombay is considering the question of starting a centre for conducting the course. Industrial concerns at Coimbatore and Madurai in consultation with the State Government are also considering establishing centres in these places.

(b) To consider bringing about certain structural changes in the existing diploma courses of the National Certificate standard under Civil, Mechanical and Electrical Engineering to suit the needs of modern industry

Note received from the Government of Andhra Pradesh

At the beginning of the Second Five-Year Plan, the need for engineers with diploma qualification (National Certificates standard) for Large, Medium and Small Scale Industries was keenly felt. Steps have been taken by the Government of India to increase the admission capacity of the existing Polytechnics and to open new Polytechnics to meet this demand and it is expected that by the close of the Second Five-Year Plan period, there will be 193 Polytechnics with an annual intake capacity over 25,000 students at this level.

The analysis of the Physical targets achieved in the Industrial sector, during the current plan has shown a definite indication that the industrial base has been widened and deepened in the current plan. To what extent the diploma holders have contributed to the widening and deepening of this industrial base is not known. It is again estimated that the additional requirements of this category of technicians during the Third Five-Year Plan period would be 90,000. It is widely reported that the economy of the country is expected to reach a "take off stage" and the planners are formulating the Third Plan with this objective in view. At this juncture, it is perhaps desirable and necessary that an evaluation of the ready usefulness of the diploma holders is made by the All-India Council for Technical Education. After a proper assessment is made necessary structural changes needed to be brought about in the present diploma courses to enable the products of this course to make more useful contribution in speeding up the process of taking the country to the desired 'take off stage' are effected.

The industry is not very happy about these diploma holders as they have neither strong theoretical background nor the practical know-how necessary for the work in industry. At present, the curriculum is such

that it is intended to give them an elementary basic knowledge of the theory supported by laboratory work. The student feels the wide gap between the knowledge acquired by him and that expected of him in the industry.

In the Third Plan, it is proposed to allocate a sum of Rs. 2,300 crores for the development of industry in both the public and private sectors. To cope with this development the number of admissions to Polytechnics is proposed to be increased to 90,000.

It is highly necessary that we should think about re-orientating the diploma course in such a manner that we produce in the Third Plan the type of technician who, with a couple of years of post diploma practical experience, will prove useful to the industry. The Large and Medium Scale industries require technicians to handle production or maintenance jobs. The present products are not suitable for these two types of jobs. The Small Scale Industries require a type of man who can independently take care of the entire technical set up of that industry. The diploma holders do not possess the pre-requisite to assume this responsibility.

The Prime Minister has often expressed the view that our country requires now and in future a type of technician who can start an industry medium or small scale, on his own instead of expecting to be absorbed in Governments and undertakings in which the avenues may ultimately become limited. The Diploma holders do not possess the necessary courage that will enable them to go forward with such ventures as the Prime Minister expects of them. There can be nothing wrong with the intellectual capabilities of the present day boys seeking admission to Polytechnics as they have grown up in a more scientific surrounding than their forefathers, and if given a right type of training can fulfil the tasks expected of them.

The Council may kindly deliberate over this matter and take such steps as are needed to produce a more useful type of technician at the diploma level in the Third Plan period.

Note from the Secretariat of the Council

The National Certificate Course in Engineering is of three years' duration. A candidate has to complete two years' practical training before the Certificate is awarded. The minimum admission qualification prescribed for the course is Matriculation or its equivalent. In view of the re-organisation of secondary education in the country, H.S./Junior Technical School certificate has also been prescribed as an admission qualification for the course along with matriculation for the time being. The National Certificate Courses, however, are now being re-organised by the All-India Board of Technical Studies in Engineering & Metallurgy to suit the changing pattern of secondary education in the country. The points raised by the State Government can be considered by the Board.

(c) To formulate measures for an effectively directed and supervised practical training for Degree and Diploma holders coming under the purview of stipendiary schemes of Government of India.

In the Government of India Stipendiary Scheme, a candidate is being sent to industry for a period of a year. This scheme is not producing the desired results. Most of the industries do not allow the candidates to participate in their production nor at least permit them to handle any equipment with the result that a candidate simply wastes his time in the shops and has no other alternative but to spend his time sometimes unprofitably in looking at things being done in the shop. Hence, the objective of the practical training is completely defeated. He neither gains confidence in the use of his hands nor has any interest in the work. It is, therefore, necessary that the All-India Council for Technical Education should formulate proposals so that the training is effective. The industry should take some interest in the boys who have been allotted to them and arrange for the supervision of their practical work and set apart certain equipment in their charge for the practical training of these students.

The Council may think of helping the industry in this respect. They may also think of having a Coordinator who will coordinate the practical training of the boys with the theoretical instruction that is being given in the institution. Such Coordinators are employed in the advanced countries.

Note from the Secretariat of the Council

In pursuance of the recommendations of the Scientific Manpower Committee, the Central Government initiated the Practical Training Stipends Scheme in 1949-50. The main object of the scheme is to secure practical training facilities for graduates and diploma holders passing out of technical institutions and equip them with necessary practical experience for gainful employment. Training under proper supervision and according to a properly designed programme (for which the establishments assume responsibility) is regarded as one of the essential conditions of the scheme. The regional offices draw up detailed training programmes in consultation with the establishments and ensure that the establishments follow the programme. The regional offices also exercise general supervision over the trainees in association with the establishments. Under the scheme, the training establishments are also required to submit quarterly progress reports on the work of the trainees. As the continuance of the stipends depends upon the satisfactory progress reports, the regional offices scrutinize these reports carefully and give suggestions for improvement wherever necessary. As there is already the necessary coordination between the training establishments and the regional offices, there is no need for a separate co-ordinator for the scheme. If, however, some of the establishments in Andhra Pradesh are not following the regular training programme, the Southern Regional Committee could look into the matter.

Item No. 17:—**To consider the proposal of the Central Water & Power Commission for the establishment of an Institute of Hydro-dynamics**

The Central Water & Power Commission has submitted a proposal regarding the establishment of an Institute of Hydro-dynamics for the consideration of the All-India Council for Technical Education. The detailed proposal received from the Commission is placed at Annexure—I.

The proposal envisages the establishment of an independent institute of Hydro-dynamics under the Ministry of Irrigation & Power with the following functions :—

(1) to instruct and train post-graduate students;
(2) to guide and supervise post-graduate research;
(3) to initiate basic research under the sponsorship of various agencies;
(4) to conduct research into ad-hoc problems which have a fundamental research value;
(5) to organise Hydraulic Conferences biennially or triennially;
(6) to sponsor a co-ordinated programme of research publications;
(7) to promote development work and inventions in the different fields of Hydraulic engineering;
(8) to organise exchange programme with Sister-institutes in and outside the country.

The Institute is expected to impart training at Post-graduate level in the following eight courses :—

(1) Fluid Mechanics
(2) River and Canal Hydraulics
(3) Coastal Engineering & Inland Navigation
(4) Irrigation Engineering
(5) Design of Dams
(6) Hydraulic Machinery
(7) Hydraulic structures
(8) Hydro-dynamics of ships and Missiles

For all these courses, Graduates in Civil, Mechanical and aeronautical engineering will be eligible. Graduates in Mathematics will also be eligible for courses 1 and 8 only. The Institute will confer the following degrees on the successful completion of the stipulated course of study indicated against each degree :

M.Sc. (Engg.)	—	by examination	after one year study
M.E.	—	do	after two years research
Ph.D.	—	by research	after 2 or more years research
D.Sc.	—	do	After M.E. or Ph.D.

The estimated cost of establishment of the Institute is Rs. 60 lakhs including recurring expenditure during the period of first 5 years.

One of the most essential requirements of an Institute of Hydro-dynamics is large-scale field and indoor Hydraulic laboratories. It would be extremely advantageous to locate the institute where such facilities exist already as it would considerably save time and funds involved in building up the facilities. The Central Water & Power Commission have expressed the view that Poona will be a rightful choice for the location of the Institute of Hydro-dynamics. The new institute located at Poona would be able to draw heavily upon the existing and future potential of the Central Water & Power Research Station to a mutual advantage and accelerate the place of its growth in the initial stages.

The matter is placed before the All-India Council for Technical Education.

ANNEXURE I

(Item No. 17)

Note on the proposed Institute of Hydro-dynamics

Justification

Hydraulics symbolises the theory and practice of collection, conveyance and utilization of water. Besides being indispensable to human life, water resources of a nation represent its natural wealth and control the national economy to a large extent. Development of the water resources and their economical utilisation has been the foremost activity in the early stages of the planned economic development of our country. Hydraulics and hydraulic engineering have played and are still to play a large part in the planning for prosperity of India. The three aspects of water management have brought about wide ramifications of hydraulic engineering ranging over hydrology to oceanography, irrigation to reclamation, dam engineering to coastal engineering and inland navigation to hydrodynamics of ship design. Increased water supply, extensive and intensive irrigation, cheaper hydropower, control of floods and quicker inland and coastal navigation are but a few of the benefits accruing from the domain of hydraulic engineering. The allied activities of design of efficient water pumps, turbines, propellers and ship hull forms are by no means less important. Underwater ballistics is vital to our naval defence. In short the range and scope of the subject defined more generally by the term hydro-dynamics is ever increasing to justify concerted attention in respect of both academic instruction and basic and applied research in this field.

It is universally accepted that an Engineering College or a Technological Institute is the rightful place for this kind of work although there are exceptions to the rule. The Iowa Institute of Hydraulic Research and the St. Anthony Falls Hydraulic Laboratory in the U.S.A. are but two examples of independent academic organizations catering to the needs of teaching and research in hydro-dynamics in close relation with Universities. In India there has not been any College working on such an organised basis presumably on account of acute shortage of competent Professors, laboratory facilities and funds involved. Even if it were so, the requirements of expert staff, laboratories and funds for such comprehensive working are obviously beyond the scope of a single college thereby justifying a new Institute by itself devoting entirely to the different fields of hydraulic engineering. Only in the latter case would it be possible to bring together several experts in different branches of hydro-dynamics working in India and abroad, so as to carry out a coordinated programme of teaching and basic and applied research.

Location

One of the most essential requirements of an Institute of Hydrodynamics is large-scale field and indoor hydraulic laboratories. It would be extremely advantageous to locate the Institute where such facilities

exist already as it would considerably save time and funds involved in building up the facilities. Moreover part-time services of senior competent research engineers working at the existing laboratory would be readily available for tuition and research. In fact it is quite fortuitous that exactly the conditions described above prevail at the Central Water and Power Research Station at Poona which casts heavily in favour of Poona being the venue of the proposed Institute of Hydro-dynamics. The present potential of the Central Water and Power Research Station is sufficiently large in respect of space, water supply, testing facilities, equipment and research staff specialized in almost all branches of hydrodynamics. The existing as well proposed research and test facilities at the Research Station which prominently include the ship testing tank, rotating arm and manoeuvring basin, cavitation laboratory, laboratory for experimental stress analysis, indoor and outdoor hydraulic laboratories. They have involved and will involve large sums of money and time to build. Even the library services would be profitably shaved along with the part-time services of senior experienced staff of the Research Station specialised in different branches of hydro-dynamics. The present campus of the Research Station is very large to accommodate an Institute of this kind. In addition the expansion of the Research Station during the third plan period envisages a residential colony for the staff and other services and amenities. From all these considerations Poona will be a rightful choice for establishing an Institute of Hydro-dynamics. The new Institute located at Poona would be able to draw heavily upon the existing and future potential of the Central Water & Power Research Station to a mutual advantage and accelerate the pace of its growth in the initial stages.

Scope of Work

The scope of work of the Institute of Hydro-dynamics will include :—

1. Instruct and train post-graduate students
2. Guide and supervise post-graduate research
3. Initiate basic research under the sponsorship of various agencies
4. Conduct research into ad-hoc problems which have a fundamental research value
5. Organise Hydraulics Conferences biennially or triennially
6. Sponsor a coordinated programme of research publications
7. Promote development work and inventions in the different fields of hydraulic engineering.
8. Organise exchange programmes with sister institutes in and outside the country

The scope of work defines the difference between this Institute and Central and State Government hydraulic research laboratories which have mostly been authorized to aid design offices in the planning of large-scale river, harbour and hydro-electric schemes and have perforce been limited to the investigation of specific problems so far. Although programmes

of fundamental and basic research have been in operation for some time, the progress is slow on account of the pressure and urgency of ad-hoc work. The Institute of Hydro-dynamics will aim at training a group of intelligent young engineers in the latest advanced techniques of research and analysis of problems in hydraulic engineering. It will form a nucleus from which young talented men competent to shoulder the responsibility of teaching and undertaking large engineering works would spread out to colleges, industrial and public works. The Institute, in addition, will be a source of original contributions to research and inventions.

Organisational Set-up

The Institute is envisaged to be an independent organisation working under the Ministry of Irrigation and Power and maintaining a very close liaison with the Central Water and Power Research Station on the one hand and the Ministry of Scientific Research and Cultural Affairs on the other. It will have the statutory character of a University and will also receive a charter for the conferment of post-graduate degrees in engineering. Its relationship with the Central Water and Power Research Station will be closer than normally defined by the term liaison. The Central Water and Power Research Station will place at the disposal of the Institute not merely research and test facilities but also part-time services of its senior experienced staff. The Institutes cadre of visiting Professors and Lecturers will draw heavily on the Central Water and Power Research Station staff qualified for the purpose.

The Institute will be headed by a Director who will also be a full-fledged Professor. He will be assisted by an Associate Director who will likewise be a Professor. As given in the chart below there will be three additional Professors, six Assistant Professors and eight Lecturers. They will constitute the permanent teaching staff. There will also be Research Engineers and Research Assistants who will be on the Institute staff for carrying out work on specific and basic research projects. Four visiting Professors and four visiting Lecturers will be invited from the qualified and willing staff of allied agencies and engineering industry to participate in teaching and research in subjects for which competent men may not be available full time. The Professorial chairs will be in the major subjects of (i) Fluid mechanics and Hydraulic Engineering, (ii) Coast and Harbour engineering, (iii) Hydraulic Machinery, (iv) Hydro-dynamics of ships and ballistics, and (v) Mathematics. In the early stages technical assistance of eminent hydraulicians from abroad who have made significant original contributions in their subjects may have to be solicited preferably through programmes of International Cooperation. During the period of their working as Professors at the Institute they will train Indian engineers acting as understudy who will be well versed to take over by the time the experts leave.

The affairs of the Institute will be reviewed by a Board of Consultants composed of five eminent engineers and Scientists from various parts of the country who will be chosen because of their interests and association with the teaching and research activities of the Institute. After a period of three years members will retire by rotation. The Board will function

purely in an advisory capacity being concerned mainly with the strengthening of research activities. The Director of the Institute will act as Chairman of the Board.

The requirements of the administrative staff and skilled technicians will best be worked out at a later stage. The vertical division of higher staff will be as follows:

Director
(Professor)

Associate Director
(Professor)

Professors (3)

Assistant Professors (6)

Lecturers (6)

Research Engineers (S)

Research Assistants (S)

Visiting Professors (4) Visiting Lecturers (4)

Requirements of Facilities

The chief requirements of facilities will be buildings for tuition and administration, laboratory buildings and equipment and a well-equipped library. In so far as the laboratory facilities are concerned the Central Water and Power Research Station will render all possible help and assistance by placing the spare capacity of the field and indoor hydraulic laboratories at the Institute's disposal. However, the wide range of subjects covered by the courses of study will necessitate construction of new laboratories for research on hydraulic machinery and underwater ballistics. It may be that these new laboratories are opened under the aegis of the Central Water and Power Research Station and then kept at the disposal of the Institute. The decision regarding the self-sufficiency of the Institute in respect of laboratory facilities in the long run will depend upon the experience of its cooperative working with the Central Water and Power Research Station. The Institute will need right from its inception test equipment which the Central Water & Power Research Station may not find convenient to spare. These are matters of details to be worked out after decision on establishing the Institute is taken. A preliminary estimate of capital and recurring expenditure for a period of first five years is Rs. 60 lakhs :

Buildings	Rs. 20 lakhs
Equipment	Rs. 25 lakhs
Recurring costs	Rs. 15 lakhs (Rs. 3 lakhs per year)
Total	Rs. 60 lakhs

Courses of Study

The Institute will confer the following degrees on the successful completion of the stipulated course of study :

M.Sc. (Engineering)	by examination	after one year's study
M.E.	by examination	after two years' research
Ph.D.	by researceh	after two or more years' research
D.Sc.	Do	after M.E. or Ph. D.

Any one of the following eight courses of study may be chosen :

I. Fluid Mechanics
II. River and Canal Hydraulics
III. Coastal Engineering & Inland Navigation
IV. Irrigation Engineering
V. Design of Dams
VI. Hydraulic structures
VII. Hydraulic Machinery
VIII. Hydro-dynamics of ships and Missiles

For all the courses graduates in civil, mechanical and aeronautical engineering are eligible. Graduates in Mathematics are eligible for course I and VIII only. The tuition courses are compulsory to all students for the first year. Relaxation may be permitted in exceptional cases.

Syllabus

The following three subjects are compulsory for all the eight courses of study:

1. Mathematics
2. Fluid Mechanics
3. Engineering Hydraulics

The grouping of other subjects for each specified course of study is given below:

I. Fluid Mechanics

Advanced Fluid Mechanics
Higher Mathematics

II. River & Canal Hydraulics

Hydrology
Stream gauging and sediment sampling
River behaviour, control and training weirs, gates and canal structures

Design of channels
Transportation of sediment
Scale models in hydraulic engineering
Construction methods in hydraulic engineering

III. Coastal Engineering and Inland Navigation
- Maritime hydraulics
- Soil Mechanics
- Shore protection
- Harbour Engineering
- Transportation of sediment
- Scale models in hydraulic engineering
- Construction methods in hydraulic engineering
- Inland navigation

IV. Irrigation Engineering
- Soil Science
- Weirs, gates and canal structures
- Design of channels
- Groundwater
- Land drainage and reclamation
- Methods of irrigation
- Group pattern and water requirements
- Economics of Irrigation

V. Design of Dams
- Theory of elasticity (advanced)
- Experimental stress analysis
- Masonry and concrete dams
- Spillways and outlets
- Soil Mechanics
- Earth and rockfill dams
- Site and foundation investigations
- Construction methods in hydraulic engineering

VI. Hydraulic structures
- Hydrology
- Masonry and concrete dams
- Spillways and outlets
- Hydropower plants
- Weirs, gates and canal structures
- Design of channels
- Mechanics of Cavitation
- Scale models in hydraulic engineering

VII. Hydraulic Machinery
- Theory of turbomachines
- Centrifugal and Axil flow pumps
- Hydrofoils, aerofoils and propellers
- Water turbines
- Hydraulic Transmission
- Hydropower plants
- Pumping plants
- Mechanics of Cavitation

VIII. Hydro-dynamics in ship & ballistic design

Hydro-dynamics of ship resistance
Propulsion and steering of ships
Hydrofoils, aerofoils and propellers
Cavitation
Underwater ballistics
Ship model testing & towing tank research

Details of Syllabus

The details of syllabus in major subjects are given below:

Mathematics

Differential equations, Integral equations, Vector and tensor analysis, Functions of complex variables, Potential theory, Dimensional analysis, Statistical methods, Numerical methods, Elements of elasticity, Elementary wave theory.

Fluid Mechanics

Hydrostatics, Hydro-dynamics of perfect fluids, Equations of motion of viscous fluids, Boundary Layer theory, Theory of turbulence, Drag of submerged bodies, jets, waves and cavities, Theory of aerofoils and hydrofoils.

Engineering Hydraulics

(a) Open channel hydraulics
Steady and uniform flow, Gradually varied flow, Rapidly varied flow, Flood routing.

(b) Pipe hydraulics
Steady flow through pipes, smooth and rough pipes, Pipe networks.

(c) Hydraulic transients
Mass oscillations in surge tanks, Theory of Water hammer, Unsteady flow in open channels.

Hydrology

Climatology, Hydrometeorology, Precipitation, Evaporation, Transpiration, Storm-flow, Runoff, Ground-water.

Maritime Hydraulics

Waves, Tides, Currents, Wind waves, Storms, Littoral drift, Agitation in ports, Beach erosion, Salinity and density currents.

Transportation of Sediment

Sediment properties and analysis, Bed load movement, Theory of suspensions, Sediment transport under waves, meandering of rivers.

River Behaviour, Control and Training

Types of rivers, Factors affecting flow and sediment transport, Behaviour of rivers, Meanders cutoffs, Deltas, Flood and sediment control, Training of rivers by different methods. Training of tidal rivers.

Harbour Engineering

Economics of harbour trade, Traffic considerations, Ports, Harbours, Seawalls, Breakwaters, Navigation channels, Range of harbours, Dredging, Dumping grounds, Lighthouses, Landing stages.

Inland Navigation

Economics of inland navigation, Collection of data, Principles and methods of river regulation, Channel improvement works, Lateral canals, Dredging, Reservoir storage, Design of locks.

Design of Channels

Silting and scouring, Theory of stable channels, Practical aspects of factors affecting stability, Regime channels, Non-erodible channels, Hydraulic design of channels, Channel transitions and control structures.

Weirs, gates and canal structures

Weirs, Barrages, Design of weirs on permeable foundations, Energy dissipation, Types of gates—vertical lift, radial, Drum, Roller, Tilting etc., Structural design of gates, Gate hoists, canal regulators, Aqueducts, Siphons, Falls.

Scale models in hydraulic engineering

Fundamental laws of similitude, scale models of hydraulic structures and ports and harbours, Model-prototype conformity, Instrumentation in scale models, Fluid flow measurements.

Groundwater

Flow through porous media, Percolation, Exist gradient, Dany-Dupuit theory, Capacity of wells, Permeability, Control of groundwater.

Theory of Elasticity

Stress, strain, General equations of elasticity, Plane Stress and plane strain problems, Torsion, Bending, Energy principles and variational methods, Numerical solutions, Theory of thin shells and curved plates, Elastic stability, Theory of Plasticity.

Experimental Stress Analysis

Loaded model tests, Photoelasticity, Prototype stress-strain measurements, Analogue computors.

Masonry and Concrete Dams

Gravity dams, Arch dams, Buttress dams, forces acting on dams, theory of stability, Principal stresses, Elastic theory of arches, Trial load analysis, Twist analysis, Temperature stresses.

Spillways and Outlets

Overflow spillways, Side channel Spillway, Glory hole, Siphons, Conduits, Tunnel outlets, Stilling basins, energy dissipation, Regulation of reservoirs.

Earth and rockfill dams

Theory of seepage, Permeability, Compaction and shear, Stability of earth slopes, Cut-offs, Earth dam sections, Inverted filters, Drainage, Rockfill dams.

Hydropower plants

Types of powerplants, Discharge and head characteristics, estimate of power, Surges and water hammer, Intakes and fore bays, Power generation and transmission, Design of power houses—surface and underground.

Mechanics of Cavitation

Types of cavitation, Steady state cavities, Transient cavities, Effects of turbulence and boundary layer on cavitations, Effects of cavitation, Similitude in cavitation, Theory of growth of a cavity, Cavitation in hydraulic structures, Hydraulic mechines and propellers.

Theory of turbomachines

Basic theory, Similarity relationships—specific speed, Theory of radial-flow and mixed flow mechines, Theory of axial flow machines, The bases of excended theories.

Hydrofoils, Aerofoils and Propellers

Theory of drag and lift, Theory of lifting surfaces, Friction drag, Propeller, Theory, Interpretation of relevant model experimentator, Turboblowers, Current meters, Modification due to cavitating conditions.

Water turbines

Impulse turbine—Pelton wheel, Reaction turbines—Francis, Kaplan and Propeller turbines, Tubular turbines, Pump-Turbine reversibility, Efficiency of performance, Governing of turbines.

Hydro-dynamics of ship resistance

Ship resistance, Modelling laws—Froude and Reynolds, Ship propulsion, Manoeuvring, ship propulsive design, Form design and selection, Ship trial analysis, Ship service performance analysis.

Underwater Ballistics

Torpedoes—submarine and amphibian, Mines—magnetic, accoustic, pressure, Cavitation in ballistic missiles

Ship model testing and towing tank research

Laws of similitude, Instrumental design and calibration, Instrumental friction elimination, Tank restraint corrections, Laminar and turbulent flow control, Ship wave generation, Sea behaviour testing, Yacht testing, Planning boats, Submarine testing.

Item No. 18:—**To consider the report of the Annual Inspection Committee for the Water Resources Development Training Centre, Roorkee University, Roorkee for the year 1959-60.**

The Co-ordinating Committee of the All-India Council for Technical Education at its meeting held on the 18th October, 1958, considered the report of a Visiting Committee appointed for the Water Resources Development Training Centre and decided that the Chairman, All-India Council for Technical Education, should appoint a committee to carry out an annual inspection of the activities of the Centre and its progress from time to time. In accordance with this decision, the Chairman constituted a Committee consisting of the following members :—

1. Dr. K. L. Rao, Member, Central Water & Power Commission.	Chairman
2. Shri S. D. Khungar, Retired Chief Engineer, Bhakra-Nangal Project.	Member
3. Shri D. V. Joglekar, Adviser, Fundamental & Basic Research of the Central Board of Irrigation and Power, Poona.	Member
4. Shri V. G. Garde, Principal, M. B. M. Engineering College, Jodhpur.	Member

The Committee visited Roorkee on the 29th January, 1960. A copy of the inspection report is given at Annexure I. The following are the important recommendations of the Committee :—

(i) The suitability of the course for design engineers should be brought to the notice of the various States and project authorities.

(ii) To attract larger numbers of trainees to the Centre, rent free accommodation for five years in the first instance should be provided. The University Grants Commission should give an additional grant of Rs. 16,242 to the Centre for this purpose.

(iii) Every effort should be made to ensure that all Asio-African Nationals admitted for training to the Centre are awarded scholarships under any one of the international schemes of assistance.

(iv) There should be greater collaboration between the Water Resources Development Training Centre and the Central Board of Irrigation.

(v) In view of the unsatisfactory position regarding the intake of trainees, admissions may be watched for the next 5 years and the question of making the Centre permanent may be considered at a later stage.

The matter is placed before the All-India Council for Technical Education for consideration.

ANNEXURE I

(Item No. 18)

Report of the Annual Inspection Committee for the Water Resources Development Training Centre, Roorkee University, Roorkee for the year 1959-60

The Co-ordinating Committee of the All-India Council for Technical Education at its meeting held on the 18th October, 1958, considered the report of the Visiting Committee of the Centre and decided that the Chairman, All-India Council for Technical Education, should appoint a committee to carry out an annual inspection of the Training Centre and its progress from time to time. In accordance with this decision the Chairman constituted a Committee with the following members:—

1.	Dr. K. L. Rao, Member, Central Water and Power Commission.	Chairman
2.	Shri S. D. Khungar, Retired Chief Engineer, Bhakra-Nangal Project.	Member
3.	Shri V. D. Joglekar, Adviser, Fundamental and Basic Research of the Central Board of Irrigation and Power, Poona.	Member
4.	Shri V. G. Garde, Principal M.B.M/College, Jodhpur.	Member

The Committee visited Roorkee on the 29th January, 1960. Shri Khungar was unable to attend. Shri M. V. D. Nair, Assistant Educational Adviser, worked as Secretary of the Committee.

The Committee discussed in detail with Shri K. N. Kathpalia, Acting Vice-Chancellor of the University and Shri Hakim Rai, the Professor of Planning of the Centre, the working of the Centre for the year 1959-60. The Vice-Chancellor placed before the Committee a memorandum showing the entire background of the Centre and its progress.

During the year under review, the intake to the course was 21 as against the sanctioned admission capacity of 50 students. This comprises one student from outside India and 20 students from India—2 were deputed by Central Water and Power Commission, 1 by the Kosi Project in Bihar, 3 by the Bihar Government, 3 by the Andhra Pradesh Government, 3 by the Mysore Government, 2 by Uttar Pradesh Government, 2 by the Madras Government, 2 by the Orissa Government, and 1 each from Punjab and Kerala.

The following were the instructional staff in position at the Centre during 1959-60:

Prof. and Head of the Department	1
Prof. (Planning)	1
Prof. (Construction)	1
Prof. (Design Civil)	1
Readers	2
Director Technical Publications	1

In addition a foreign expert under UNTAO was serving in the Department as Senior Adviser. The Centre has issued letters of appointment for the following posts.

1. Prof. Design (Hydroelectric)
2. Associated Professor (Power Plant).

The Authorities further expect that another expert in Hydro-electric Power Plant would be assigned to the Centre by the UNTAO. The staff position during the year under review is satisfactory.

The Committee noted that the syllabus for the course starting in 1960-61 has been recast. Hours of teaching have been increased from 4½ to 5 per day and the number of periods for the general lecture for the course as a whole has been increased from 300 to 400. This will enable the trainees to have a better knowledge of the various aspects of Water Resources Development. The Committee is particularly of the view that the course conducted at this Centre is greatly beneficial for training the design engineers of the River Valley Projects. At present there is a great dearth of this class of design engineers and every State needs them. The Committee feels therefore that this aspect of the suitability of the course for design engineers should be brought to the notice of the various State and Project authorities of the major River Valley Projects.

The intake of the trainees of the Centre continues to be unsatisfactory. The Committee examined the possible reasons for this position. The training imparted at the Centre is undoubtedly beneficial and meets the present needs, and the staff is adequate. It therefore appears that the only reason why a large number of persons who would otherwise have availed of the training facilities at the Centre, are not doing so at present, is the heavy cost of training at the Centre. The expenses that a trainee will have to bear while under training is of the order of Rs. 200 per month comprising Rs. 75 per month room rent and Rs. 100 to Rs. 125 for other expenses. The reason advanced by Shri Kathpalia for charging a high rent of Rs. 75 per month per trainee was that the Centre has to repay the loan taken by the Centre from the Government for the construction of the hostel for the trainees. The persons deputed for training are generally of the Assistant Engineer Cadre and their salaries are not sufficient to meet the expenses of the training at Roorkee and their home establishments in their respective States. In the circumstances, it is necessary to reduce the expenses of the trainees at Roorkee so as to enable them to meet the additional obligations at Roorkee

University without indebtedness. One possible way of reducing the expenses of the trainee is to give him rent free quarters. This can be done only by either giving him an equivalent allowance of Rs. 75 per month by University Grants Commission or to grant an additional sum of Rs. 16,242 to the University so as to enable them to pay back annually the instalment to the Government due on the loan taken by the University for the construction of trainee hostels. The rent free concession will, surely attract far larger number of trainees both from inside and outside the country. As an experimental measure, this step may be adopted for a period of five years. Keeping in view that the annual recurring expenditure of the Centre is of the order of Rs. 3,22,000, the additional expenditure of Rs. 16,242 would be amply justified if it results in attracting more trainees to the Centre thus realising the object for which the Centre has been established.

In regard to foreign trainees, the position is more unsatisfactory and the trends are that lesser and lesser foreign trainees are taking advantage of the facilities at the Centre. This is perhaps due to lack of information about the Centre and lack of scholarships for the persons deputed by foreign countries. The Vice-Chancellor should seek the permission of the Ministry of External Affairs to get into touch with the Indian Embassies of Asio-African countries with a view to obtain their advice as to the best means of familiarising the project authorities in those countries with the facilities available at the Training Centre. Efforts should also be made to obtain a sufficient number of scholarships through any one of the international schemes of assistance. The Vice-Chancellor should hold preliminary discussions with the authorities of the UNTAO and submit specific proposals to the Department of Economic Affairs, Government of India, with a view to ensure that each Asio-African country is allotted a specific number of scholarships.

The Committee was glad to note that the Centre has undertaken the publication of lectures delivered at the Centre which are of interest to the engineering profession. They were informed that the following publications were under print:

(i) Earth and Rockfill Dams by Prof. G. F. Sewers; and

(ii) Miscellaneous Lectures by D. V. Joglekar on sedimentation of reservoirs.

The Committee suggest that the Vice-Chancellor should write to all the Engineering Colleges informing them of these publications. The Committee also note that lectures given by some of the experts are cyclostyled and compiled in book form and suggest that the Centre should take steps to get these printed as these would be very useful for educational institutions and for the engineering profession. The Committee suggest that there should be greater collaboration with and participation in the Central Board of Irrigation and Power, which is composed of all the Chief Engineers of the States and Projects in the country. This will not only bring a realistic outlook to the activities of the Centre but also it will help in keeping the various Chief Engineers informed of the facilities offered at

The Committee recommend that the Centre may be allowed to purchase this equipment provided they are in a position to do so from the allotment already made to them for the non-recurring expenditure.

The Committee wishes to convey its thanks to the Vice-Chancellor and his staff for the assistance given during the visit to the Centre.

L7SR&C/A—(Sec. II)—500--9-3-61—GIPF.