



INDIAN INSTITUTE OF TECHNOLOGY
MADRAS

Annual Report

1976-77



EIGHTEENTH ANNUAL REPORT
1976 - 77

INDIAN INSTITUTE OF TECHNOLOGY, MADRAS

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SRI N. SANJEEVA REDDY
The President of India

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Bangalore.

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Dept. of Electronics,
Govt. of India, New Delhi.

Sri J. A. Kalyana Krishnan,
Financial Adviser,
Government of India,
Internal Finance Division,
New Delhi.

Representatives of the Parliament:

Sri S. S. Das, M.P.
12, North Avenue,
New Delhi.

Sri G. Bhuvanarahan, M.P.
15, Ferozeshah Road,
New Delhi.

Dr. Rajatkumar Chakrabarti,
Flat No. A/4, University Staff Quarter,
Raja Subodh Mallick Road,
Calcutta-32.

Representative of the All-India Council for Technical Education:

Sri V. Krishnamurthy, Secretary,
Ministry of Industry,
New Delhi.

Nominees of the Visitors:

Dr. M. S. Swaminathan,
Director-General,
Indian Council of Agricultural,
Research and Ex-officio
Secretary, Ministry of Agriculture.

Sri Hiten Bhaya,
Director,
Indian Institute of Management,
Calcutta.

Sri Bhaskar Mitter, Chairman,
M/s Calcutta Electric
Supply Co. Ltd., Victoria House,
Calcutta-700001.

Dr. P. K. Iyengar,
School of Physics,
BARC, Bombay.

Sri A. L. Mudaliar, Chairman,
ICI, 34, Chowringhe Road,
Calcutta.

Secretary:

Deputy Educational Adviser (Tech.),
Ministry of Education & Social Welfare,
New Delhi.

The Board of Governors:

Chairman:

Sri K. T. Chandy, Chairman,
Kerala State Industrial
Development Corporation Ltd.,
Trivandrum.

Nominees of the State Governments:

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Director of Technical Education,
Government of Karnataka,
Bangalore.

Prof. T. R. Doss,
Former Vice-Chancellor,
J.N. Technological University,
Hyderabad.

Dr. S. Vasudev,
Director of Technical Education,
Government of Kerala,
Trivandrum.

Dr. V. C. Kulandaiswamy,
Director of Technical Education,
Government of Tamil Nadu,
Madras.

Nominees of the Council:

Dr. S. R. Valluri, Director,
National Aeronautical Lab.,
Bangalore.

Sri T. Abdul Wahid,
Businessman and Industrialist,
19, Vepey High Road,
Madras.

Vice Admiral N. Krishnan,
Chairman and Managing Director,
Cochin Shipyard Ltd.,
Cochin.

Prof. Gurbaksh Singh,
Vice Chancellor,
University of Hyderabad,
Hyderabad.

Director:

Prof. R. G. Narayanamurthi,
Indian Institute of Technology,
Madras.

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Professor, Dept. of Mathematics,
I.I.T., Madras.

Prof. B. S. Murthy,
Professor, Dept. of Mechanical
Engineering, I.I.T., Madras.

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Sri K. T. Chandy, Chairman,
Kerala State Industrial
Development Corporation Ltd.,
Trivandrum.

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Deputy Educational Adviser
(Tech.), Ministry of Education
and Social Welfare,
Government of India,
New Delhi.

Sri J. A. Kalyana Krishnan,
Financial Adviser
Internal Finance Division.
Government of India,
New Delhi.

Prof. T. R. Doss,
Former Vice-Chancellor,
J.N. Technological University,
Hyderabad.

Dr. V. C. Kulandaiswamy,
Director of Technical Education,
Government of Tamil Nadu,
Madras.

Prof. R. G. Narayanamurthi,
Director,
I.I.T., Madras.

Secretary:

Sri R. Venkataraman,
Registrar-in-Charge.

The Buildings and Works Committee:

Chairman:

Sri K. T. Chandy, Chairman,
Kerala State Industrial
Development Corporation Ltd.,
Trivandrum.

Members:

Prof. R. G. Narayanamurthi,
Director,
I.I.T., Madras.

Sri B. Raghupathi,
Superintending Engineer,
C.P.W.D., Madras.

Prof. K. S. Sankaran,
Professor-in-Charge
Engineering Unit,
I.I.T., Madras.

Sri P. K. Kandaswamy,
Chief Engineer,
P.W.D., Madras.

Sri Y. S. Nagaraja Rao,
Executive Engineer,
I.I.T., Madras.

Secretary:

Sri R. Venkataraman,
Registrar-in-Charge.

The Senate:

Chairman:

Prof. R. G. Narayanamurthi.

Members:

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P. C. Varghese
D. Venkateswarlu
R. K. Gupta
S. D. Nigam
V. S. Nazir Ahmed
B. S. Murthy
C. Ramasastry
S. K. Srinivasan
M. C. Gupta

G. V. N. Rayudu
S. Jambunathan
C. R. Muthukrishnan
P. F. Thiede
S. Ramani
D. K. Banerjee
B. Ramaswamy
V. Seshadri
Y. B. G. Varma
V. M. Krishna Sastry
L. N. Ramamurthy

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V. C. Venkatesh
R. Srinivasan
M. Venugopal
V. G. K. Murti
M. K. Achuthan
T. Gopichand
A. K. Sreekanth
K. S. Sankaran
J. C. Kuriacose
R. Vasudevan
K. Srinivasaraghavan
V. Srinivasan
T. K. Bose
V. Anantaraman
N. V. Chandrasekhara Swamy
P. Srinivasa Rao
B. V. Aswathanarayana Rao
R. S. Alwar
K. P. Rajappan
G. Aravamudan
C. N. Pillai
P. T. Manoharan
H. N. Mahabala
M. Satyanarayana
H. C. Radhakrishna
D. Johnson Victor
N. R. Rajappa
D. Prithviraj
Vincent X. Kunukasseril

A. Kuppurajulu
K. Balaraman
K. A. Damodaran
C. S. Ballal
M. V. Krishnamurthy
Hans Wagner
S. C. Mitra
L. V. K. V. Sarma
K. M. Das
H. Raman
Achim Bopp
K. Thulasiraman
Y. Narayana Rao
P. R. Krishnaswamy
V. Radhakrishnan
H. Chandrasekharan
R. Natarajan
V. Ramamurthi
M. S. Narasimhan
D. Kakati
H. Md. Roshan
P. S. Srinivasan
R. Radhakrishnan
*Nominees of the Chairman,
Board of Governors:*
G. S. Laddha
M. Santappa
C. T. Kurian
Secretary
V. Shanmugam,
Deputy Registrar.

**CHANGES OCCURED IN THE MEMBERSHIP OF THE
VARIOUS BODIES DURING THE YEAR 1976-77.**

Visitor of the Institute

SRI FAKRUDDIN ALI AHMED SRI N. SANJEEVA REDDY
SRI B. D. JATTI

The Council of the Indian Institute of Technology.

Chairman:

Prof. Nurul Hasan,
Union Minister for Education
and Social Welfare,
New Delhi.

Dr. P. C. Chunder,
Union Minister for Education
and Social Welfare,
New Delhi.

Members:

Sri A. N. Sarkar, Chairman,
Board of Governors,
Indian Institute of Technology,
Kharagpur.

Sri B. P. Poddar, Chairman,
Board of Governors,
Indian Institute of Technology,
Kharagpur.

Prof. R. N. Dogra,
Chairman,
Indian Institute of Technology,
Delhi.

Sri Dharamvira,
Board of Governors,
Indian Institute of Technology,
Delhi.

Dr. Y. Nayudamma,
Director General,
Council of Scientific and
Industrial Research,
New Delhi.

Dr. A. Ramachandran,
Director General
Council of Scientific and
Industrial Research,
New Delhi.

Dr. K. A. V. Pandalai,
Director,
I.I.T., Madras.

Prof. R. G. Narayanamurthi,
Director,
I.I.T., Madras.

Sri H. S. Shahani,
Joint Educational Adviser (T.)
Minister of Education
and Social Welfare,
Government of India,
New Delhi.

Sri Prem Nath,
Financial Adviser,
Minister of Finance,
Government of India,
New Delhi.

Sri J. A. Kalyanakrishnan,
Financial Adviser,
Internal Finance Division,
Government of India,
New Delhi.

Sri Bhavao Sahib Dharmarkar,
Member of Parliament.

Sri S. S. Dass,
Member of Parliament.

Sri Sarjoo Pandey,
Member of Parliament.

Sri G. Bhuvarahan,
Member of Parliament.

Prof. S. Chakravathy,
Member,
Planning Commission,
New Delhi.

Sri V. Krishna Murthy,
Secretary,
Ministry of Industry,
New Delhi.

Prof. G. Tripathi,
Banaras Hindu University,
Varanasi.

Dr. M. S. Swaminathan,
Director General,
Indian Council of Agricultural
Research, Secretary, Exofficio,
Ministry of Agriculture.

Sri M. M. Suri,
B. 14, Greater Kailash,
New Delhi.

Sri Hitern Bhaya,
Director,
Indian Institute of Management,
Calcutta.

Sri S. K. Mukherjee,
Director, Fertiliser
Corporation of India,
New Delhi.

Sri P. K. Iyengar,
School of Physics,
BARC, Bombay.

Sri R. P. Billimoria,
Director,
Hindustan Steel Limited,
Ranchi.

Sri Bhaskar Mitter,
Chairman,
M/s. Calcutta Electric Supply
Corporation Limited,
Victoria House,
Calcutta-700001.

Sri A. L. Mudaliar,
Chairman,
ICI 34, Chowringhe Road,
Calcutta.

The Finance Committee:

Sri Prem Nath,
Financial Adviser,
Ministry of Finance,
Government of India,
New Delhi.

Sri J. A. Kalayana Krishnan,
Financial Adviser,
Internal Finance Division,
Government of India,
New Delhi.

Dr. K. A. V. Pandalai,
Director,
I.I.T., Madras.

Prof. R. G. Narayanamurthi,
Director,
I.I.T., Madras.

The Building and Works Committee :

Members:

Dr. K. A. V. Pandalai,
Director,
I.I.T., Madras.

Prof. R. G. Narayanamurthi,
Director,
I.I.T., Madras.

Dr. D. J. Victor,
Prof.-in-Charge,
Engineering Unit,
Indian Institute of Technology,
Madras.

Prof. K. S. Sankaran,
Prof.-in-Charge,
Engineering Unit,
Indian Institute of Technology,
Madras.

Sri P. Sivalingam,
Chief Engineer,
Public Works Department,
Madras.

Sri P. K. Kandaswamy,
Chief Engineer,
Public Works Department,
Madras.

Secretary:

Secretary:

Sri C. V. Sethunathan,
(Registrar).

Sri R. Venkataraman,
(Registrar-in-Charge).

The Senate:

Members:

Sri P. Ramachandran,
Dr. S. R. Ramadas
Dr. N. M. Raghavendra.

Dr. C. K. Narayanaswamy.

REPORT BY THE DIRECTOR

Eighteenth Annual Report

(July 1, 1976—June 30, 1977)

The Indian Institute of Technology, Madras is an Institute of national importance and higher technological education and is located in a beautiful sylvan setting of about 630 acres of land. It is an almost self contained residential institution of about 2,200 students. It has been growing from strength to strength ever since it was established in July 1959.

The changes in the body of scientific knowledge and in the development of technology are fast and open up new possibilities and create immense scientific, technological and socio-economic problems and challenges. The Institute aims to provide leadership not only by mastering the developments in science and technology all over the world but also by contributing to these developments for the technological growth of our country and other developing countries. During the past eighteen years, the Institute has striven to discharge its obligation to the country and can claim a good measure of success in its efforts.

The Institute has endeavoured to establish a high standard in its educational and research programmes, comparable with the standard of leading institutions anywhere in the world. It has succeeded in its endeavour, thanks to the dedication of the institute staff, the quality of the students and the faculty, the heavy investment of the Government of India (Rs. 12.25 crores in fixed assets and 18.81 crores for meeting the recurring expenditure) and collaboration with and assistance from the government and leading universities of the Federal Republic of Germany.

The more significant features of our work during the period under review are:

1. High percentage (43%) of the postgraduate and research scholars of the total students strength (936 postgraduate and research scholars as against 1,249 undergraduate students).
2. The admissions to the postgraduate Courses were made this year again through CEPA (Common Examination to Postgraduate Admissions). In all 3,298 candidates appeared for the examination in 25 centres spread all over India. The candidates who qualified in the CEPA were offered admission strictly on the basis of their rank in the examination results and their choice of specialisation without interview. This experiment has as its aim improvement of the standard of admission to postgraduate programmes, as in the case of Joint Entrance Examination for B.Tech. admission.
3. This year to cater to the demand of the nation with Television Technologists, a D.I.I.T. course in Television Engineering was started. Five candidates were admitted.
4. 55 Ph.D. Degree were awarded at the thirteenth Convocation. Out of the 55 Ph.D. degrees awarded, 33 were in Engineering subjects.
5. Continuing Education Programmes of the Institute, Quality Improvement Programme and Centre for Systems and Devices.
6. Continuation of projects under the Fourth Indo-German Agreement.
7. Collaboration with France for the development of activities in the Aeronautical Engineering field.
8. Increase in industrial liaison activity resulting in consultancy assignments including testing Charges and a revenue of Rs. 12.97 lakhs.

9. Progress of Rural Development Centre and transfer of technology.

The details of these and other contributions are detailed in this report under the following sections:

I. Admissions, Degrees and Prizes :

1. Student admissions 1976---77.
2. Student strength.
3. Degrees awarded.
4. Prizes.

II. Research and Development :

1. Research publications and patents.
2. Sponsored research schemes / projects.
3. Research Centres.
4. Assistance to industry-Industrial Consultancy Centre.
5. Indo-German Colloboration.
6. French Colloboration.

III. Education Programmes :

1. Continuing Education Programmes.
2. Quality Improvement Programmes.
3. Curriculum Development Centre.
4. Important lectures and seminars.

IV. Other Facilities and Activities

1. Staff.
2. Library.

3. Institute Gymkhana.
4. N.C.C. and N.S.S.
5. General facilities.
6. Construction of buildings.
7. Centre for Rural Development.

V. Budget

VI. Institute and National Aims

VII. Future.

I. ADMISSIONS, DEGREES AND PRIZES

1. Student Admissions, 1976—77

The number of new students and scholars admitted to various courses (1976-77) is given in Table 1.

TABLE 1

Admissions 1976-77

Department	B. Tech.	M. Tech.	DIIT	M.Sc.	M.S.	Ph.D.	Total
Aeronautical Eng.	17	15	—	—	4	—	36
Chemical	37	27	—	—	14	3	81
Civil	39	23	—	—	9	6	77
Electrical Eng.	63	45	—	—	11	4	123
Industrial Eng.	—	16	—	—	2	1	19
Industrial Mangt.	—	11	—	—	3	2	16
Mechanical Eng.	63	54	2	—	20	5	144
Metallurgy	28	24	—	—	4	3	59
Chemistry	—	—	—	12	—	7	19
Mathematics	—	—	—	11	—	5	16
Physics	—	—	—	15	—	6	21
Computer Science	—	28	—	—	5	—	33
Applied Mechanics	—	13	5	—	6	3	27
Total	247	256	7	38	78	45	671

The total of 671 includes the following:

Foreign nation students	..	21
Scheduled casts students	..	30
Scheduled tribe students	..	3
Women students	..	10
QIP scholars	..	21
Sponsored candidates	..	5

£. Students Strength

The total strength of students and scholars in the department are given below in the Table 2.

TABLE 2

Total Students Strength 1976-77

Department	Under graduate course	Post graduate course	Research	Total
Aeronautical Engineering	64	15	15	94
Applied Mechanics	..	15	40	55
Chemical Engineering	190	38	34	262
Civil Engineering	219	40	48	307
Electrical Engineering	324	71	44	439
Industrial Engineering	—	26	8	34
Industrial Management	—	22	20	42
Mechanical Engineering	329	115	84	528
Metallurgy	123	29	27	179

Chemistry	—	21	64	85
Mathematics	—	19	18	37
Physics	—	23	44	67
Computer Science	—	35	15	50
Total	1249	469	461	2179

The Total of 2179 includes the following:

Foreign nation students	..	116
Scheduled Caste students	..	122
Scheduled Tribe students	..	13
Women students	..	61
QIP scholars	..	63
External registration candidates	..	40
CSIR Scholars and Sponsored candidates	..	79
Part-time candidates	..	163

3. Degrees Awarded

The number of degrees awarded at the thirteenth convocation of the Institute on August 20th, 1976 are given in Table 3. Dr. M. S. Swaminathan, Director General of ICMR delivered the convocation address.

TABLE 3

Number of degrees awarded

Discipline	B. Tech.	M. Tech.	M.Sc.	M.S.	DIIT	Ph.D.	Total
Aeronautical Eng.	11	2	—	2	—	—	15
Bio-Engineering and Applied Mechanics	—	—	—	3	5	—	8
Chemical Eng.	49	16	—	3	—	2	70

Civil Engineering	58	13	—	—	1	6	78
Electrical Eng.	72	28	—	3	—	7	110
Engineering Mech.	—	3	—	1	—	4	8
Mechanical Eng.	62	47	—	3	7	12	131
Metallurgy	28	16	—	3	—	2	49
Chemistry	—	—	11	—	—	9	20
Mathematics	—	—	10	—	—	4	14
Physics	—	—	15	—	—	9	24
Computer Science	—	13	—	—	—	—	13
Industrial Eng.	—	11	—	—	—	—	11
Indus. Management	—	18	—	5	—	—	23
Total	280	167	36	23	13	55	574

The percentage of first and Second classes are given in Table 4.

TABLE 4

Class	B.Tech.	M.Tech.	DIIT	M.Sc.
First class with Distinction	11.08%	9.58%	—	—
First Class	76.42%	79.05%	92.32%	80.56%
Second Class	12.50%	11.37%	7.68%	19.44%

With this convocation in August 1976 the number of degrees awarded so far by the Institute is: B. Tech. 3061, M.Sc. 432, M. Tech 1345, DIIT. 137, M.S. 104, Ph.D. 328, Total 5407.

4. Prizes

The names of the academic prize winners for the year are give below:

1. *President of India Prize:* Sri V. Srinivasan
(For the student of the B. Tech. degree course with the Best Academic Record). B. Tech.—Mechanical Engineering.
2. *Governor's Prize:* Sri Gadgil Surendra Janardan
(For all round proficiency in B. Tech. degree course). B.Tech—Mechanical Engineering
3. Merit Prizes for the students with the best academic record in each discipline of each course:

B. Tech. Course:

Aeronautical Engineering	Sri Venkata Satya Bayanna Raghavendra Rao Loka
Chemical Engineering (Reliance Heat Transfer Private Ltd., Prize)	Sri Narasinga B. Rao
Civil Engineering	Sri Ventata Sridhara Rao Vakka- lagadda
Electrical Engineering (Power, Siemens Prize)	Sri L. K. Prakash Narayan
(Electronics, Philips India Ltd.)	Sri Vikram Vishwas Karmarkar
Mechanical Engineering (Banco Foundation Prize)	Sri V. Srinivasan
Metallurgy	Sri N. Kuppuswamy
Naval Architecture	Sri N. Jayaraman

M. Tech. Course:

Aeronautical Engineering	Thomas V. Mathew
Chemical Engineering (Prof. B. Sengupta's Prize)	Sri N. Madhusudhanan
Civil Engineering	Sri S. N. Janarthanan
Computer Science	Sri S. Ramesh
Engineering Mechanics	Sri B. Shekar Reddy
Electrical Engineering (Siemens Prize)	Sri A. Subash Chandran
Industrial Engineering	Sri T. Sivanandam
Industrial Management	Sri D. Venkateswara Reddy
Mechanical Engineering	Sri C. V. Prasada Rado
Metallurgy	Sri Dhamdhare Shireesh Hari
Metallurgy—Metal Casting option (Sri S. Anantharamakrishnan Memorial Prize)	Sri A. Janagan

M.Sc. Courses:

Chemistry	Kum M. Geetha
Mathematics	Kum N. Rukmani
Physics	Kum Nutulapathy Meena
D.I.I.T. Industrial Tribology	Sri R. Padmanabhan
Mechanical Engg.	Sri B. V. L. Mangalakara Rao

II. RESEARCH AND DEVELOPMENT

1. Research Publications and Patents

On the basis of Research and Development work done at the Institute, nine processes were developed during the year. The following patents were obtained.

1. a tubular flow reactor (I.P. No. 139313)
2. a pneumatic mixer (I.P. No. 139312)

3. a device for producing fluid streams or bubbles in a fluid or fluid-solid medium (I.P. No. 139292)

SPONSORED PROJECTS (1976-77)

2. Sponsored Research Schemes/Projects

The Institute has currently a number of sponsored research schemes/projects financed by organisations like the Council of Scientific and Industrial Research. The Indian Council of Medical Research Ministry of Defence, Department of Atomic Energy, Space Science and Technology Centre, Research and Development Organisation for electrical industry etc. Department-wise detail are given under the departmental report.

The Institute has currently 101 sponsored research schemes/project financed by various organisations. Department-wise details are given below:

Sl. No.	Name of the Sponsoring authority	Title of the Project
---------	----------------------------------	----------------------

Aeronautical Engineering

- | | | |
|----|------------------|---|
| 1. | Aero R & D Board | Flutter Analysis of Panels in super-sonic flow in the presence of a boundary layer. |
| 2. | ,, | Analytical, experimental and design studies on fibre reinforced plastic structures. |
| 3. | ,, | Theoretical and experimental investigations on certain problem in gas turbines. |
| 4. | ,, | Numerical methods for the design and analysis of Aerofoils and |

- bodies in subsonic/supersonic flows.
5. ,, Design and development of Ram-jet engine.
 6. ,, Design and development of rarified gas dynamic facility.
 7. SSTC, Trivandrum Completion of design and commissioning of the arc jet facility.
 8. ,, Hypersonic wind tunnel.
 9. ,, High temperature air heater.
 10. CSIR Composite structures.
 11. Madras Airport Construction of Monsoon Canopy in front of domestic departure concourse at Madras Airport.

Applied Mechanics

12. Dept. of Science & Technology Development and testing of bi-compatible materials for the fabrication of (i) bags for storing blood in the Blood Banks and (ii) Synthetic wound dressings.
13. ,, Development of Trileaflet heart valve prosthesis.
14. ,, Development of a vertical axis wind generator.
15. ,, Bio-feedback instrumentation for neurologic therapy.

- | | | |
|-----------------------------|--|---|
| 16. | Dept. of Atomic Energy | Development of high speed air bearings for nuclear research applications. |
| 17. | CSIR | Scheme on Development of Artificial Kidney. |
| 18. | „ | Design and Development of a low speed strain rate controlled universal testing machine. |
| 19. | Indian Council of Medical Research New Delhi | Design and development of a system for recording standard 12 lead ECG during exercise and its evaluation. |
| 20. | „ | Inquiry on Development of Membrane Blood Oxygenator (Artificial lungs). |
| 21. | R. & D. Orgn., Min. of Defence | Corona Discharge photography—A potential diagnostic tool. |
| 22. | VSSC, Trivandrum | Acoustic Transmissibility tests. |
| 23. | Bharat Dynamics Ltd., Hyderabad | Fabrication of wire spool unwinding machine. |
| 24. | BHEL, Hyderabad | Stress Analysis of large turbine castings. |
| 25. | Dept. of Science & Technology | Performance testing of bearings and lubricants with special reference to the simulation of industrial conditions. |
| Chemical Engineering | | |
| 26. | CSIR | Multistorage fluidisation investigations in cold model. |

27. Dept. of Atomic Energy, Experimental Investigations on steady state performance and flow instabilities in boiling channel systems.
Govt. of India
28. Aero. R. & D. Board Development of inhibitor for burning solid propellant charge.
29. Brakes India Ltd. Development of structural adhesives.

Chemistry

30. Dept. of Science & Technology New Energy Source Development of photogalvanic cells.
31. Dept. of Atomic Energy An Investigation of catalytic properties of neutron irradiated zinc oxides.
32. PL—480 Catalytic High Pressure Hydrogen transfer reactions.
33. „ Light and heat induced activity of Alcohols by semi-conductor oxides.
34. R. & D. Orgn. Min. of Defence Synthesis and reactions of functionalised S-triazines and other triazines.
35. CSIR Catalysed Reactions involving photo-chemical simulation.

46. Dept. of Science & Tech-
Development of portable audio-
meter unit for mass screening of
hearing disorders.
45. Dept. of Electronics, Comput-
erized Hospital Informa-
tion System.
Govt of India

Computer Centre

44. Tor Istag Steel Corpora-
tion
Use of Torsteel in concrete sleepers.
Road Congress.
43. RDSO, Lucknow
"Pozzolana Cement" for Indian
Road Congress.
42. Min. of Defence, Govt. of
India
Load Testing of K.M. Bridge
Components.
41. " " " " " " " "
Model Tests on Torsion in Bridge
Decks.
40. Min. of Shipping and
Transport, Govt. of India
Floating Breakwaters.

Civil Engineering

39. I.S.R.O.
Developmental studies on high
temperature resistant polymers.
38. Indian National Science
Academy
Characterisation of Iron, Cobalt
and Nickel complexes and their
effective as catalysts for hydro-
generation.
37. CSIR
Liquid Phase catalytic Hydrogena-
tion of glucose and fructose by
transition metal complexes.
36. CSIR
Mechanistic studies on the Oxida-
tion of Olefine on Oxide catalysts.

47. Dept. of Science & Tech- Development of on-line enquiry system. technology

Electrical Engineering

48. Electronics Commission Development of MOS Surface Varactor

49. Dept. of Science & Tech- Detection and Measurement of Air Pollution using lasers. technology

50. UGC Development of Materials for electro-optic devices.

51. CSIR Development of silicon MOS Capacitor or MOS Varactor.

52. Indian National Science Academy Effect of Atmospheric turbulence on an open air laser communication line.

53. ISRO High performance Dual mode horns.

54. Southern Railways Fabrication and supply of 3.3 m dia Antenna.

55. Kirloskar Elec. Co., Ltd. Manufacture of speed change Induction Motors.

Materials Science Research Centre

56. Dept. of Science & Tech- Studies on the solid state chemistry and catalytic properties of mixed oxide of some transition metals. technology

57. " Development of Solid Materials for (a) Production of Hydrogen by Photo-Electric chemical de

composition of water using Solar Energy and (b) Storage of Hydrogen.

58. Dept. of Science & Technology Studies of the preparation and properties of certain, super-conducting and related materials.
59. BHEL, Hyderabad Development of Posistors.

Mechanical Engineering

60. CSIR Technology of preservation of Fruits, Vegetables and Marine Products.
61. CSIR Porous cylindrical Solar Heater
62. CSIR Holographic techniques for stress analysis.
63. CSIR Design and development of an Ultrasonic Burner.
64. CSIR Stress analysis in production process: Development and application of a special technique.
65. CSIR Effect of Turbulence on the performance of Turbine blades in cascade with special reference to separation zone blade suction surface.
66. CSIR Rotating vaneless diffuser for centrifugal blower.

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| 67. | Dept. of Science & Technology | New Energy sources Development of a 3-Ton Solar air-conditioner. |
| 68. | „ | Design and development of the multipurpose tubular reversible axial flow machines. |
| 69. | „ | Development of Laser Interferometer. |
| 70. | „ | Centrifugal compressors—surge control. |
| 71. | Min. of Defence (R & D) | Design and development of an Aerial Camera similar to F-95. |
| 72. | „ | High speed cascade tests. |
| 73. | „ | High speed compressor and turbine investigation. |
| 74. | „ | Development of gas supported bearings. |
| 75. | Dept. of Electronics | Development of Printing Units |
| 76. | Dept. of Atomic Energy | Holographic techniques for stress analysis and holographic non-destructive testing. |
| 77. | SERC Madras | Joint Research Project on the development of technology for the manufacture of large diameter prestressed concrete pipe. |
| 78. | Institute of Applied Manpower Research, New-Delhi | Study of scientific and technical manpower in R & D Establishments. |

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| 79. | NSF, Washington | Control of exhaust emission from Diesel vehicles. |
| 80. | BHEL | Thermal Design and Research Studies in Large Deaerators used in power plants. |
| 81. | BHEL, Bhopal | Project on Hydroturbines. |

Metallurgy

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| 82. | CSIR | Cold Pressure welding of similar and dissimilar metals. |
| 83. | CSIR | Fabrication of friction welding machine. |
| 84. | CSIR | Study of the structure of glasses using the Warren Mozzi Techniques. |
| 85. | CSIR | Development of break down agents for Sodium silicate carbon dioxide bonded sands. |
| 86. | Min. of Defence R & D | Welding characterisation of Nickel. |

Physics

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| 87. | Aero R & D Board | Cryogenic Systems for Infra-Red Detectors. |
| 88. | CSIR | Pseudo-potential calculation of the equation of states and anharmonic properties of metals. |
| 89. | CSIR | Surface states of semiconductors in high and ultra high vacuum. |

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| 90. | CSIR | Development of cryostats for the study of some properties of materials at low temperature. |
| 91. | CSIR | Spin wave resonance and nuclear magnetic resonance in ferromagnets. |
| 92. | Dept. of Science & Technology | Investigation on Semi-conducting crystals at Microwave Frequencies. |
| 93. | Dept. of Atomic Energy | Theory of Point defects in Oxides. |
| 94. | ICMR | Medical Diagonistics using Laser Speckle |
| 95. | BHEL, Hyderabad | Development of rotating Dewar for liquid Helium with Transfer coupling. |
| 96. | Dept. of Science & Technology | Properties of materials of construction at low temperature. |
| 97. | Dept. of Space | Polymers useful under Cryogenic conditions. |

Centre for System and Devices

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| 98. | Dept. of Science & Technology | Development of molecular beam technology for fabrication of solid slate devices. |
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Engineering Design Centre

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| 99. | Dept. of Science & Technology | Design and development of a compatible set of Photo—gram. metric and Multi spectral Remote Survey Cameras. |
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Quality Improvement Programme Division

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| 100. | AICTE and UGC | Identification of goals, curriculum design, needs and aspirations in Engineering education. |
| 101. | „ | Curriculum Development Processes. |

RESEARCH CENTRES

Electrical Energy

1. Conducting balanced and unbalanced short circuit studies on Bihar State Electricity System for English Electric Co. Madras.
2. Conducting load flow studies on Bihar State Electricity System for English Electric Co. Madras.

The following projects were under execution:

1. Development of three-phase load flow program for Tata Consulting Engineers, Bombay.
2. Conducting computerised system studies on Rajasthan State Electricity System for Tata Consulting Engineers, Bombay.
3. Development of Software packages for
 - (a) formation of three-phase admittance and impedance matrices for an unbalanced transmission line.
 - (b) transient stability studies with unbalanced faults.
4. Development of high voltage testing facilities.

The following project proposals were prepared and submitted for consideration of grant:

- (i) Development of hardware and software for power system data collection, processing and retrieval—Department of Science and Technology.
- (ii) Development of hardware, software and technical know how for computer aided control of power systems in India—Department of Science and Technology.
- (iii) Remedial measures for problems of industrial and saline pollution of transmission line insulators—Department of Science and Technology.
- (iv) Establishing facilities for study, detection and measurement of internal partial discharges in fabricated equipment—Department of Science and Technology.
- (v) Fabrication of a variable low frequency 100 kv supply—Carborundum Universal.

Consultancy assignments on 'Optimal Design of Induction Motor's' are being executed on a continuing basis for M/s Kirloskar Electric Company, Bangalore.

Negotiations are under way with the New Government Electric Factory, (NGEF), Bangalore for undertaking optimal design assignments in respect of (a) Two Speed Induction Motors and (b) High Power Factor Motors for Pumps.

Solar Energy Division

The Solar Energy Division of the Energy Research Centre (ERC) is actively engaged in research and development on Solar devices such as water heaters, cookers, solar stills, air heaters, space cooling and power generation.

An open-cycle 3 ton air-conditioner, under a grant from DST has been fabricated, the testing of which is in process. A small intermittent solar refrigerator has been designed and fabricated and is being tested.

Recently, at the request of the Government of Tamil Nadu, design for a solar still of 500 l/day capacity for the production of potable water from sea water, has been proposed. The plant will be installed shortly at Krusade Islands off Rameswaram.

A two week winter School on Utilisation of Solar Energy was conducted with the financial assistance of ISTE for thirty teachers of Engineering Colleges.

Wind Energy

The wind power division of the Energy Research Centre continued its activities on the project with BHEL under the auspices of Department of Science and Technology for the design and development of a vertical axis wind machine. Model tests were conducted on a 1 m high machine with two or three bladed configurations. Theoretical analysis concerning the characteristics of such machines with straight blades (with and without inclined ends) was completed and two reports published. Based upon the results obtained from the model studies, it was decided to go in for a proto-type capable of generating about 5 KW of power. A preliminary design of the proto-type as made by the colaborators at BHEL has already been installed at Hyderabad. The future work lies in improvement of this design based upon the wind tunnel studies and incorporating features like spoilers for speed control.

Engineering Design Centre

"The Centre is oriented towards design and development of products, processes and total systems from planning to production especially in interdisciplinary fields utilising the available resources of the Institute.

The Centre is currently engaged in the development of Multi-spectral and Photogrammetric Cameras, Leather Processing Machinery and Miniature Circuit Breakers. All the projects are running to schedule.

The Centre has already developed a STATIC DRIVER TRAINER, a useful equipment for teaching 'L' drivers, and supplied it to the Driver Training School of Pallavan Transport Corporation. The Centre is also planning to develop High Speed Gear Boxes and tool and equipment for agriculture, Khadi & Village Industries."

Fibre Reinforced Plastics Research Centre

One student is enrolled for Ph.d. programme. Continuing Education Programmes

Short Course on FRP Technology (October, 11-16, 1976, 45 participants)

Important Lectures and Seminars:

- (a) "Second International symposium on New Fibres and Composites" January, 10-11, 1977 Sponsored by Department of Science and Technology and UNDP, 200 delegates.
- (b) 'Open House' Program on the eve of completion of DST/UNIDO project on Jute-Resin Composite products, April 28, 1977.
- (c) "Jute Applications for Low Cost Housing, Silos and Boats" paper presented by V. X. Kunukkasseril at UNIDO Sponsored conference for Low Cost Housing, Nicosia, Cyprus, April 1977.
- (d) "Analytical Methods" K. A. V. Pandalai, Second Symposium on New Fibres and composites, January, 10-11, 1977, IIT, Madras.
- (e) "Applications of Composites" V. X. Kunukkasseril, Second Symposium on New Fibres and Composites, January, 10-11, 1977, IIT, Madras.
- (f) "Characterisation of Composites" N. G. Nair, Second Symposium on New Fibres and Composites, January 10-11, 1977, IIT, Madras.
- (g) "Fibre Reinforced Plastics-Principles and Applications", N. G. Nair and V. X. Kunukkasseril, All India Seminar on Polymers, A.C. College of Technology, Madras, August 1976.
- (h) "Application of Fibre Reinforced Plastics in Civil Engineering" N. G. Nair, Seminar on New Building Materials and

Technology, College of Engineering, Trivandrum, September, 1976.

Research and Development.

1. Research Publications:

Papers: One

Books/Monographs

- (i) Proceedings of the Second Symposium on New Fibres and Composites, January, 10-11, 1977
- (ii) Short term course Notes on FRP Technology, October 11-16, 1977.
- (iii) "Bibliography on Composites and Allied Topics" Compiled by R. Palaninathan, January 1977.

2. Sponsored Research Schemes and Projects:

(a) Projects:

- (i) Studies on Multilayered Shells and Filament Wound Structures —C.S.I.R.
- (ii) Development, Fabrication and Testing of 1.2 metre and 3.3 metre dia FRP Microwave Antenna-Southern Railways.
- (iii) Performance Evaluation of Glass Filament Wound Plastic Pipes-Fibreglass Pilkington Limited, Bombay.
- (iv) Jute-Resin Composite Low Cost Houses, Silos and Boats-DST and UNIDO.

(b) Departmental Projects: SIX.

2. Assistance to Industry—ICC:

- (i) Light Weight Bus Seat—M/s L. G. Balakrishna and Brothers Limited, Karur, Tamilnadu.

- (ii) 15,000 litres Capacity Acid Storage Tank—Swiss Welded-Mesh Company, Madras.
- (iii) FRP Tubes and Divertor oil Vessels for High Voltage, Application—Hackbridge—Hewittic and Easun Limited, Madras, .
- (iv) FRP Milk Tubs—Tamilnadu Dairy Development Corporation, Madras.
- (v) Teleprinter Cover—Hindustan Teleprinters Limited, Madras.
- (vi) Lamp Shade—Fibreglass India, Madras.
- (vii) Also we have provided testing services to 20 FRP industries and technical consultancy services to about 30 concerns.

New Major equipments added:

- (a) 150 T Capacity Press;
- (b) Lathe with maximum job size of 800 mm dia.
53 metre long.

Equipment Fabricated:

- (i) Roving Cutter;
- (ii) Ox-Powered Filament Winding M/C.
- (iii) Resin Mixer;
- (iv) Bust Pressure Testing Equipment.

Visitors to the Centre :

- (i) Mr. Armand G. Winfield, Senior Consultant on Reinforced Plastics, UNIDO.
- (ii) Mr. Alan M. Shibley, Senior Consultant on Reinforced Plastics, UNIDO

Invited Lectures Delivered by the Staff

“New Developments in Fibre Reinforced Plastics” N. G. Nair, Plastics and Rubber Institute, Madras.

Any other Information.

Apart from the C.S.I.R. Project fund, the total income generated by this centre during this year through courses, symposia, Industrial Consultancy, Testing, services and Inter-Institutional project amount to about Rs. Two lakhs.

The following projects submitted by the staff of this centres have been approved and will be taken up shortly.

Development of processes and Machinery for the Continuous production of Reinforced Plastic Sheet Moulding Compounds.

Studies on Glass Fibre Reinforced Cement Composites and applications.

Design and Development of Preform Process Techniques to make FRP Components.

Development of Glass Fibre Processing Equipment.

Development of Jute Reinforced Plastics Composites with special emphasis on Low Cost Housing and other Applications.

In addition to the above, Mr. Armand G Winfield who was a visitor to this centre and also a Senior Consultant, UNIDO, has submitted a project worth Rs. 1.5 crores to UNIDO on Jute-Resin Low Cost Housing, Silos and Boats. This work will be carried out in this centre if approved.

The following two books are under preparation and are expected to be published shortly. 1. Engineering Theory of Plates and Shells by Dr. K.A. Pandalai, 2. Fibre Reinforced Plastics Technology. Edited by Dr. K A.V. Pandalai, Dr. V. X. Kunukkasseril and Dr. N. G. Nair.

Materials Science Research Centre

Four students are registered for Ph.D programme. A three week course for 40 participants ‘Materials for Engineering Technology’ was conducted.

Research and Development

(a) *Research Publications:*

- (i) "Photoelectrochemical Cells for the decomposition of water using solar Energy" M. V. C. Sastry and G. V. Subba Rao. Int. Symp. on Industrial Electrochemistry IIT, Madras, December 1976.

(ii) *Books/Monogram :*

Title : Selected Topics in MATERIALS SCIENCE

Editors: Prof. M. V. C. Sastri

Dr. G. V. Subba Rao

Year : November, 1976

(b) (1) *Sponsored Research Schemes & Projects:*

- (i) Development of materials for (a) Production of hydrogen by photoelectrochemical decomposition of water using Solar Energy and (b) Storage of hydrogen . . . DST.
- (ii) Studies on Solid State Chemistry and Catalytic properties of some mixed oxides of transition metals. . . DST.
- (iii) Development of posistors based on Ceramic Barium Titanate . . . BHEL/Hyderabad.

(2) Departmental Projects: TWO.

(c) *Following is a list of major equipments added:*

1. 'UNITROL' High Temperature muffle furnace to reach 1500°C.
2. 'VICO' High Vacuum system complete with all necessary accessories.
3. L & N K.5 Potentiometer facility.

4. LCR Bridge.
 5. 'Ethygen' hydrogen generator.
 6. 'PRECON' Globar Furnace with temperature controller.
 7. 0.1% Universal Bridge (TF 1313a).
- (b)
1. Muffle furnaces—both horizontal and vertical to reach 1000°C.
 2. High-temperature fused—salt electrolysis apparatus for crystal growth.
 3. Two-zone tubular furnace for crystal growth by chemical vapour deposition.
 4. Four-probe resistivity apparatus for measurements between 77 K and 300 K.
 5. Seebeck coefficient apparatus (for use on pellets usable upto 400°C).
 6. Hall coefficient apparatus for measurements in the temp. region 77—500 K.

Visitors to the Department:

Prof J. O. M. Bockris
Flinders University,
Australia.

Dr. John Bardeen
Nobel Laureate
University of Illinois,
USA.

Any other Information:

The following laboratories have been developed:

1. Wet Chemical and Microanalytical Laboratory.
2. High-temperature Solid State Synthesis Laboratory.

A brief indication of developmental programme likely to come up in the near future:

1. Proposal for an interdisciplinary course leading to M. Tech Degree in Materials Science, with faculty drawn from various Departments to be submitted to the Senate.
2. Proposal to offer a short course on Hydrogen Energy Carrier Systems, with financial support from DST.
3. Faculty proposals.
 - (a) The Assistant Professors one with specialisation in Solid State Materials Synthesis and the other with specialisation in Thin Film/Ion Implantation Device Technology. (Proposal submitted to the Director).
 - (b) Supporting Technical/Research staff at the level of Scientific Officer-II/Senior Technical Assistant would be required.

Regional Sophisticated Instrumentation Centre

The important function of this centre is to help the scientists from within IIT and outside for carrying out physico chemical measurements employing most sophisticated instruments.

During the year 1976-77 two new instruments have been purchased. About 55 Universities as well as 30 Industries and National Laboratories used the measurement facilities. The number of measurements made during this year in various categories are:

Infrared spectra 1964 (1130); FT Infrared spectra 60 (10); UV-Vis-near IR spectra 393 (617); 60 MHz NMR spectra 66 (173); ESR spectra 382 (2144); 100 MHz NMR spectra 406 (233); Fluorescence spectra (19)—the numbers in bracket being the number of measurements made by IIT scientists and the number outside the bracket shows the outside samples analysed.

The number of measurements made this year has far exceeded that of last year. A new brochure was brought out, giving details of the services available at RSIC with short write-ups about each method of analysis. A summer school on Chemical Applications of Spectroscopy was conducted exclusively for scientists from industries and national laboratories which proved to be very beneficial for scientists working in these establishments and intend to utilise the facilities available in this centre.

ASSISTANCE TO INDUSTRY-INDUSTRIAL CONSULTANCY CENTRE

The Industrial Consultancy Centre was established at the Institute in April 1973 serve as a link between industry and the Institute and to co-ordinate the industrial liaison activities of the latter.

Total No. of jobs approved ··· 895

Total amount covered by the above jobs ··· Rs. 11,56,445

The projects undertaken covered: Measurements, Calibration, Testing and certification to standards, Consultancy on Planning and Production, Analysis, Fabrication, Design and Development, Fault rectification and servicing, Investigation, Reports and Recommendations.

Knowhow on the following three processes were released for commercial exploitation:

S. No.	Process	Name of Staff Member
1	Silicic Acid	Sri C. Sivaprasad Rao, Chemical Engineering Department.
2	Rotary Bubble Generator	Dr. A. Prabhakara Rao, Chemical Engineering Department.
3	Fluid Sand Process	Dr. H. Md. Roshan Mr. S. Saravanamuthu Dr. E. G. Ramachandran } Metallurgy. Department

Under the Indo-German agreement in force, special provision exists for German assistance in the development of Industrial Consultancy at IIT, Madras. Under this scheme Prof. Dr. Hans Wagner has joined this Institute as Adviser to ICC in July 1976.

Towards the end of 1976 the ICC shifted to a new location having an area of about 400 sq. metres in the Southern wing of the II floor of Building Science Block.

Talk of Industrial Consultancy Activities at IIT Madras by Prof. V. G. K. Murti at Small Industries Service Institute, Madras-32 to a group of participants undergoing Industrial Entrepreneurship course.

An intensified programme of visits to local industries by the staff of ICC accompanied by staff of Departments and Centres is contemplated in order to acquaint the Industrial Organisations of the facilities and expertise we have and elicit information from them and identify industrial problems that could be tackled at the Institute.

2. INDO-GERMAN COLLABORATION

Under the Fourth Indo-German agreement, the following nine inter-university Indo-German projects have been taken up in the first phase and are in progress.

1. Design and development of multistage fluidised bed reactor.
2. Development of pretensioned pre-stressed concrete railway sleeper for the Indian Railways.
3. Development of high-speed digital link.
4. Heat-transfer studies in electrical machines.
5. Speed-control of a squirrel-cage induction motor.
6. Centrifugal compressors.
7. Improvement of weld quality in wheels.

8. Preparation and investigation of magnetic properties of ferromagnetic materials of technical interest.
9. Design and construction of cryogenic equipment.

3. FRENCH COLLABORATION

The recent agreement with France for collaboration and assistance to the Aeronautics Department of this Institute is being implemented.

Sri S. Santha Kumar, Lecturer has been deputed to France for training. Two students have also been selected to prosecute higher studies in France.

CONTINUING EDUCATION PROGRAMMES FOR THE ACADEMIC YEAR 1976-77

1. Jigs and Fixtures in Quantity Production (August, 1976).
2. Surface Protection of Metals (August, 1976).
3. Introduction to IBM 370/155-11 Computer System (15 September, 1976).
4. Transport Management (September, 1976).
5. Job Control Language (23 September, 1976).
6. Debugging Fortran Programs (September, 1976).
7. 8th Annual Conference of Indian Association for Management (3 October, 1976).
8. Biomedical Engineering in Medicare Delivery (10 October, 1976)
9. Maintenance Management (October 1976)
10. Fibre Reinforced Plastics Technology (16 October, 1976).

11. Cam Design for Single Spindle Automats (20 October, 1976).
12. Material Management (8, October 1976)
13. Electronic instrumentation (October, 1976).
14. Industrial Metrology (October, 1976).
15. Cobol Programming (October, 1976).
16. Management Games and Simulations (October, 1976).
17. Transportation Modelling (October, 1976).
18. Principles and practice of Cryogenics (1 November, 1976).
19. Utilization of Solar Energy (22 November, 1976).
20. Treatment and Testing Metals (26 November, 1976).
21. Cutting Tool Technology (November, 1976).
22. Process Planners Course (November, 1976).
23. HAL Management Training Programme (November, 1976).
24. BEML Management Training Programme (November, 1976)
25. Short Training Programme (November, 1976).
26. Fifth National Symposium on Refrigeration and Air Conditioning (7 December, 1976).
27. Pneumatic Controls (17 December, 1976).
28. Catalysis and High Pressure Technology (18 December, 1976).
29. Second National Symposium on Cryogenics (10 December, 1976).
30. Chemical Applications of Spectroscopy (10 December, 1976).
31. Operations Research Society Meeting (22 December, 1976).
32. Numerical Control in Machine Tools (December, 1976).

33. Futurology—Policy Studies (29 January, 1977).
34. Mechanical Design (January, 1977).
35. Avionic Systems (January, 1977).
36. Workshop on Heat and Mass Transfer for Asian and Pacific Countries (January-February, 1977).
37. Basic Electronics and Instrumentation (January, 1977).
38. Materials Handling (January-February, 1977).
39. Hydraulic Control (January, 1977).
40. Optimisation Technique for Engineering Design (8 January, 1977).
41. Design of Shallow Foundations (February, 1977).
42. High Energy Rate Forming (February, 1977).
43. Workshop on Control of Automobile Pollution (February 1977).
44. Radar Signals: Analysis and Processing Techniques (March, 1977).
45. Semi-Conductor Device Technology (March, 1977).
46. Aircraft Control and Automatic Piloting (April, 1977).
47. Process Planners Course (May, 1977).
48. Finite Element Method and use of Computers for Stress Analysis (16 May, 1977).
49. Particle Size Analysis (21 June, 1977).
50. Production Engineering (July, 1977).

Continuing Education Programmes are active at this Institute since 1973. The Institute offers under this programme in-service

refresher courses for Scientists, Engineers and Technologists engaged in industry and other technical and scientific organisations. The Programme is offered under two broad headings viz. Short terms Courses and Long Term Courses, the former being limited to two to three weeks duration and the latter for longer duration.

Apart from these courses, that are offered under the Continuing Education Programme, Seminars, Symposia and Workshops are also conducted frequently. The Institute also provides opportunity to its employees to update their knowledge in their field of interest by providing them short training programmes.

About 35 short term and 5 long term courses have been conducted during the period under report.

The Continuing Education Programme is an extension activity of the Institute to establish closer association with practising members of the profession.

QUALITY IMPROVEMENT PROGRAMME UGC TEACHER FACULTY IMPROVEMENT PROGRAMME

1. Serving teacher programme

The number of teachers of engineering college admitted during the year is 8 for M. Tech and 8 Ph.D programmes. This brings the number of QIP scholars on rolls in 1976-77 session to—54.

For the first time the Institution admitted 15 teachers of other Science college under the UGC Teachers Fellowship.

2. Short term courses:

1. Fluid Mechanics (2 weeks in summer—35 participants.)
2. Computer Engg. & Applications (3 weeks in summer—28 participants).

3. Materials for Engineering Technology (3 weeks in summer—28 participants).
4. Television Engineering (2 weeks in summer—21 participants).
5. Material Handling Technology (5 weeks in summer—27 participants).
6. Industrial Catalysis High Pressure Technology (4 weeks in November-December, 1976—19 participants).
7. High Voltage Lab. Practice (2 weeks in December, 1976—15 participants).
8. High Energy Forming Processes (3 weeks in December, 1976—15 participants).
9. Non-destructive Testing of Materials and Components (1 week in summer—10 participants).
10. Matrix Computer Methods in Structural Analysis (3 weeks in summer-26 participants)
11. Advanced Industrial Engineering (2 weeks in summer—32 participants).
12. Rational Approach to Design for Strength (3 weeks in summer—12 participants).

IMPORTANT LECTURES AND SEMINARS

The following are some of the important lectures and seminars held at the Institute.

1. Dr. M. S. Swaminathan, Director-General ICAR delivered the convocation address on 20-8-1976.
2. A special convocation was held on 21-1-1977 for the conferment of the degree of Doctor of Science (honoris causa) on Dr. John Bardeen, Nobel Laureate who delivered his address on the occasion.

3. At the special convocation held on 22-4-1977 Mr. Hans Dietrich Genscher, Federal Minister for Foreign Affairs F.R.G. conferred the Degree of D.Sc. (honoris causa) who delivered his address on the occasions.
4. Dr. Macolm S. Audiseshaiah delivered the second A. L. Mudaliar memorial lecture.
5. Dr. P. C. Chunder, Union Minister of Education and Chairman, Council of IITs visited the IIT Madras.

OTHER FACILITIES AND ACTIVITIES

1. STAFF

During the year 11 Professors, 13 Assistant Professors, 2 Senior Design Engineers, 8 Lecturers, 1 Chief Security and Vigilance Officer, 1 Assistant Registrar, 1 Assistant Finance and Accounts Officer, 1 Surgeon, 1 E.N.T. Specialist, 1 Part-time Medical Officer, 1 Paediatrician, 1 Part-time Anaesthetist, 1 Resident Medical Officer, 1 Junior Medical Officer, 1 Deputy Librarian, 1 Assistant Librarian, 1 Assistant Engineer, 3 Junior Engineers, 1 Secretary to Public Relations, 3 Senior Technical Assistants, 5 Junior Superintendents, 1 Programme Librarian, 6 Assistants, 5 Technical Assistants joined the Institute. Many internal candidates qualified themselves for higher posts in the open selection. This brought the total academic staff strength to 366 and non-academic staff strength to 1202. The total number of Institute employees came to 2104 including the work charged staff.

2. LIBRARY

The Central Library continued to get Scientific books, periodical and xerox copies of technical literature from Technical University Berlin under Indo-German collaboration programme. In collaboration with INSDOC has completed successfully UNESCO pilot project on Chemical Information Services with chemical abstracts condensates

using CAN/SDI software serving 150 scientists in India, Sri Lanka and Nepal. From the beginning of the year 1977 subscription to 90 select titles have been arranged to be procured by accelerated surface post

Books and Bound Volumes of periodicals (acquired)	4,025
Pamphlets and reports (acquired)	1,199
Microfilms and Microfiches (acquired)	31
Total intake during the year	5,300
Total accessions up-to date	1,48,641
Total number of Periodicals	1,397
Total Expenditure during the year	10.5 lakhs

INSTITUTE GYMKHANA

Sports and Games Activities

The Institute teams in hockey, football, basket ball, volley ball, swimming, tennis and athletics participated in the Madras Collegiate Athletic Association tournaments this year also.

External Tournaments

The hocky, badminton, basket ball, swimming, table tennis, skating and bridge teams open tournaments and other in the Stanley Medical College, Betram tournament, Y.M.C.A. and A. M. Jain Colege and other tournaments this year also. The Institute Bridge team participated in the Tamil Nadu State Championship.

XII Inter I.I.T. Meet

Our Institute retained the General Championship Trophy for the 6th year in succession winning Table tennis, Basket Ball, Tennis Hockey and Athletics.

Inter University

The Institute table tennis and Ball Badminton team participated in the Inter University tournaments.

Nationals

Our student Mr. R. Ravi represented the Tamil Nadu in the National Table Tennis Championship.

Cultural and Literary Activities

Cultural and Literary activities of the Gymkhana reached their high mark during January 1976 when the Cultural Festival was organised. There was a good response from out station colleges from far-off places like Delhi, Kharagpur, Ooty and Bangalore. An exhibition of photographs and paintings was also organized.

The institute gymkhana also made its mark in the field of literary and Cultural Competitions in the City by winning the following trophies and shields.

Jaycees Madras

Rotary Club Madras

Lions Club of Guindy

Inter Collegiate Quiz

Theosophical Society

Rotaract Club of Madras

N.C.C. and N.S.S.

The strength of the NSS was 160 for the year. Two special camps with strengths of 79+80 were held during the year. The NSS has adopted Narayanapuram village for its concentrated activities directed towards the Economic development and the Sociological development of the village. The NSS Volunteers work in close co-ordination with the Centre for Rural Development of the Institute which is engaged in bringing up a Technology Complex near the adopted village on 94 Acres of low lying land assigned by the Government of Tamil Nadu to the Institute. The main emphasis of the Technology Complex is Transfer of Appropriate Technology to Rural areas. The NSS is also engaged in Adult-literacy and Non-formal Education Programmes in two other villages near the Institute, Taramani and Velachery. The NSS Volunteers are a well motivated group, have endeared themselves to the villagers and made themselves acceptable to the rural community as catalysts for the desire transformation for the Rural Community.

CONSTRUCTION OF BUILDINGS

The following are some of the important buildings which are in progress or were completed during the course of the year.

List of works completed:

1. C² Type Quarters (2 Blocks).
2. 'D' Type Quarters (4 Blocks).
3. Married Officers Hostel (1 Block).
4. Extension to Kendriya Vidyalaya.
5. Construction of 2 blocks of E-1 Type quarters
6. Construction of Second floor over B.S.B. rear wing.
7. Setting up television laboratory.
8. Construction of Fuel Filling Station, and Housing for Petrol and Diesel Tanks near Auto Shop.
9. Additional room to R & AC Lab. in gas dynamics Laboratory.
10. Construction of Shuttle Badminton Court.
11. Construction of First Floor over guest house.
12. Extension to Vibration Laboratory.
13. Extension to Hospital.
14. Construction of 3 bays as extension to B.S.B.
15. Construction of 1 block of E-1 type quarters.
16. Construction of an underground sump and pump house.

Works in progress:

1. Construction of 'D' type quarters. (2 blocks).
2. Construction of E-1 Type Quarters. (2 blocks).
3. Construction of Married Officers Hostel. (1 block).
4. Construction of Research Scholars Quarters
5. Extension to Structures Laboratory.
6. Construction of F.R.P. Centre.
7. Construction of 3 additional Bays near B.S.B.
8. Supply of A.C. Plant for the Radio active Laboratory.

CENTRE FOR RURAL DEVELOPMENT

It is imperative that the intrinsic and effective development of a country has to start from below, i.e., from the village level up. This alone can be the proper direction of development since about 70 percent of the people of our land live in the rural sector.

Experience of the past has shown that Economic Development must at least run parallel to General Social Development. It can even be said that Economic Development may as well precede Social Development. It is with this philosophy in mind that IIT, Madras has started A CENTRE FOR RURAL DEVELOPMENT (CRD) two years back. The emphasis is on transfer of Appropriate Technology available already in a large measure at the Institute to the Village to generate immediate employment for the villagers by making use of available raw materials and their proper Management. An energy complex combining Bio-gas, Solar Energy and Wind Power is being set up near the village along with appropriate water Management. Every effort is taken to develop the complex in such a manner so that this 'Programme Packet' can be repeated in other villages, with the necessary modifications.

BUDGET AND INSTITUTE EARNINGS

1. BUDGET PROPOSALS

(i) Approved budget and the expenditure for the year 1976-77:

Approved Budget (net) 1976-77	Rs. 382.67 lakhs
Amount allotted by the Ministry	Rs. 382.67 lakhs
Actual expenditure (net) 1976-77	Rs. 396.89 lakhs

(ii) Budget proposals for Revised Estimates 1977-78 and Budget Estimates 1978-79:

(Figures in lakhs of rupees)

Actuals for	Budget for	Revised Esti- mates	Budget Esti- mates
1976-77	1977-78	1977-78	1978-79
Rs.	Rs.	Rs.	Rs.

Recurring:

(a) Ocean Engineering Centre	—	9.00	9.00	13.00
(b) Other than Ocean Engineering	364.28	343.50	380.14	424.38

Non-Recurring:**(a) Ocean Engineering**

Centre:				
Buildings	—	11.00	11.00	9.00
Equipment and Others	—	26.00	27.00	13.00

(b) Other than Ocean

Engineering				
Buildings	39.89	30.00	7.00	73.00
Equipment and Others	52.16	54.45	74.56	86.71
Total	456.33	473.95	575.70	619.09
<i>Less: Income</i>	59.44	4.28	49.67	50.79
<i>Net:</i>	396.89	428.67	526.03	568.30

FUTURE

The Institute cannot rest content with the contributions it has so far made. The country faces many problems whose solutions lie in the application of science and technology. In line with the plans developed by the nation as a whole for the promotion of science and technology, the Institute has to diversify its activities in scientific and technological education, research and development, design and consultancy and liaison with all sectors, contributing to the economic growth and development of the nation. The Institute must establish new records and reach higher peaks of excellence through discipline, dedication and devotion to duty as well as team-spirit and teamwork of faculty, staff and students.

As our activities increase in tempo and get diversified, a proper monitoring and planning mechanism becomes essential, as otherwise, the developments will be poorly co-ordinated and not well-thought out. Therefore, it is proposed to set up a "planning and monitoring" cell. Although it is impossible to predict the future, the necessity for perspective planning cannot be questioned.

The Institute stands for encouraging excellence, creativity, and innovation in all spheres of activity and at all levels. The spirit of inquiry, the readiness to accept challenges, keeping an open, questioning, analytical mind unfettered by dogmas and prejudices all of which represent the essence of the scientific culture must become part of the blood-stream of everybody connected with this Institute.

REPORTS OF THE DEPARTMENTS

Aeronautical Engineering

On Courses

Changes made in syllabus and Curriculum (M. Tech.).

To increase the job potential of our post-graduate aeronautical engineers it has been agreed to merge the existing three separate streams, viz., aerodynamics, aerospace propulsion, and structures, into one. In the revised programme there are basic compulsory core courses in the broad areas of aeronautical engineering with a wide choice of electives to be opted by the students. This revised programme has come into effect from 1977-78.

Education Programme:

Quality Improvement Programme/UGC Teacher Fellowship Programme:

Serving Teachers Programme:

Number Trained:

M. Tech.	.. 1
Ph.D.	.. 2

Number on rolls:

M. Tech.	.. 1
Ph.D.	.. 2

List of important lectures and seminars:

<i>Title of the talk</i>	<i>Speaker</i>
Elastic wave propagation Dynamic Stability (Fluid Structures-medium interaction Dynamics of Composites.	Dr. S. K. Datta, Professor, Univ. of Colorado, Boulder, USA.
Unsteady one-dimensional Gas Dynamics Flows (The equations of motion and the Martin Ludford Gas).	Dr. J. A. Steketes Prof. and Head Dept. of Aero. Tech. Univ. Delft Netherlands.

Title of the Talk

Speaker

Rayleigh Problem in MHD
with construction of
Fundamental Solution.

Dr. J. A. Steaketes
Netherlands

Recent Development in
Transonic Flows.

Dr. N. R. Subramanian,
Scientist, Aero. Divn.,
National Aero. Lab.,
Bangalore.

Research in Aeronautics
IIT, Kanpur.

Dr. K. Ghosh,
Aero. Engg. Dept.,
IIIT, Kanpur.

Aircraft Spin

Dr. S. M. Ramachandra,
Deputy Chief Engr.,
Hindustan Aero. Ltd.,
Bangalore.

Use of Winglets for
reduction of Aircraft
Drag.

Prof. J. L. Stollery,
Head, Aero. Divn.,
Cranfield Inst. of Tech.,
U.K.

R and D work at IIT
Kharagpur.

Dr. B. C. Basu
Head, Aero. Dept.,
IIT, Kharagpur.

Some aspects of Unsteady
aerodynamics of Airfoils
and cascades.

Dr. B. Satyanarayana,
NASA Ames Res. Center,
Moffett Field, California.

Under the Indo-French collaboration between this department and the aeronautical institution in France three French Scientists visited the Institute for a period of three weeks each and gave a series of lectures as follows:

Title of the Lecture

Speaker

Boundary Layers
Transonic Testing.

Dr. R. Michel,
ONERA/CERT/DEART,
France.

Celestial Mechanics, Dynamics of
Satellite Motion, Theory of
Optimization of Trajectories,
Theory of Game.

Dr. C. Marchal,
ONERA, France.

Composite Materials
on calculation
about Techniques.

Prof. G. Leonard,
Chairman of the
Composite Materials and
Res. Lab. of Aerospatiale
France.

Research and Development

- (i) Research publication:
 - (a) Papers .. 5
 - (b) Book/Monograms .. Nil
- (ii) Patents:
 - (a) List of patents processed:
'Advanced Technology All purpose Cart'.
- (iii) (a) Sponsored research schemes and projects
(b) Departmental Projects: 15
- (iv) Assistance to Industry—ICC.
 - (a) Testing of existing types of bullock carts under different operating conditions for Dunlop India Limited.
 - (b) Assisting Indian Space Research Organisation for external flow and nozzle heat transfer calculations.
 - (c) Calculation of theoretical rocket performance of the liquid propellants that are of interest to Defence Research and Development Laboratory, Hyderabad.

Special honours/distinctions conferred:

Syndicate Bank Award in the Bullock-cart Design Contest (Professor K. A. Damodaran).

Invited lectures delivered by the staff:

1. Filament Winding Techniques in FRP workshop (K. Balaraman).
2. Compression Moulding of Glass Fibre Reinforced Plastics (K. Balaraman).
3. Aircraft Testing—Institution of Engineers (Madras) (K. Balaraman).
4. Aircraft Accidents—Symposium conducted by Aeronautical Society of India (Madras Branch) (K. Balaraman).
5. Aircraft Materials and Techniques—Institution of Engineers (Madras) (C. S. Ballal).
6. High Temperature Gas Dynamics: A series of lectures offered at BARC, Bombay (T. K. Bose).
7. Heat Transfer from Dissociated and Ionized Gases at Workshop on Heat Transfer for Asia and Pacific (T. K. Bose).

Any other Information

- (a) Indo-French programme of assistance/collaboration for the department of Aeronautical Engineering—Advanced work, training in France. Under this programme it has been possible to invite eminent aeronautical scientists and engineers from France and also send our own staff and students to France for training and study in certain special speeds in aeronautical sciences. Number of scholarships are available to the students under this programme.
- (b) Development of musical instrument out of glass fibre reinforced plastics; prototype of veena and mridangam designed and fabricated and later demonstrated.

A brief indication of developmental programme likely to come up in the near future:

For the experimental study of high temperature plasma flows are heated jet facility has been proposed. Financial support for this from the Department of Science and Technology has been sought.

Applied Mechanics

On Courses

- (i) New courses introduced: Two year M. Tech. course in Maintenance Engineering and Management.
- (ii) Changes made in Curriculum: M. Tech. (Engineering Mechanics).
Math. 695 Computer Programming and Numerical Analysis was introduced in the second semester instead of AM 609 Computer Programming.

Math. 691 Numerical Analysis was omitted in the first semester.

Education Programmes

- (i) Continuing Education Programmes:

Machine Dynamics Laboratory conducted lectures and laboratories for Plant Engineering Participants of the National Productivity Council in the field of Machine Dynamics and Industrial Tribology during January and June 1977.

- (ii) Quality Improvement Programme/UGC Teacher Fellowship Programme.

Serving Teachers Programme

Number Trained:

Ph.D. . . . 1

Number on rolls:

Ph.D. . . . 5

Research and Development

1. Research publications:

Papers . . . 25

2. Sponsored research schemes and projects:

- (i) (a) DST project on Vertical Axis Wind Mill.
(b) Development of a Design Procedure for Turbine Casings for Thermal Power Plant (sponsored by B.H.E.L. Hyderabad).
(c) Bhabha Atomic Research Centre, Bombay 'High Speed Air Bearings'.
(d) Department of Science and Technology 'Performance Tests on Lubrication and Lubricants'.

- (ii) Departmental projects: 11.

3. Assistance to industry.

- (a) Computer Analysis of the Main Frame for Kutub Hotel Extension.
(b) Main Frame Analysis of Transit Sheds for Bangladesh.
(c) Transmission Lins Dynamics, M/s. Best and Crompton Engineering Co.
(d) Noise Evaluation Test at MAPP Kalpakkam and Hotel Chola.
(e) Torsional Damper Testing, HVF, Avadi.
(f) Acoustic Transmissibility of Shell Type Structures, V.S.S.C., Trivandrum.

Any other Information

Additional space/Laboratory etc. provided

Attachment to Vibration
Laboratory as Tribology
Laboratory (750 sq. ft.)

List of New Major equipment added

1. Pulsed Ruby Laser..
2. Pulse Generator.
3. Camera with Flash.
4. Enlarger.
5. Jig Saw Machine.
6. Helium Neon Laser.
7. Storage Oscilloscope of ECIL.
8. Fatigue Testing Machine for 50 million cycles for Transmission Line Dampers.

Visitors to the Department

1. Prof. Kristiansen of Texas Technical University, U.S.A.
2. Prof. Stekotee of Delft, Holland.
3. Prof. Kovasznyay of John Hopkins, U.S.A.
4. Prof. Gallus of TU Aachen, W. Germany.
5. Prof. Michel of ENSAFE, France.
6. Mr. Patric J. Norris of the International Harvesters, San Diego, U.S.A.
7. Prof. Bernard Roth of Stanford University, Stanford, California, U.S.A.
8. Dr. Sengupta, of Boeing Research Lab. U.S.A.

Invited Lecturers delivered by the staff

1. Diagnostic Engineering by Dr. B. V. A. Rao, at Institution of Engineering—10-3-1977.
2. Signature Analysis and Predictive Maintenance by Dr. B. V. A. Rao, at PSG Institute, Coimbatore—18-3-1977.

A brief indication of developmental programme likely to come up in the near future.

1. Acoustic Holography Laboratory
2. Fabrication of Jet Tunnel under way.
3. In view of the importance of these disciplines like Machine Dynamics, Industrial Tribology, Maintenance Engineering, which play a vital role in the Industry and particular plant engineering, the activities in these areas would increase. The laboratories in this discipline which have already been given a shape have to be enlarged and diversified to cater to the many problems of modern times and maintenance problems of the Industry. This would also be helping the postgraduate students in these areas to gain better knowledge both in theory and Practice.

LIST OF RESEARCH PROJECTS COMPLETED AND IN HAND

Sl.No.	Funding Agency	Project Title	Remarks
1.	ISRO-VSSC	High Temperature Air Heater	Completed during February 1976.
2.	ISRO-VSSC	Calculation of External Heating of SLV Project	Completed during March 1976.
3.	ARDB	Development of Computer Programme for Evaluation of Aerodynamic Characteristics of Swept Wing Aircraft	Completed during March 1976.
4.	ARDB	Aerodynamics of Generalised Missile Type Configuration at Supersonic Speed	Completed during March 1976.
5.	ARDB	Design and Development of Supersonic wing calculator wing Analog Network	Completed during May 1976.
6.	DRDL	Calculation of Technical Rocket-performance of Liquid Propellants	Completed during July 1976.
7.	ARDB	Design and Development of Ramjet Engine	
8.	ARDB	Design and Development of Rarefied Gas-dynamic Facility	
9.	ARDB	Analytical, Experimental and Design Studies on FRP Structures	
10.	CSIR	Composite Structures	
11.	ARDB	Theoretical and Experimental Investigation on certain Problems in Gas Turbines	
12.	ISRO-VSSC	Agreement for the Complete Design and Commissioning of the Arc Jet Facility	
13.	ISRO-VSSC	Calculation of Nozzle Heat Transfer	
14.	ARDB	Numerical Methods for the Design and Analysis of Airfoils and Bodies in Subsonic and Supersonic Flow	
15.	IIM Bangalore	Bullock Cart Research	

Bio-Engineering

On Courses

- (i) New courses introduced
 - a. Ergonomics
 - b. Advanced topic in Bio-medical Engg. and Bionics.

Education Programme

- (i) Continuing Education Programmes
 - Short term/part time courses conducted: Biomedical Engg. in Medicare Delivery October 9, 10, 1976
- (ii) Quality Improvement Programme/UGC Teacher Fellowship Programme
 - Serving Teachers Programme
 - Number on rolls in Ph.D. ... 2

Research and Development

- (i) Research publications
 - (a) Papers: only total number published in journals .. 26
 - (b) Monograms : Title: Seminar on BME.
Authors: T. M. Srinivasan and B. Ramamurthi.
Year 1976
- (ii) Sponsored research scheme and projects

	Project	Agency
(1)	12 Lead ECG	ICMR
(2)	Biofeedback	DST
(3)	Blood bags	DST
(4)	Laser Speckles	ICMR
(5)	Oxygenator	ICMR

(closed)
- (iii) Assistance to industry-ICC Transferred know-how regarding electronic blood pressure unit

Special honours/distinctions conferred on the members of the staff with details:

- (1) Dr. K. M. Patil : Elected as Treasurer, Biomedical Engg. Society of India.
- (2) Dr. Megha Singh : Invited as Moderator for Hemorheology at X International Congress of Angiology, Tokyo 1276.
- (3) Dr. T.M. Srinivasan : Elected as Secretary, Biomedical Engg. Society of India.
Member, Study group in BME sponsored by ICMR.

- (4) Wg. Cdr. N. Mohan : Chairman, Study Group in BME Muralisponsored by ICMR.
- a. New Major equipments added
 - (1) Exercise ECG
 - (2) Temperature Feedback Unit
 - (3) Ultrasonic Echocardioscope
 - (4) Ultrasonic blood flow mater
 - (5) Vector cardiograph
 - b. Many biomedical staff are honorary consultants to hospitals on diverse projects.
 - c.
 - (1) Biofeedback instrumentation
 - (2) ULF ballistocardiography
 - (3) Development of proposal for devices for rural health centres and static medicare delivery system
 - (4) Variable flow rate drug infusion pump
 - (5) High pressure due injector
 - (6) Laser applications in medicine
 - (7) Ergonomics laboratory
 - (8) Ultrasonic imaging of deep structures of the body.

Chemical Engineering

Education Programmes :

(i) Q. I. P. Teacher Fellowship Programmes :

(a) Serving teachers programme.

No. trained so far M. Tech.	2
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No. on rolls M. Tech.	1
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Ph.D. (QIP)	1
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b) Continuing Education Programme :

Short term course in "Particle Size Analysis".

(ii) Important lectures and Seminars.

Conference on 'Chemical Engineering Education'.

Date 2nd, 3rd and 4th January, 1977.

Organized by Chemical Engineering Education Development Centre and Department of Chemical Engineering.

Research and Development :

Research Publications.

- (a) Papers Nine.
- (b) Books/Monographs :

Prabhakar Rao, in a book entitled 'Particle Science and Technology; Editor: D. T. Wasan, Academic Press, New York (1976).

Patents

List of patents obtained.

- (1) A device for producing fluid streams of bubbles in a fluid solid medium—Dr. A. Prabhakara Rao, I. P. No. 139292.
- (2) Tubular flow Reactor—Dr. M. Satyanarayana I. P. No. 139313.
- (3) Sponsored Research Schemes and Projects.
- (a) CSIR :
 1. Multistage fluidisation investigations in cold model.
 2. Studies on trickle bed reactors.
 3. Preparation and characterisation of industrial catalysts.
 4. Studies on packed fluidization.
 5. Studies on condensation of single vapours.
 6. Fluid Energynicing.
- (b) M/s. Trustwell Export, Madras.
Development of Natural Shampoo.
- (c) Q. I. P.

Studies on multistage fluidisation.

Departmental projects : 8

Assistance to Industry—I. C. C.

1. Technical consultancy on silica gel to M/s. Southern Agro-chemicals and M/s. Veena Chemical Industries, Madras.
2. Process on Chromatographic grade silica gel sold to M/s. Sree Balajee Fine Chemicals, Trichy.
3. Patent (I. P. No. 139292) sold to M/s. Kaveri Engineering Industries, Trichy.
4. Consultancy retainer basis for
 - (a) M/s. Kaveri Engineering Industries, Trichy.
 - (b) M/s. Amethyst Chemicals, Ranipet.
5. Preparation of design manuals for fluid bed drying to M/s. Larsen and Toubro Ltd., Bombay.

6. Production of basic magnesium carbonate from sea bitterns, to M/s. Marthi Crystal Salt Co. Ltd., Madras.
7. Recovery of scheelite from gold ore tailings by electro-static separation to M/s. Bharat Gold Mines Ltd., Kolar.

Indo-German Collaborations.

- (a) Projects: Design and Development of a fluid bed reactor.
- (b) Value of assistants DM 50,000/- = Rs. 75,000.
- (c) Prof. Dr. Ing. H. Brauer from T. U. Berlin was at I.I.T., Madras from 3-1-1977 to 19-1-1977

Visitors to the Department.

- (a) Prof Dr. Ing. H. Brauer, Technical University, Berlin.
- (b) Dr. J. F. Davidson.
- (c) Dr. O. Levenspiel.

A brief indication of developmental programme is likely to come up in the near future :

It is proposed to strengthen the activities initiated in the department during the fourth plan period and to fully utilize the set up of the faculty and students in each specialisation in the teaching, research and industrial liaison work, the areas of specialisation being Particle Technology, Transfer Operations, Chemical Reaction Engineering, Process Dynamics and Control, High Polymer Engineering, Chemical Plant Design.

The Teaching activities of the department are to be set for incorporating specialities of interdisciplinary nature and/or courses of relevance and importance to our country to be assembled or changed with short time constants.

It is proposed to take up research programmes on problems both relevant and challenging by shifting the emphasis from system behavioural aspects to choice of systems. (i.e.) two kinds of programmes proposed are (i) to obtain solution for specific problems of technological relevance to our country and (ii) problems of fundamental importance likely to generate applications at a future date.

Chemistry

Education Programmes:

Quality Improvement Programme/U.G.C. Teachers fellowship Programme.

- (i) (a) Serving teachers programme
No. on rolls working for Ph. D. : 5
- (b) Short term courses conducted :
Industrial Catalysis and High Pressure Technology
(2 weeks, November-December 1976, 20 participants).
- (ii) Important lectures and Seminars :

“Excited State population in Nonequilibrium helium plasmas”
by Prof. P. K. Ghosh of Indian Institute of Technology, Kanpur.

Two-day Symposium in Chemistry organised jointly by this Department and Pachaiyappa's College, Madras, was held during the first week of March 40 research papers were presented and discussed.

Research and Development

(i) Research publications :

Papers : Only total number published in Journals 54

(ii) (a) Sponsored research schemes and projects.

1. On Photogalvanic cell, sponsored by the Department of Science and Technology, New Delhi.
2. On monitoring of Air pollution using lasers. sponsored by the Department of Science and Technology, New Delhi.
3. On influence of neutron irradiation on ZnO catalyst-sponsored by the Department of Atomic Energy.
4. On polymers for low temperature applications sponsored by the Indian Space Research Organisation.
5. On light and heat-induced activation of alcohols sponsored by the National Science Foundation, U.S.A.
6. On liquid phase catalytic hydrogenation using transition metal complexes sponsored by Indian National Science Academy.
7. On catalytic reactions involving photochemical stimulation, sponsored by CSIR.
8. On liquid phase catalytic hydrogenation by metal complexes, sponsored by CSIR.

9. On recovery of mercury from the caustic soda factory wastes sponsored by M/s. Dharangadhara Chemicals Ltd.

Departmental projects : 9

(iii) Assistance to Industry—ICC

Method has been suggested to recover mercury lost in Factory solid wastes to M/s. Dharangadhara Chemicals Limited, Sahupuram, Tamil Nadu. Methods are also being developed to recover the mercury lost in factory effluent wastes discharged by the said factory.

As in the past years, analytical / services making use of various equipments available in the Department have been rendered to variety of establishments.

Special honours distinctions conferred on the faculty members of the staff with details.

Two members of the faculty of this Department were recently awarded Senior Fellowship of the Alexander Von Humboldt Foundation, West Germany for carrying out advanced research.

- (a) Major Equipments Ice making machine.
added :
- (b) Fabricated : An equipment for measurement
of electrical resistivity of
solids.

Visitors to the Department :

Prof. T. N. Waters, Oxford, U.K.

Prof. H. W. Nurnberg, F.R.G.

Prof. Endicott, U.S.A.

Prof. R. J. Thirak, U.K.

Invited lectures delivered by the staff :

Three faculty members (Drs. S. R. Ramadas, R. Narayan and D. V. Ramana) delivered lecture outside the Institute under COSIP programme, sponsored by the University Grants Commission. Dr. J. C. Kuriacose delivered a special lecture at the Symposium on Catalysis at Dehra Dun.

A brief indication of developmental programme likely to come up in the near future.

A Scheme for process development for the synthesis of rare organic chemicals mainly for laboratory use will be taken up soon. Manufacture on a small scale of some of these chemicals mainly to cater to the needs of Universities and Research Establishments is also contemplated. The items chosen will be those which are at present imported and those which are suitable for being taken up for small scale manufacture.

Investigations are being made on the synthesis, structure characterization and study of physical properties of variety of transition metal oxides having special significance as electronic and magnetic materials.

It is proposed to extract elements like silicon, boron, etc., by electrolysis from molten fluorides and to make use of this process for metallizing surfaces to improve the wear and corrosion resistance of surfaces. Fundamental studies for the development of non aqueous batteries and other electrochemical energy sources will be undertaken soon. It is also proposed to develop electrochemical methods for the analysis of pollutants in the ppm range.

CIVIL ENGINEERING

On Courses

- i) New Programmes introduced : An M. Tech programme in Building Technology and a B. Tech programme in

Naval Architecture have been approved.

- ii) New courses introduced : Several 800 level courses were introduced.

Education Programmes :

- i) Continuing Education Programme :
- a) Part time refresher course on "Design of Shallow Foundations" for practising engineer was held from 4th Feb. 1977 to 1st March 1977. No. of participants : 9
 - b) Short term course on "Finite Element Method and Use of Computers for Stress Analysis" for practising-engineers was held from 16th May 77 to 4th June 77. No. of participants : 34
- ii) Quality Improvement Programme/UGC Teacher Fellowship Programme :
- a) Serving teachers programme :

Number trained so far for M. Tech	..	14
Number trained so far for Ph. D.	..	20
Number on rolls now for M. Tech	..	2
Number on rolls now for Ph. D.	..	10
 - b) List of short term courses conducted :

Short Term course on "Matrix Computer methods in Structural Analysis" was conducted from 6th June to 24th June 1977. No. of participants : 33
- iii) List of important lectures and seminars :
- a) Dr. T. Paulay, Professor of Civil Engineering, University of Canterbury, New Zealand delivered lectures on

“Design of Structures to resist Earthquake loads” on 21st January 1977.

- b) Dr. K. M. Kripanarayanan, Senior Structural Engineer, Portland Cement Association, Laboratories, Illinois, USA delivered lectures on “Computers in Concrete Building Design” on 27th Jan. 1977.
- c) Dr. Ing. D. Habil, P. Egger Head of the Rock Mechanics Division, Federal Technical University, Lausanne, Switzerland delivered lectures during 29th April 1977 on “Rock Engineering and Rock Mechanics ”

Research and Development.

Research Publications—Papers : 28 (Twentyeight)

Sponsored research schemes and projects

1. Concrete beams in the web shear crack (CSIR)
2. Nonlinear Finite Element Analysis of R. C. Framed Structures (CSIR)
3. Computer aided design of multistorey frames: (CSIR)
4. Floating Breakwaters (Ministry of shipping and transport)
5. Investigation of Pozzolana cement (R.D.S.O. and Ministry of Transport)
6. Use of Torsteel in prestressed concrete rail sleepers (Tor-Istel Steel Corporation, Calcutta, India)

Department Projects: 50

Assistance to ICC

The Department of Civil Engineering has undertaken number of problems referred to it through ICC for investigation. The

scope of work includes design consultancy, testing of various materials and structures for private and public sector undertakings. The amount of industrial consultancy carried out by the Civil Engineering Department is approximately of the order of Rs. 4.00 lakhs.

Indo German Projects :

- a) (i) Systemes approach to Engg. Design—Structural Systems
- (ii) Low cost housing
- (iii) Study of formation and movement of salt water interface near Madras Coast leading to possible pollution of aquifers.
- b) Indicate the value of assistance received from IIT Madras. .. Rs. 8,000
- c) Special Honours/Distinctions conferred on the members of the staff with details.

The E. P. Nicolaides Prize by Institution of Engineer (India) for the paper on "Bond resistance of deformed reinforcing bars" was awarded to Dr. D. J. Victor and Shri K. Ramamurthy in April 1977.

Any other information.

- ii) Additional Space/Laboratory etc.

One more floor to the Structural Engineering Laboratory has been added.

Visitors to the Department

1. Dr. T. Paulay, Professor of Civil Engineering, University of canterbury, New Zealand.
2. Dr. S. Valliappan, Associate Professor of Civil Engg., University of New South Wales, Australia.
3. Dr. K. M. Kripanarayanan, Senior Structural Engineer, portland Cement Association, Illinois.

4. Dr. Ing. Dr. Habil P. Egger, Head of Rock Mechanics Division, Federal Technical University, Lausanne, Switzerland.

A brief indication of development programme likely to come up in the near future.

The Department of Civil Engineering is expecting to play a major role in the Development of Ocean Engineering Studies. The Department also envisages the application of systems approach and computer to civil engineering problems.

COMPUTER CENTRE

Teaching

The centre offers M. Tech., M. S. and Ph. D programmes in Computer Science. In 1977, one M. S. student and 15 M. Tech students of the third batch have graduated. There are about sixty students in the various programmes presently registered. Advanced elective courses in the areas of Programming Languages and Software, Operating Systems, Analysis and Design of Algorithms, Computer Graphics, Computer Hardware and Architecture have been offered.

Continuing Education

A 4-Week part-time course on "Computers in Management" was offered in February 1977. A 3-Week full-time summer school on "Computer-Oriented Statistical Methodology" was conducted in June 1977 in collaboration with the Indian Statistical Institute, Calcutta. Short courses on computing and computer facilities for the Institute students and faculty and also for the Campus School Children were conducted.

Industrial Consultancy

Consultancy projects in the following areas have been completed. Production planning and control, Statistical Survey data processing, warehousing transportation modeling and simulation, Cash Flow Analysis, illumination distribution and efficient lighting.

Further, the computer facilities have been used by industries for engineering design, optimisation problems, telephone exchange software development, examination results processing, census data processing and various other applications.

Research and Development

Thesis projects in the following areas have been completed: Graph Algorithms, Computer Graphics, Operations Research (Network Flows), Microprocessor simulation and software, Natural Language understanding and query processing, Data Base systems.

Systems Development Work carried out include efficient file reorganisation on disks, monitoring of computer usage for smooth distribution of workload, analysis of SMF data for performance evaluation, incorporation of SSP routines for use under WATFIV and diagnostic aids for Fortran programs run under G-Compiler.

A user manual covering JCL, utilities and packages has been written and is now available.

On-Going and Future Projects

1. Analysis of ERTS-I Satellite in collaboration with National Remote Sensing Agency.
2. Supporting NISSAT - Entrepreneur information Service for the Leather Industry (in collaboration with CLRI)
3. Computerised Hospital Information System (jointly with the Directorate of Tamilnadu Teaching Hospitals. Sponsored by the department of Electronics)
4. Tamilnadu Nutrition - Data Analysis
5. CAN - SDI. Selective Dissemination of Information to Chemists and Chemical Technologists in India and neighbour countries like Sri Lanka, Pakistan, Bangladesh (jointly with INSDOC, New Delhi, sponsored by Department of Science and Technology)

6. Development of an on-line inquiry system (sponsored by the Department of Science and Technology)
7. Interconnection of display terminals to the IBM 370/155
Indigenous display terminals are used and Interactive Software is being developed.
8. Establishing a link between IBM/370 and the small computer system to be acquired by SERC (CSIR Complex) for which SERC will buy the necessary hardware.
9. Connect the PDP/II system in the Digital Techniques Laboratory to the system 370/155 necessary software will be developed by the Computer Centre. An inter University project between IIT, and the University of Bremen to develop the necessary hardware.

Electrical Engineering

On courses

- i) New Programmes introduced : *a.* Admissions made for M.S. Ph.D. under external registration.
b. D. I. I. T. Course in Television Engg.
- ii) New Courses introduced : Several new courses (subjects) introduced as part of new M. Tech. curriculum.
- iii) New System/method added : Broader system of electives introduced as part of new M. Tech curriculum.
- iv) Changes made in Curriculum : M. Tech. curriculum revised during 76-77 for implementation from July 77 onwards.

Education Programmes

- i) List of short term courses/part time courses conducted.
 - a.* Short term course (CSD) on 'Avionic' systems'—3 weeks
Jan-Feb 77

- b. Short term course (CSD) on 'Radar Signal Analysis and Processing' - 2 weeks - March 77
- ii) Quality improvement programme/UGC Teacher Fellowship Programme
- Short term courses conducted as
1. Q.I.P. Short term course on Television Engineering 2 weeks June 76
 2. QIP Short term course on High Voltage Laboratory Practice 2 weeks December, 1976
- iii) Important lectures and seminars :
1. Digital filters 'by Dr. S. K. Mitra, Professor, University of California, USA, on 17-12-1976.
 2. 'Power Systems and Solar Energy Application' by Dr. R. Fischl, Professor, Drexel Univ. USA on 18th and 19th February, 1977.
 3. 'Aerospace Telemetry' by Dr. V. P. Kulkarni, Head Electronics Gr., USSC, Thumba, Feb. 1977.
 4. 'On board Computers for Missiles' by Sri A.C Bhatta charya, Dy. CSO, DRDL, Hyderabad, Feb. 1977.
 5. 'Missile Guidance by Inertial Navigation' by Sri K.P Singh, Dy. Director, DRDL, Hyderabad Feb. 1977.
 6. 'Pulse Compression Techniques' by Dr. Y.S.N. Murthy, Assistant Director, DLRL, Hyderabad, March 1977.
 7. 'Accuracy and Resolution in Radar' by Dr. V. U. Reddy Professor IIT Kharagpur, March 1977.

Research and Development

Research Publications

Papers 40

Patents

a) List of patents processed

1. On Current transformers : Dr. P. Sankaran and Dr. V. G. K. Murthy.
2. New Methods of manufacture of lateral p-n-p transistors for IC's to give improved current gain and cut off frequencies. Dr. M. K. Achuthan and Sri K. N. Bhat.
3. New Methods of manufacture of PIN Diodes used for MW switching, optical detector and related applications Dr. M. K. Achuthan and Sri K. N. Bhat.

Sponsored Research Scheme—Projects

- | | |
|---|---|
| a) 1. Centre for systems and Devices Projects of research and Training in Signal Processing Techniques. | Radar and communication project office, Ministry of Defence, New Delhi. |
| 2. Semiconductor Devices | |
| 3. Guidance and Control Systems | |
| 4. High performance dual-mode horns | ISRO |
| 5. Development of MOS | CSIR |
| 6. Measurement of Current in EHV lines using lassers | BHEL (R and D) Hyderabad. |
| 7. Molecular Beam Technology for fabrication of Solid State Devices | Dept. of Sciece and Technology |
| 8. Detection and Measurement of Air Pollution using lassers | Dept. of Science and Technology |

- b) Departmental Projects : 40
Assistance to Industry – ICC
1. Development and Testing : for Helios Electronics and
of UHF Antennas Antennas, Madras
 2. Optimization of Trans- : for Transformers and Swit-
formers and Induction chgear, Madras & Kirloskar,
Motors and Designs Bangalore.
 3. Design of Thyristor : for Wilson and Co. Madras.
Inverters .
 4. Improvement of Gun- : for B.E.L. Bangalore and
control System for HVF Avadi
Vijayanta Tanks
 5. Stability and Voltage-dip : for BHEL, Hyderabad.
Calculation
 6. Power Pulse Generator : for ACE Co., Madras.
for spark erosion
machines

Indo-German Collaboration

1. a) Data-link between PDP 11 and IBM 370 Computers
b) Speed Control of Induction motors
c) Microwave Communication Systems
2. Indicate the value of assistance received Rs. 70,000/ and DM 50,000 on each of above three projects.
3. a) Prof. P. Besslich, T. V. Bremen (from No. 1 above)
b) Prof. W. Leonhars, T. K. Braunschweig and Prof. J. Holtz,
Gesant Hochschule, Weppertal (for No. 2 above)
c) Prof. H. G. Ungar, T. V. Braunschweig and Dr. K. Schuneman
(for No. 3 above)

Special honours/distinction conferred on the members of the staff with details.

Details of work of Dr. V. Seshadri, Professor included in KEY ABSTRACTS of 'INSPEC', Institution of Engineers, London.

Additional Space/lab. etc. Control Engg. Lab. has been provided expanded by 100 m²

- a) 1. Colour Television Equipment (worth Rs. 80 lakhs) have been installed.
- 2. Electrical Noise Laboratory has been set up.
- b) 1. Low Frequency counter and B. H. Curve Tracer (Measurements Lab.)
- 2. Electronic Simulator for Aircraft Dynamics (C and D, Guidance/Control Lab)
- 3. F.F.T. Analyser and Digital M.T.I. (CSD Signal Processing Lab.)

Visitors to the Department.

- a) 1. Dr. Sivaprakasa Pillai, Sri Lanka University
- 2. Prof. Karamaratne, Sri Lanka University
- 3. Prof. Atherton, Univ. New Brunswick, Canada
- 4. Dr. K. P. Dabke, Prof. Monash Univ. USA
- 5. Dr. M. Vidyasagar, Prof. Concordia Univ. Canada
- 6. Chief Engineers of Zonal Railways and Gr. of Southern Railway as a group.
- b) 1. Dr. T. A. R. Bhat, Asst. : on 'Radar and Radio
Professor Navigation Aids'
at REC Trichy.
- 2. Dr. B. Ramaswamy : on 'Thyristor Power Control
Professor at College of Engineering'
Guindy (Short-term course)

3. Dr. V. V. Sastry, : on 'Speed Control of Induction
Asst. Prof. Motor' at Calicut Regional
Engineering College.
4. Dr. A. Kuppurajulu : on 'Stability of Power Systems'
Professor at BHEL, New Delhi.

Any other information

Dr. K. P. Rajappan, Professor, has been serving as Special Officer for consultancy in Electronics for the Cochin Univ. Kerala.

A brief indication of developmental programme likely to come up in the near future.

Low-power loss measurement technique to be developed at the measurements Laboratory.

Humanities and Social Science

Research Activities :

Research activities in the department was mainly of an applied nature. Mainly research was carried out in the following areas :

1. Optimisation of work-in-process inventory in an auto mobile industry.
2. Financial Planning Interphase in a manufacturing organisation.
3. Purchase—Inventory Interphase in a Manufacturing organisation.
4. New Product Planning and Launching.
5. Application of Industrial Engineering Techniques in Hospitals.
6. Multiechelon inventory in a Manufacturing Organisation.
7. Spare parts Inventory Management in a Agro Industry.
3. Effect of Changes in Price Level on Accounting Practice.

9. Marketing Practices in Machine Tool Industries.
10. Allocation of Sales territories to Salesmen.
11. A study in the economic feasibility of Solar Energy for Water Heating.

Industrial Liaison :

The Department had industrial liaison with several industries during the year. About 30 projects were carried out at industries by the students and staff.

Sponsored Projects :

Progress has been made in the Ministry of Education Project under the Q. I. P. on Identification of the Goals of Engineering Education in our country.

Consultancy Work :

The following consultancy works are under progress :

- i) Inventory Management in a Sugar Mill.
- ii) Planning and Control in a Transport Organisation.

Continuing Education Programmes :

Some of the faculty members of the Department conducted executive development programmes for some of the leading industrial houses and public sector industries under the auspices of several professional bodies. They also participated as Faculty in Management Development programmes in various organisations.

The following part-time programme was conducted for the benefit of industrial executives :

IIT—IAMM Certificate course in Materials Management.

For the benefit of teachers of Engineering Colleges an advanced Summer School in Industrial Engineering is offered for two weeks from 13th June 1977.

HAL BEML Management Training Programme :

This programme—fifth programme for HAL trainees and second programme for BEML trainees was offered by the IIT, Madras from 11—11—76 to 7—5—77, by the joint collaboration of several departments of IIT. 29 HAL and 9 BEML trainees have undergone this course and they were awarded certificates.

Mathematics

Education Programmes :

- i) Quality Improvement Programme/UGC Teacher Fellowship Programme
- a) Serving teachers Programme
No. of trained so far — Ph. D. 1
No. of rolls in each of those courses : Ph. D. 5
(under F.I.P)
- ii) Important lectures and seminars speaker
Title of the talk
 - a) Dr. M. S. Seshadri, Reaction—diffusion couple system
Max-planck Institute
for Biophysics, Frankfurt
 - b) Dr. D. Radhakrishnan Rosen's metabolism
Repair systems—some
Mathematical aspects
 - c) Prof. K. R. Unni Functions of Lip(a)
 - d) Dr. T. Amarnath Perturbation Methods
Loyola College, Madras
 - e) Prof. M. P. Singh, Transport of gases in Preliminary
IIT Delhi capillaris
 - f) Prof. A. P. Balachandran Elementary Particles physics
Syvacuse University (series of lectures)
 - g) „ Introduction of topological concepts in field theory

- | | | |
|----|--|---|
| h) | Dr. S. Bhaskara Rao,
ISI | The Structure theory of self-complementary graphs |
| i) | Prof. Leon S. Lasdon
Case Western Reswv
Univ. Ohio | Application of mixed miteger programming to distribution design. |
| | ” | Non-linear optimization in the electric and hydro-electric power industry |
| j) | Dr. K. B. Sinha
University of Geneva | Mathematical theory of socattering |
| k) | Prof Lions,
Laboratoire de Rechbe an
informatique of Auto-
matique France | Homogenifation Applications
in Mechanics |
| l) | Prof. F. Buckens
University of London
Belgium | Propagation of sound waves in
Homogeneous media |

Research and Development

i) Research Publications

- a) S. K. Srinivasan and K. M. Mehata, Stochastic Process, Tata McGraw Hill Publishing Co. Ltd. New Delhi, 1976.
- b) S. K. Srinivasan and G. Sampath, Stochastic model for spike trains of single neurons, Lecture notes in Biomath series, Springer, Berlin.
- c) R. Subramanian, P. Achuthan and K. Venkatesan, Praktische Mathematik fur Ingenieure and Physike by R. Zurmuhl-Translation into English. Allied Publishers.
- d) P. Achuthan and K. Venkatesan, Prinzipien der welllmechanik by W. Panli - translation into English. Allied Publishers.

ii) The staff who have gone to Federal Republic of Germany under this scheme.

a) Dr. L. V. K. V. Sharma — — 3 months

b) Dr. R. Subramaniam — — 6 months

c) Dr. V. Subba Rao — — 3 months

Special honours/distinctions conferred on the members of the staff with details.

T. S. Shankara received an award from Adwaita Research Centre for his article on space time and causality.

i) Different category of staff who had joined the department this year
Professors 2, Assistant Professor 1, Lecturer 1
Invited lectures by staff members.

R. Subramaniam delivered an invited lecture at University of Bielfied, West Germany and K. R. Parthasarathy in the Seminar on group theory held at Indian Statistical Institute, Calcutta, T. S. Shankara in the ISTM Conference, Bangalore, C. M. Purushotham attended the science congress at Bhubaneswar.

ii) Many members of the staff reference papers for international journals and review papers for Mathematical Review Zentral blett fur Mathematik and Applied Mechanics Review.

Visitors to the Department

1. Dr. M. S. Seshadri, Max-Planck Institute for Biophysics.
2. Prof. A. P. Balachandran, Syracuse University
3. Prof. Leon S. Lasdon, Case Western University, Ohio
4. Dr. K. B. Sinha, University of Geneva

5. Prof. Lions, Laboratoire de Recherches Informatique et Automatique, France.
6. Prof. F. Bucher, University of Geneva.

The Journal of Mathematical and physical Sciences is entering the second decade. So far 10 volumes consisting of more than 3500 pages have been published. The Editorial Board is international in character and Journal continues to attract quality papers,

Mechanical Engineering

On Courses

New Programmes introduced

M. Tech. course in Production Engineering has been introduced.

New Courses introduced

Three 800 level courses on cavitation, Advances in centrifugal compressor Technology and Selected Topics of Axial Flow Compressor.

Education Programmes

i) Continuing Education Programmes

- a) A 2 week ISTE - sponsored winter school on 'Utilization of Solar Energy' was conducted during December, 1976 Number participants - 29.
- b) Instrument Technician (28th June to 9th July 1976) - participants - 21.
- c) Industrial Pneumatics (6th to 10th December, 1976) - Participants - 14.
- d) Taking part in HAL/BEML Management Training Programms.

- e) A short term course on Diesel Engines for fuel efficiency engineers of NPC, Madras was conducted from 30th March 1977- to 15th April, 1977. Number of participants - 25.
- f) A short term course for HAL Process Planners, Tenth course- May/July 1977.
- ii) Quality Improvement Programme/UGC Teacher Fellowship Programme.
- a) Serving Teachers Programme
- | | | |
|-----------------------|----------|----|
| Number trained so far | M. Tech. | 21 |
| | Ph. D. | 17 |
| Number on rolls | M. Tech. | 9 |
| | Ph. D. | 4 |
- b) Short Term Courses conducted.
- Short term course on Materials Handling Technology, (4 weeks—May 17 to June 11, 1976—27 participants including 11 from industries).
- Advanced metrology (1 week in Nov. 1976, Participants —14).
- Short Term course on 'Rational Approach to Design for Strength' was held from 23—5—1977 to 10—6—1977.
- iii) Important Lectures and Seminars.
- a) 'Vibration and related problems in Production Technology, Damping in boring machines, Deep hole drilling machines and new cutting tool materials' by Prof. R. New of Brunel University, U. K. delivered special lectures on 8th and 10th January, 1977.

- b) 'Group Technology' by Dr. G. A. B. Edwards of M/s. GAB/Edwards and Associates, U. K. on 11-3-77.
- c) A series of three talks on Turbomachine topics by Prof. Dr. Ing. H. Gallus of T. H. Aachen were delivered in February, 1977.

Research and Development

i) Research Publications

a) Papers .. 56

b) Books/Monographs : Title : Dynamic Behaviour of Portal Jib Crane drives Revolving and Luffing.

Author : Dr. M. A. Parameswaran.

Publishers : VDI, Duesseldorf 1976.

ii) Sponsored research schemes and projects DST Sponsored Projects.

1) A 3 ton Solar Airconditioner is being developed through a project from DST.

2) Development of a Laser Interferometer.

3) Design and Development of the multipurpose tubular reversible axial flow machines under SERC

Total cost of project Rs. 3,60,000

Duration 3 years

4) Surge control of centrifugal compressors.

CSIR Sponsored Projects

- 5) A sonic burner is under development through a project from CSIR.
- 6) Holographic Techniques and Stress Analysis
- 7) CSIR Project on Stress analysis of tools
- 8) Technology of Preservation of Fruits, Vegetables and Marine Products – Sponsored by CSIR, New Delhi.
- 9) Rotating vaneless diffuser for centrifugal blowers.
- 10) Splitter vanes for centrifugal impellers.

BHEL Sponsored Projects

- 11) Five different projects on the design and development of bulb turbines suitable for low head applications.
- 12) Design and Development of 1 Ton and 10 Tons Solar Absorption Refrigeration Plants.
- 13) Design and Development of a 10 KW Solar Power Plant.

Department of Atomic Energy

- 14) "Holographic Techniques and Stress Analysis and Non-destructive testing.

Electronics Commission

- 15) Design and Development of Printing Unit.

Ministry of Defence

- 16) F-95 Camera - Design and Development, fabrication.

U.S. NSF (PL-480)

- 17) Project on "Control and Exhaust Emission from Diesel Vehicles"

UGC Sponsored Project

- 18) Project on Text Book in Experimental Methods.

Aero (R&D) Board Project

- 19) High Speed Cascade tests.
20) High speed Centrifugal compressor.

Departmental Projects

Number 93

iii) Assistance to Industry - ICC

A number of firms have solicited our services for pressure gauge testing and determination of thermal conductivity of mineral wool. A number of industries have been contacting in connection with commercial production of solar heaters.

Electro magnetic Shaker - Design and Testing

(Tag Corporation, Madras)

Tool Makers Microscope (N.R.D.C. Project)

(Madras Dial Gauges and Measuring Instruments, Bangalore)

Cion Sorter (Marshall and Sons, Madras)

Calibration of Temperature measuring instruments.

Thermophysical property measurement.

Evaluation of performance of process power plants. etc.

Consultancy services to the industries in the design and development of all types of rotodynamic pumps and hydraulic turbines. Facilities are available to test centrifugal pumps having dead weights upto a maximum of 4 tons.

Calibration of certain type of flow meters and pressure gauges and testing of several hydraulic components are also undertaken to a certain extent.

Matching of indigeneous Carburettor to a moped engine from M/s Scooters India Limited.

Evaluation of Diesel as fuel in S.I. Engines for M/s Agro Engines Limited.

Design and Testing of the Vertical outboard drive and horizontal drive - for M/s Greaves Cotton and Company Limited, Madras.

Stress Analysis of Spirally wound heat exchanger for M/s Larsen & Tubro Limited, Bombay.

Assembly of tools for plastic processing for M/s Polyene Film Industries, Ambattur.

Investigation of 'Oil Carry over' in Compressors for M/s Sundaram Clayton Limited, Madras.

Checking of surface finish for Ammonia Compressor Cylinder for M/s Madras Refineries Limited. Madras.

Designing of Solar Engine for M/s Auroville, Pondicherry.

Investigation of the Failure of "84" Roll Mill for M/s Dunlop India Limited, Madras,

Testing of a PCI unit for M/s Dunlop India Limited, Madras.
Training of personnel for Thumba

Design and Development of Dynamometer for Indian Oil Corporation.

Performance testing of nylon gears.

Calibration of two LYNX whirling Hygrometers for Messrs. Bombay Ammonia Private Limited, Madras.

Fabrication of two Vapour Compression Refrigeration Demonstration Panels for P & T Department, Madras.

Testing. Evaluation of performance and suggesting the improvements of A/C system of the composite railway coach built by ICF, Madras.

Testing of reciprocating compressors - M/s Sundaram Clayton
ISI certification for reciprocating compressors - M/s Elgi Equipments, Coimbatore.

Nozzle blade testing for M/s. Bharat Heavy Electricals Hyderabad.

Calibration of probes for M/s. BHEL, R&D Unit, Hyderabad.
Calibration of orifice plate - M/s Elgi Equipment, Coimbatore,
ISI—Rating test on Wiilars L-34 engine, Enfield India Limited.

Tests on modified kerosene and petrol engines - Enfield India Limited.

Tests on A 44—Suvega - Moped India Limited, Tirupathi.

iv) Indo - German Collaboration

a) Projects under this scheme

Heat Transfer in Electrical Machines. Tandem vaned Centrifugal compressor - Energy.

b) Value of Assistance received

DM—1, 13, 724

c) Staff Joined as experts from Federal Republic of Germany Prof. Dr. Ing. H. Gallus, visited the Thermal Turbomachines Laboratory during February 1977.

d) Staff who have gone to Federal Republic of Germany under this scheme.

Mr. K. V. Chalapathi Rao, Lecturer visited

Prof. Quack's Institute in University of Stuttgart.

Dr. G. Gopalakrishnan, Asst. Professor visited the Institute for Jet Propulsion and Turbomachines, Aachen Technical University for work on the project.

Projects under this scheme :

Utilisation of Solar Energy for Cold Storage of Food Products

Development of alternative fuels for I. C. Engines.

Value of assistance received:

DM: 100,000

Special honours distinction conferred on the members of the staff with details.

Prof. M. C. Gupta has been elected as a Director of the International Solar Energy Society,

Prof. V. C. Venkatesh was awarded the prestigious VASVIK prize of 12,500 and a Gold Medal for the year 1976 (23-1-77) for outstanding contributions in the field of Mechanical Engineering.

Dr. V. Seshagiri Rao delivered a lecture on 'Refrigeration equipment selection for dairy projects' at the ISTE summer School Programme at the Central Polytechnic, Madras.

Dr. V. C. Venkatesh at the College Engineering, Guindy, June 1977.

Dr. R. Krishnamurthy, MPC, May 1977.

Dr. R. Krishnamurthy, IIT, QIP Course, June, 1977.

Dr. H. Chandrasekharan—at the College of Engineering, Guindy, June, 1977.

(i) (a) New Major equipments added Non-dispersive infrared analyser, flame ionisation detector for measuring the pollutants NO, CO & HC One 50 Channel 'Date Logger'.

(b) Fabricated

An intermittent absorption type refrigerator utilizing solar energy has been developed. A Swirl burner has been developed for research on the effect of swirl on the stability of premixed diffusion flames.

Two centrifugal casting machines for non-ferrous bushes were fabricated by B. Tech. project students in collaboration with Metallurgy Department.

A vibration damper for the lathe. A thread whirling attachment. Air support for accurate measurement. Simple industrial robot. Non-contact inductive roughness measuring equipment Stylus tracing system for roughness measurement. Elasto-magnetic tool dynamometer. Piezo-electric tool dynamometer.

(ii) a) Visitors to the department

Prof. Quack and Dr. Isler

Dr. A. Ramachandran, Secretary, Department of Science and Technology, Government of India and Dr. H.N. Sharan Director (Engineering) BHEL, New Delhi visited the Laboratory.

b) Invited Lectures delivered by the staff:

Dr. R. Krishnamurthy—'On tribology-Friction and Wear' organised by N.P.C. February, 1977.

Dr. V. C. Venkatesh, organised by N.P.C. February, 1977.

Fifth National Symposium on Refrigeration and Air-conditioning was organised on December 6-7, 1976. Workshop on Heat and Mass Transfer for Asia and the Pacific was organised from January 16, 1977 to February, 5, 1977.

iii) Development programme likely to come up in the near future.

Solar energy thermal storage systems will be investigated analytically and experimentally. A Test-rig for testing liquid and gas burners is being designed.

Establishment of a Diploma Programme in Combustion Science and Technology and a Winter School in Combustion Science and Technology under QIP.

Four drawing halls are sanctioned for the Machine Elements and Mechanical Handling Laboratory and will be constructed during the year 1977-78.

Research in the area of Food Processing, Preservation and Transport.

Utilization of Solar Energy for Refrigeration and power generation.

Development of Cryogenic equipment.

Starting M. Tech. Programme in cryogenic Engineering.

Metallurgy

A new stream in the M. Tech. programme—Materials Technology was started from July, 1976.

Technical meetings under the auspices of the local chapter of the Indian Institute of Metals and lectures by visiting specialists were arranged as usual.

The following courses were held

1. A one-week course on 'Surface Protection of metals' was held for the Madras Productivity Council in August, 1976.
2. A one-day Seminar on 'Electron Microscopy' was held jointly by this Department and M/s Siemens India Ltd, in October, 1976.
3. A one-week course on 'Testing and Treatment of Metals' was held under the Continuing Education Programme in November, 1976.
4. A four-day course on 'NON-destructive testing of welds' was sponsored by Indian Institute of Welding, Madras Branch in December, 1976.

5. A three-week course on 'High Energy Rate Forming Techniques' was held under the Quality Improvement Programme in December '76.
6. A ten-day course on 'Non-destructive testing of Materials and Components' was held under Quality Improvement Programme in May, 1977.

In addition to the above, lectures were also delivered by the staff members of the Department to the Advanced Training Institute, Guindy, the National Productivity Councils at Madras, Salem and Trichy, the Regional Engineering College, Tiruchy and the College of Engineering, Guindy. Lectures were also delivered as usual to the trainees from HAL and BEML.

The following projects are being actively pursued in the Department :

1. Improvement in welding quality of wheels—Into-German Project.
2. Welding characteristics of Nickel steels—Ministry of Defence/DMRL.
3. Development of melting, fabrication and surface protection technology of Magnesium alloys—Ministry of Defence/ARDE.
4. Properties of materials of construction at low temperatures jointly by the Metallurgy and Physics Department of I.I.T., Madras and the Indian Institute of Science, Bangalore.
5. Recycling of grinding swarf—Department of Science and Technology.

The Department continued, as usual, to maintain good liaison with outside industries and assist them on technological matters through the Industrial Consultancy Centre, I.I.T., Madras.

Several patents are being developed. A process which has been developed here has been sold for Rs. 35,000/-.

Physics

Education Programmes

- i) Continuing Education Programmes
Short term/part time courses conducted
 - a) Second National Symposium on Cryogenics was held in December 1976
 - b) A six week course on 'Cryogenics - Principles and Practice' was conducted in November-December 1976 for participants from Industry and Universities.
 - c) Staff of the Department gave series of lectures on 2 recent advances in Physics to the Teachers in Physics of city colleges. For the benefit of the graduate students in physics of city colleges, a series of Demonstration, lectures illustrating the principles in Physics were arranged in the Department.
- ii) Quality Improvement Programme/UGC Teachers Fellow Programme
 - a) Serving teachers programme
No. on rolls Ph.D. course 5 enrolled under UGC, TFP
- iii) List of important lectures and seminars

Speaker	Title of the talk
a) Dr. R. Vasudevan Institute of Mathematical Science Adyar, Madras.	Super Fluidity
b) Dr. J. Maxwell Leading Laser and Optics Specialist from U. K.	Catadioptric Imaging Systems
c) Dr. Thomas R. Long Bell Laboratories Columbus, Ohio.	Electrical contacts at Bell Telephone Labora- tories

- | | | |
|----|---|--|
| d) | Dr. D. Sankaranarayanan,
Tata Institute of
Fundamental Research,
Bombay. | Elementary Particles |
| e) | Prof. S.J. Tau,
New England Institute
Connecticut, U. S. A. | Positron annihilation and
its application to Solid
State Physics |
| f) | Dr. M.A.B. Whitaker,
Coleraine, Ireland. | Anomalous Photovoltaic
Effect. |
| g) | Dr. H. G. Venkatesh,
Professor of Physics,
Assistant Director,
B.I.T.S., Ranchi. | The Pulse matrix
Q-Switching
in lasers |
| h) | Prof. John Bardeen
(recipient of the Nobel
Prize in Physics in
1956 and in 1972) | Super
conductivity |
| i) | Prof. Gustov Klipping
Pritz Haber Institute
West Berlin | on Cryogenics |
| j) | Prof. V.V. Gromov,
Deputy Director, USSR
Academy of Sciences,
Moscow | |
| k) | Prof. G.K. White,
CSIRO Laboratories,
Australia. | |
| l) | Prof. P. K. John,
University of Western
Ontario, Canada | |

gave special
seminar talks
in January
1977.

Research and Development

- i) Research Publication
- Papers : Total number published in journals. 27 Nos.
- ii) Sponsored research schemes and projects
- | | |
|---|-------------------------|
| Development of Information storage devices | CSIR |
| Development of Cryostats for the study of some properties of materials at low temperatures. | CSIR |
| Development of optical modulators | DEFENCE |
| Cooling System for IR detectors | AERO and R and D Board. |
| Medical Diagnostics using Laser Speckle | ICMR |
| Design and fabrication of Lecture Demonstration apparatus. | COSTED |
| Surface states of semiconductors at high and ultra high vacuum. | CSIR |
| Properties of materials of construction at low temperatures. | DST |
| Development of rotating Dewar for Liquid Helium with transfer coupling. | BHEL, Hyderabad. |
| Investigation of semi-conducting crystals at microwave frequencies. | DST |
| Theory of point defects in oxides. | Dept. Atomic Energy |
| Spin wave resonance and nuclear magnetic resonance in ferromagnets | CSIR |
| Departmental projects .. | 2 |
- iii) Indo-German collaboration

- | | | |
|-----|---|---|
| a) | The projects under this scheme
preparation and Investigation of
magnetic materials of technical interest
Design and construction of cryogenic
equipment like centrifugal pumps etc. | INDO-
GERMAN |
| b) | The Staff who have joined as
expert from Federal Republic of
Germany | Dr. Klipping
Fritz Haber
Institute |
| iv) | The staff who have gone to Federal
Republic of Germany under this
scheme
Additional space Laboratory etc.
Provided

New major equipments added

Fabricated | Dr.K.V.S.Rama Rao

Dr. R. Srinivasan
Extension to
Low Temperature
Laboratory
Compressor for
Liquid
Helium plant
Cryostats for study of
Thermal properties |

Invited Lectures delivered by the Staff :

Dr. R. Srinivasan, Professor and Head of Physics has given a series of Lectures on recent advances in Physics to the teachers in Physics of city colleges.

For the benefit of the graduate students in Physics of city colleges, a series of Demonstration Lectures illustrating the principles in Physics were arranged in the Department. A brief indication of Development programme likely to come up in the near future.

- i) It is proposed to study various physical properties of indigenous materials at extremely low temperature in the Low Temperature Laboratory.

- ii) Design and construction of various cryogenic equipments used in Cryosurgery, cryopumping etc.,
- iii) Preparation and growth of single crystals to be used as infrared detectors, optical modulators and solar cells.
- iv) Growth of semiconducting crystals and investigation of their properties under various conditions and frequencies
- v) Preparation and study of magnetic materials in bulk and thin film form for technical application.

REPORTS OF CENTRAL SERVICES AND FACILITIES

Central Library

Apart from what has been reported in the main report functioning details of library are given below. Extension to library building is under active consideration. A rearrangement of shelves have been made to house more addition to the library. This year a system of overnight loan of text books to the students was introduced and has proved to be popular. The inter library co-operation among various libraries continued during this year. A jumbo Korestat copier was added this year to the reprographic section to increase out put in that section. In connection with a seminar organised by the committee on Science and Technology for Developing countries, an exhibition of books was organised in collaboration with USIS and other book sellers. The library brought out a publication on "A select bibliography on Futurology". this year.

Sri C. Deenadayalu. Deputy Librarian attended a seminar on "Library Manpower Management" at Bangalore. He along with Shri Kasiviswanadham presented papers in COSTED seminar held in Indian Institute of Technology, Madras. Sri P. Venkatesan and Smt. J. Durairaj attended ASLIC conference in Burdwan.

Statistics Membership :

1. Institute members (Staff & Students)	5,190
2. Outside Members: Individual	63
Corporate	39
3. Consulation Permits	90

Circulation :

1. No. of readers visited	80,522
2. No. of volumes issued	76,040
3. No. of reservations for Books : Registered	3,864
No. of reservations for books : Fulfilled	3,633
4. Amount of overdue & Other charges realised	Rs. 51,650/-
5. Inter-Library-Loan; Borrowed for Institute members	78
Lent out from Institute Library :	93

Acquisition :

Books & Bound volumes of periodicals	4,025
Pamphlets and reports	1,199
Microfilms and Microfiches	31
Ph. D. Thesis	45

Total intake during the year	5,300
Total accessions up-to-date	1,48,641

Current Periodicals :

By subscriptions	1,120
From Technical University Berlin (Under Aid)	109
By exchange or gift	168

1,397

Documentation Services :	SDI Recipients : Internal	101
	External	47
	LDN Recipients : Internal	42
	External	19
Reprographic Section :	Microfilms made	678
	Korestat Copies made	14,011
	Gevafax Copies made	31,477
Bindery :		
	Number of books & Journals bound for Library	1,605
	Number of photocopy articles and form books bound	643
	Number of books and journals repaired	174
	Number of publications (reports, Lecture notes etc.) bound for other departments	975
	India 2000 A.D. publication	133

Central Workshop

Assistance to Industry-ICC

The outstanding jobs done in the central workshop during year under review are :

1. Gear cutting (Special Gears)
2. Gear and Hob inspection
3. Dynamic Balancing of Pulleys, Rotars, impellers etc.
4. Jig grinding and Jig boring
5. Fabrication work :
 - Core casting Machine components
 - Star wheel for Cine Projector
 - Leather Folding Machine
 - Universal Hand Press

S. S. Nozzles

Cams (Fabrication)

Fabrication of Die

6. Repair of Instruments and calibration

7. Special Hob grinding

Staff deputed to Federal Republic
of Germany for training

Sri Francis Xavier
Central Workshop.

Institute Hospital

The Institute Hospital has shown progress in many spheres during the year 1976-77.

Building : A fourteen bedded ward originally meant for infectious disease was constructed and it is being used now for general disease cases in addition to the above, a Laundry for washing the hospital linen in the hospital premises itself and a kitchenette for preparing liquid foods for patients admitted in this hospital and who are not able to get food immediately, were also constructed.

The operation theatre and the stores room were remodelled to suit the existing conditions of the hospital.

Staff : Dr. M. S. Prakas, M. S., F.I.C.S., was appointed as the Surgeon and Medical Officer-in-charge from 1st April '77 in the place of Dr. D. Harirajan. Dr. (Mrs) Suja Bhaskaran joined as the Paediatrician from 5th January. '77 and resigned from the post on July 30th, 1977. Dr. (Mrs) Sumati Khangaonkar was working as Part-time Anaesthetist from September 1976 and she was appointed as full time Anaesthetist from 4th July, 1977. The strength of Nursing Staff has been raised from 4 to 7. One Pharmacist was appointed and was put incharge of the Stores. The strength of para-medical workers were also increased.

Statistics :

Total No. of out-patients	—	94,606
Admission of In-patients	—	847
Deliveries conducted	—	53
Surgery - Major cases	—	18
Minor cases	—	95
Total No. of Dressings	—	8,798
Total No. of Injections	—	23,836
Total No. of emergencies attended	—	1,150
Total No. of outside hospital referred	—	137
Total No. of Antenatal cases	—	133
M.T.P. with Sterilisation	—	5
M.T.P. with Loop	—	7
M.T.P.	—	11
Puerperal sterilisation	—	20
D. & C	—	15

Immunisation Programme

Small pox vaccination	—	259
Triple Antigen	—	416
Anti Polio (Oral)	—	453

Laboratory Investigations

Urine	—	4,292
Motion	—	3,657
Blood	—	3,880

PLACEMENT OFFICE

During the year 1976-77, nearly 170 companies/establishments, from Public Sector and private sector contacted the Placement Office. Representatives from 70 companies visited this office and conducted campus interviews.

In recent years there has been an increase in the demand for employment of post-graduates and it is gratifying to note that an increased percentage of our post-graduate students have secured employment as a result of efforts made by the Placement Office.

The Placement Office continues to keep in touch with as many industries and organisation as may require technically qualified personal and furnishes them with information about the courses offered with specialisations in the various branches, to enable them to have detailed information about the talents available from among the graduates of the Institute. Since the Institute has on its rolls students from foreign countries also, Placement Office sponsors these students to employing organisations in their home countries.

This office has also been handling an increasing number of application from students of B. Tech. and M. Tech. degree courses for practical training during the summer vacations. While enabling the students to acquire practical experience, this training also serve to help the industries in making use of their services and assessing their potential.

The Placement Office also looks after the work pertaining to the Alumni Association of the Institute.

Information regarding the Placement position of the alumni of the year 1975-76 is given below:

Total passed out	574	
(Graduates and Post-Graduates)		
Engaged in further studies		
	a) In India	36
	b) Abroad	37
Employed in India		
	a) Self Employed	2
	b) Public Sector	109
	c) Private Sector	75
Position not known (Mostly postgraduates)		315
		574

NATIONAL CADET CORPS

During the training year 1976-77 two NCC Units functioned in the Institute. One of them was an AIR WING Technical Unit and the other an ARMY WING composite Technical Unit.

ENROLMENT

New enrolment is confined to the I year B. Tech Students. During the academic year 1976-77, 99 cadets were enrolled in the Air Wing and 42 cadets in the Army Wing. The total strength of cadets in the Air and Army wings was 177 and 81 respectively.

TRAINING

Keeping the aims of the N.C.C. in view, training was imparted to the I, II and III year cadets in accordance with the prescribed syllabus. Basic and advanced Military training was also given by stages to the cadets in all the three years of training. The specialised technical training for the Army Wing Cadets covered the three corps of the Army viz. Engineers, Signals and EME and that for the Air Wing Cadets covered the two technical branches of the AIRFORCE viz. Mechanical and Electronics.

The Air Wing Cadets were also given Gliding training. In the training year 1976-77, 10 cadets were given an average of 25 glider launches each. During the year 1977-78, efforts will be made to provide gliding training to more number of cadets.

CAMPS AND SPECIAL COURSES

The Cadets of the Air Wing NCC Unit attended the ALL INDIA VAYU SAINIK CAMP, held at Bangalore from 26-5-77 to 8-7-77.

Three cadets of the Air Wing were attached to No. 3 BASE REPAIR DEPOT, Air Force, CHANDIGARH for Special training from 20 June 77 to 16 July 77.

Cadet Corporal K, GOVINDA RAJ of the Air Wing attended the Adventure Course held at the Himalayan Mountaineering Institute, Darjeeling from 23 May 77 to 12 June 77.

CERTIFICATE EXAMINATIONS

NCC "B" and "C" certificate examinations were conducted for the cadets of both the NCC Units in March 1977. 54 Cadets (40 from Air Wing and 14 from Army Wing) Passed "B" certificate examination and 9 cadets (5 from Air Wing and 4 from Army Wing) Passed "C" certificats Examination,

Any Other Information

The NCC Unit presented Guard of Honour to Dr. M.S. Swaminathan, Director General of Indian Council of Agriculture Research and Dr. John Bardeen, Double Nobel Laureate. Prof. R. G. Narayanamoorthy, Director-incharge took the salute on the Promise Day Parade held on 12th August 1976.

