

**THIRTYFIRST**  
**ANNUAL REPORT**

**1989 - 90**



**INDIAN INSTITUTE OF TECHNOLOGY**

**MADRAS**

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## THE VISITOR

SRI R VENKATARAMAN  
PRESIDENT OF INDIA

## THE BOARD OF GOVERNORS

Chairman

SHRI A L MUDALIAR

Ex-Officio

PROF N V C SWAMY  
DIRECTOR  
INDIAN INSTITUTE OF TECHNOLOGY, MADRAS

### Nominees of State Governments

Shri P K RASTOGI I.A.S.  
Commr. & Director of Tech. Education  
Govt. of Andhra Pradesh  
HYDERABAD 500 029.

Dr R JAYARAMAN  
Director of Technical Education.  
Govt. of Kerala  
TRIVANDRUM 695 001.

Prof B.N. KRISHNAMURTHY  
Director of Technical Education  
Govt. of Karnataka  
BANGALORE-560 001.

DR T.R. NATESAN  
Director of Technical Education.  
Govt. of Tamil Nadu  
MADRAS 600 025.

### NOMINEES OF THE COUNCIL

Dr V C KULANDAISWAMY  
Vice-Chancellor  
Indira Gandhi National Open University  
Maidan Garhi  
NEW DELHI 110 030.

Dr M SANTAPPA  
73 III Main Road  
Kasturba Nagar, Adyar  
MADRAS 600 020.

Prof. (Mrs.) LILA GULATI  
Centre for Development Studies  
Aakulam Road  
Ulloor  
TRIVANDRUM 695 011.

Shri SURESH KRISHNA  
Chairman & Managing Director  
Sundaram Fasteners Limited  
Padi  
MADRAS 600 050.

## NOMINEES OF THE SENATE

Dr. M K ACHUTHAN  
Professor, Dept. of Elec. Engg.  
IIT MADRAS-600 036.  
(upto 31.5.1989)

Dr D JOHNSON VICTOR  
Professor, Dept. of Civil Engg.  
IIT MADRAS-600 036.  
(from 1.1.1990)

Dr. GVN RAYUDU  
Professor, Dept. of Mech. Engg.  
IIT MADRAS-600 036.  
(upto 31.12.1989)

Dr K SRINIVASA RAGHAVAN  
Professor, Dept. of Met. Engg.  
IIT MADRAS-600 036.

Secretary

Shri V SHANMUGAM  
Registrar

## THE FINANCE COMMITTEE

Chairman

SHRI A L MUDALIAR

Members

Shri L S NARAYANAN  
Financial Adviser  
Ministry of Human Res. Development  
Government of India  
NEW DELHI 110 001.

Dr M SANTAPPA  
73 III Main Road  
Kasturba Nagar  
Adyar  
MADRAS 600 020.

Shri I B SANGAL  
Director (T)  
Ministry of Human Res. Development  
Government of India  
NEW DELHI 110 001.

Dr R JAYARAMAN  
Director of Tech. Education  
Government of Kerala  
TRIVANDRUM 695 001.

Prof N V C SWAMY  
Director  
Indian Institute of Technology  
Madras

Secretary

Shri V SHANMUGAM  
Registrar

# THE BUILDINGS AND WORKS COMMITTEE

## Chairman

Prof N V C SWAMY  
Director  
Indian Institute of Technology, Madras.

## Members

Dr H RAMAN  
Chairman Estate & Works Committee  
IIT, MADRAS 600 036.

Shri N MALAYALAM  
Institute Engineer  
IIT, MADRAS 600 036.

Shri C GANESAN  
Executive Engineer  
IIT, MADRAS 600 036.

Shri A V SATHYAKAMAN  
Chief Engineer (Buildings)  
Public Works Department  
Chepauk, MADRAS 600 005.

Shri R SUBRAMANIAM  
Superintending Engineer  
Central Public Works Dept.,  
Shastri Bhavan, MADRAS 600006.

## Secretary

Shri V SHANMUGAM  
Registrar

# S E N A T E

PROF N V C SWAMY  
(Chairman)

ACHAR D R G  
ACHUTHAN M K  
ACHUTHAN P  
ACHYUTHA H  
ALWAR R S  
AMBIRAJAN S  
ANANTHA PADMANABHAN K  
ANANTH M S  
ARAVAMUDAN G  
ARAVINDAN P K

DIPAK CHOUDHURI  
DURGA PRASADA RAO Ch  
ELANGO K  
ESWARAN C  
GANAPATHY C  
GANESAN N  
GANESAN T P  
GANESAN V  
GOPALAKRISHNAN K V  
GOPICHAND T  
GOPINATH K  
GOPINATHAN M S  
GOWDA B H L  
IYER K J L  
JAMBUNATHAN S  
JANAKIRAMAN P A  
JHUNJHUNWALA A  
JOHNSON VICTOR D  
JOHRI V B  
KALIDAS C  
KALYANAKRISHNAN R  
KALYANARAMAN V  
KALYANASUNDARAM P  
KAMALA KRITHIVASAN (Mrs.)  
KOTHIYAL M P  
KISHNAMURTHY C S  
KRISHNAMURTHY R  
KRISHNAN S  
KRISHNA RAO A V  
PARAMASIVAM V  
PARAMESWARAN M A  
PARTHASARATHY K R

ASWATHANARAYANA RAO B V  
ASWATHANARAYANA P A  
BALAKRILSHNAN V  
BALASUBRAMANIAN K K  
BANERJEE D K  
BARADARAJAN A  
BHASKARAN K A  
BHATTACHARYA P  
BOSE T K  
CHANDRAPRASAD C  
DAMODARAN K A

KRISHNASASTRI V M  
KUPPURAJULU A  
LAKSHMINARAYANA K  
MADHUSUDHANA RAO M  
MAHABALA H N  
MAHADEVA IYER V  
MAHASESHASAYI (Mrs.)  
MAJHI S N  
MANOHARAN P T  
MEGHA SINGH  
MD ROSHAN H  
MUKUNDA RAO M  
MURTI V G K  
MURTI Y V G S  
MUTHUKRISHNAN C R  
NAGALINGAM M  
NAGARAJAN R  
NAGARAJAN T  
NAINAN P KURIAN  
NARASIMHAN M S  
NARASIMHA RAO S  
NARAYAN R  
NARAYANA BHAT K  
NARAYANAN S  
NARAYANA RAO Y  
NARAYANASWAMY C K  
NATARAJAN R

RAMAKRISHNAN T V  
RAMAKRISHNAN V  
RAMAKRISHNA UDUPA M



PARTHASARATHY P R  
PATIL K M  
PAUL H S  
PHILIP P K  
PILLAI C N  
PRABHAKAR O  
PRABHU B S  
PRANESH M R  
PRITHVIRAJ D  
RADHAKRISHNA H C  
RADHAKRISHNA S  
RADHAKRISHNAN R  
RADHAKRISHNAN V  
RADHAKRISHNAN V M  
RADHAKRISHNA RAO K  
RAINA J P  
RAJAGOPALAN N  
RAJAGOPALAN R  
RAJARAM J  
RAJU V S

SATYANARAYANA M  
SEETHARAMU K N  
SESHADRI V  
SHUNMUGAM M S  
SIVARAM B M  
SIROHI R S  
SIVARAMAKRISHNAN V  
SOBHANADRI J  
SREEKANTH A K  
SRIDHARA RAO G  
SRINIVASAMURTHY S  
SRINIVASAN M  
SRINIVASAN P S  
SINIVASAN R  
SRINIVASAN R S  
SRINIVASAN S K  
SRINIVASAN T K K  
SRINIVASARAGHAVAN K  
SRINIVASA RAO P  
SRIRAMULU V

RAMAMOHANA RAO A  
RAMAMURTI V  
RAMAN H  
RAMAN R  
RAMANA D V  
RAMANATHA IYER T S  
RAMANUHAM M  
RAMAR K  
RAMA RAO K V S  
RAMASWAMI B  
RAMJEE V  
RAMJI RAO R  
RANGARAJAN G  
RAO V R S  
RAVINDRAN M  
RAYUDU G V N  
SANKARAN P  
SARMA L V K V  
SARMA L V L N  
SASTRY C A  
SASTRY S B S  
SASTRY V V

SRIVASTAVA U N  
SUBBA RAO G V  
SUBRAMANIAN G  
SUBRAMANIAN N  
SUBRAMANIAN R  
SUBRAMANIAN S  
SURESH RAO H  
SURJIT SINGH  
SWAMY C S  
VARADAN T K  
VARMA Y B G  
VASUDEVAN R  
VEDAM SUBRAHMANYAM  
VELUSWAMI M A  
VENDHAN C P  
VENKAT RAO V  
VENKATESH A  
VENKATESHAN S P  
VENKATRAM T  
VENKATRAYULU N  
VIJAY R RAGHAVAN  
VISWANATHAN B  
VISWANATHA REDDY K  
YEGNANARAYANA B  
YEGNANARAYANAN S S

Three educationist from outside the Institute nominated by the  
Chairman, Board of Governors

Shri M V GEORGE  
Mrs JAYA KOTHAI PILLAI  
Sri V RAJARAMAN

Members of the Faculty (Nominees)  
Nominees:

BALAKRISHNAN M  
CHALAPATHY RAO M V  
RENGARAJU V R  
ROY CHOUDHARY R L  
SUBRAMANIAN D S

Secretary

SHANMUGAM V  
Registrar

## **REPORT BY THE DIRECTOR FOR THE PERIOD - APRIL 1989 TO MARCH 1990**

As in the previous years, the Institute continued its progress in various academic spheres during the year under report.

### **1. STUDENT STRENGTH**

There were 1080 undergraduate students and 962 Postgraduate and Research Scholars at the Institute.

### **2. AWARDS/DISTINCTIONS TO FACULTY**

Prof. V. Ramamurti of the Department of Applied Mechanics was elected a Fellow of the Indian National Science Academy.

Prof. Megha Singh of the Department of Applied Mechanics was elected a Fellow of the Royal Society of Medicine, U. K.

Prof. P. T. Manoharan of the Department of Chemistry and Regional Sophisticated Instrumentation Centre was awarded the FICCI Award for Physical Sciences.

Prof. G. V. Subba Rao of the Materials Science Research Centre was awarded the "MRSI Award" by the Material Research Society of India in February 1990 for his outstanding contributions in the area of Materials Science.

Prof. H. Raman and Shri G. Ramkumar of the Civil Engineering Department were awarded with Gold Medal and Certificate during the 4th Indian Engineering Congress in December '89 for their technical paper entitled "Simulation Model for Waiting Time of Ships and Berth Occupancy".

Prof. D. R. G. Achar of the Metallurgical Engineering Department was awarded National Metallurgists' Day Award for 1989, instituted by the Ministry of Steels and Mines, Government of India.

Prof. V. V. Sastry and Prof. M. S. Narasimhan of the Electrical Engineering Department were the recipients of VASVIK Awards.

### **3. CONVOCATION**

The 26th Convocation was held on 8th August 1989 at the Student Activity Centre. Shri Russi Mody, Chairman and Managing Director, Tata Iron & Steel Co. Ltd., Jamshedpur, delivered the Convocation address. At this Convocation 244 B.Tech., 328 M.Tech., 51 M.Sc., 54 M.S., and 81 Ph.D degrees were awarded.

#### **4. INDUSTRIAL CONSULTANCY AND SPONSORED RESEARCH**

During the year under report the value of the Consultancy assignment increased to 1.07 crores. The value of the sponsored research programme started during the year under report was Rs.4.33 crores. The Industrial Associateship Scheme attracted more Members during the year, increasing the total membership to 170. Six Technology Appreciation Programmes were conducted during the year.

#### **5. SYMPOSIA**

A symposium on "Solid State Physics" sponsored by the Department of Atomic Energy was conducted by the Department of Physics in December 1989. More than 400 delegates participated in this symposium. A National Workshop on Water Resources Project Management sponsored by Ministry of Human Resource Development was organised by the Civil Engineering Department.

#### **6. IITM SERIES IN SCIENCE & ENGINEERING**

So far, two books have been published under the series and the third book entitled "Catalysis" by Prof. J. C. Kuriacose is under printing.

(N. V. C. Swamy)  
Director

# DETAILS OF THE REPORT

Admission, Award of Degrees and Prizes

STUDENT ADMISSION 1989-90

The numbers of students and scholars admitted to various courses 1989-90 is given in Table-1

**ADMISSION 1989-90**

**TABLE-I**

Sl. No.	Department	B.Tech.	M.Tech.	M.Sc.	M.S.	Ph.D.	Total
1.	Aerospace Engg.	18	9	-	4	4	35
2.	Applied Mechanics	-	12	-	8		25
3.	Chemical Engineering	30	13	-	11		55
4.	Chemistry	-	-	17		13	30
5.	Civil Engineering	31	40	-	10	6	87
6.	Computer Sci. & Engg.	26	22	-	7	5	60
7.	Electrical Engineering	66	39	-	6	4	115
8.	Humanities & Soc.Sci.	-	20	-	2	4	26
9.	Mathematics	-	-	27	-	4	31
10.	Mechanical Engg.	70	69	-	10	15	164
11.	Metallurgical Engg.	24	14	-	2	6	46
12.	Naval Architecture	11	-	-	-	-	11
13.	Ocean Engg. Centre	-	15	-	4	3	22
14.	Physics	-	6	20	-	8	34
	Solid State Tech.		*				
<b>Total</b>		<b>276</b>	<b>259</b>	<b>64</b>	<b>54</b>	<b>88</b>	<b>741</b>

The total 741 includes the following:

Foreign Nationals	:	13
Scheduled Castes	:	40
Scheduled Tribes	:	8
Women	:	59
QIP Scholars	:	31
Sponsored Candidates	:	42
External Registration	:	17
Project Staff	:	12

## DEGREES AWARDED

The numbers of degrees awarded at the Twenty-sixth Convocation of the Institute on 8th August, 1989 is given below in Table-II. Padmabhushan Sri Russi Mody, Chairman and Managing Director, Tata Iron and Steel Company Ltd., Jamshedpur delivered the Convocation address.

### NUMBER OF DEGREES AWARDED

**TABLE - II**

S.No.	Discipline	B.Tech.	M.Tech.	M.Sc.	M.S.	Ph.D.	Total
1.	Aerospace Engg.	13	7+72 (ACP)	-	2	1	95
2.	Applied Mechanics	-	13	-	8	4	25
3.	Chemical Engineering	31	17	-	3	5	56
4.	Chemistry	-	-	21	-	23	44
5.	Civil Engineering	28	39	-	7	3	77
6.	Computer Sci.& Engg.	26	25	-	10	-	61
7.	Electrical Engg.	54	38	-	6	10	108
8.	Hum.& Soc.Sciences	-	21	-	1	4	26
9.	Mathematics	-	-	13	-	2	15
10.	Mechanical Engg.	59	77	-	10	7	153
11.	Metallurgical Engg.	23	9	-	3	4	39
12.	Naval Architecture	10	-	-	-	-	10
13.	Ocean Engg.Centre	-	6	-	4	5	15
14.	Physics	-	4*	17	-	13	34
*Solid State Tech.							
Total		244	328	51	54	81	758

With this Convocation in August, 1989 the no.of degrees awarded so far by the Institute is:

B.Sc. (TA)	20	DIIT	245
B.Tech.	6433	M.S.	664
M.Tech.	4399	Ph.D.	1192
M.Sc.	954		

GRAND TOTAL = 13887

## PRIZE WINNERS 1989-90

### Institute Merit Prizes for the student with the Best Academic Record in each Discipline of each Course

M.Sc.Degree Course	-Mathematics -Physics	S.Sankar G.Sathya
M.Tech Degree Course	-Engineering Mechanics -Maintenance Engg&Managemnt -Civil Engineering	Ravichandran V Subharansu Sekhar Mishra Keshar Jayant Balachandra
B.Tech Degree Course	-Civil Engineering -Metallurgical Engg.	Dinesh GA Venkat Raman G

### ENDOWMENT PRIZES

Air India Prize for the best student in M.Tech Aerospace Engineering	Venkatakrishnaiah- Thandaga
Siemens Prize for the best student in M.Tech Electrical Engineering	Sarlashkar Jayant- Vitthal
Siemens Prize for the best student in B.Tech Electrical Engineering (Power)	Deepa Ramaswamy
Philips India Prize for the best student in B.Tech Electrical Engg.(Electronics)	Nagabhushana TS
Banco Foundation Prize for the best student in B.Tech Mechanical Engineering	Krishnamurthi- Rangarajan
Prof B Sengupto Prize for the best student in M.Tech. Mechanical Engg.	Sridhar TR Kumarasubramaniyam N
Reliance Heat Transfer (P) Limited Prize for the best student in B.Tech Chemical Engg.	Prabhu B
Dr S Vaidyanathan Memorial Prize for the best student in M.Tech Mechanical Engineering (Production Engineering)	Kumarasubramaniyam N

Dr K Subbaraju Memorial Prize for the best student in M.Tech Chemical Engg.	Ravi Padma Sree
KV Arunkumar Memorial Prize for the best student in M.Tech. Industrial Management	Venkateshwar Rao G T
HAL Prize for the student with the best academic record passing the B.Tech Degree Course in Aerospace Engineering	Rajesh B
CMC Prize for the outgoing M.Tech.student in Computer Science with the best academic record	Narayanan G
V.Ratna Rao Memorial Prize to the outgoing M.Sc. (Chemistry)student with the best academic record	Kala S
Alumni Association Prize for the best student in B.Tech Computer Science	Ajay Kripa Sreekanth
Sudharshan Bhat Memorial Prize for the best student in M.Tech Industrial Metallurgy	Durga Prasad B
Coka Parthasarathy Memorial Prize for the best student in M.Tech Industrial Management	Venkateshwar Rao G T
Sudharshan Bhat Memorial Prize to the full time Research scholar in Metallurgical Engg with the best published research paper	Krishnamurti Swaminathan
Giri Bros (P) Ltd Prize for the best student in M.Tech Mech Engg with project in Metrology	Kumarasubramaniyam N
S.Anantharamakrishnan Merit Prize for the student in Mech Engg with Best Project	Pradipta Mullick
Anantharamakrishnan Memorial Prize for the best student in M.Tech Metallurg.Engg(Metal Casting)	Kannan Sudesh
American Bureau of Shipping Prize for the best student M.Tech in Ocean Engineering	Vijendra Kumar
American Bureau of Shipping Prize for the best student in B.Tech Naval Architecture	Thiruppathy S



**Indira Sivasailam Merit Prize for the Girl Student in B.Tech with best curricular performance**

**Deepa Ramaswamy**

**Valli Anantharamakrishnan Merit Prize for the Girl Student with the Best Academic Record in B.Tech**

**Deepa Ramaswamy**

**B Ravichandran Memorial Prize for the best student in B.Tech Chemical Engineering**

**Prabhu B**

**B Ravichandran Memorial Prize for the best student in B.Tech Computer Science**

**Ajay Kripa Sreekanth**

**Sivasailam Merit Prize for the student in B.Tech Mech Engg for the best individual Project**

**Rajesh Rajamani  
Chippada Srinivas**

# CENTRE FOR BIO-SCIENCES AND BIO-TECHNOLOGY

## (1) Introduction of the Centre:

The Centre was established in October 1982. Bio-technology is one of the oldest areas of Science but the application of biological processes in manufacturing Industries is under going a sea of change because of developments in tissue culture, enzyme engineering recombinant DNA technology & enviornmental biotechnology. The faculty drawn from depts. of Chemical Engg, Applied Mechanics, Computer Science, Physics and Chemistry are associated with the activities of Centre for Bio Sciences & Biotech. At present there is no faculty exclusively employed for the centre. Env. Biotech is being given importance.

## (2) Faculty expertise:

1. Dr.A.Baradarajan	Ph.D	Professor
2. Dr.T.S.Chandra	Ph.D(IISc Bangalore)	Asst.Prof.
3. Shri K.Gopalakrishna	M.Tech(IIT Kanpur)	Asst.Prof.
4. Dr.K.Lalitha	Ph.D (Mysore)	Asst.Prof.
5. Prof.Megha Singh	Ph.D(Carolina)	Professor
6. Dr.(Mrs)Mahashesayee	Ph.D(RPI New York)	Professor
7. Prof.R.Nagarajan	Ph.D(IIT.Madras)	Professor
8. Prof.S.R.Ramadas	Ph.D(IISc Bangalore)	Professor
9. Prof.T.V.Ramakrishna	Ph.D(Birmingham)	Professor
10. Prof.C.A.Sastry	Ph.D (Bombay)	Prof.& Head

## (3) Research & Development activities:

Research studies continued on the following aspects.

1. Effect of selenium Toxicity on Fish with special reference to Bio chemical and histo pathological changes.
2. Biological treatment of phenol containing waste water
3. Waste water treatment using rotating biological disc contractor.
4. Treatment of various Industrial wastes with simultaneous generation of bio-gas using anaerobic contact filter.
5. Aerobic biological treatment of different Industrial waste waters using loop reactor.
6. Removal of phenols and dyes from waste water by adsorption.
7. Studies on Proteases.
8. Studies on Bio catalytic Mechanisms and Environmental Bio-Technology.
9. Studies on Anaerobic digestion and waste treatment.

10. Studies on Anaerobic bio degradation of biomass of cellulose and hemi Cellulose components.

**(4) New equipment/facility procured**

1. High volume Sampler
2. COD appratus
3. BOD Incubator
4. Electrophoresis System
5. UV Box.

**(5) Sponsored Project**

Title	Funding Agency	Period	Co-ordinator
"Colour removal from Industrial waste water"	CSIR Rs.2,00,000	2 years	Prof.C.A.Sastry

**(6) Major Consultancy assignments**

**(A) Regular Consultancy:-**

	Co-ordinator	Charges
1. Water treatment M/s.ISRO, Sriharikota, SHAR Centre	Prof.C.A.Sastry	Rs.1,500/-
2. Waste water treatment Shrishma Fine Chemicals & Pharamaceuticals Bang.	"	Rs.60,000/-
3. Waste water treatment M/S.Britannia Industries Madras	"	Rs.8,000/-
4. Waste Water treatment M/S. Madras Refineries Ltd Madras	"	Rs.2,500/-
5. Water treatment M/S.Bush Boake Allen Ltd Madras	"	Rs.3,000/-
6. Waste water treatment M/S.Brooke Bond(I)Ltd, Hosur	"	Rs.25,000/-
7. Water treatemnt M/S.W.S Industries Porur	"	Rs.5,000/-
8. Environmental Impact Assessment Andharapradesh State Electricity	"	Rs.1,45,000/-
9. Water treatment M/S.Enkem Engineers	"	Rs.3,000/-

**(B) Retainer Consultancy -**

		per month
1.	M/S.Laxmi Starch Hyderabad	Rs.1,600/-
2.	SPIC Ltd, Madras	Rs.1,000/-
3.	Nircon Engg.Consultant.Madras	Rs.1,200/-
4.	Esquire Engg.Madras	Rs.1,500/-

**(7) Research Publications**

1. B.V.S.Gurunatha Rao and C.A.Sastry  
"Studies on characteristic and treatment of waste water from a starch and Liquid Glucose Industry using Tapioca" - A case study Indian J.Environmental Protection Vol.9.No.1, Jan.1989.
2. Y.V.Subramanyam and C.A.Sastry  
Two stage upflow anaerobic filter for the treatment of partially Treated Distillery waste water"  
Indian J.Env.Protection Vol.9 No.5 May 1989.
3. C.A.Sastry  
Marine and estuarine pollution studies"  
Biology Education 6 (3)/July-Sep.1989.
4. Promod Kumar and C.A.Sastry  
"Electric Field Distribution in a corona Region of an Electrostatic precipitator",  
Indian J.Env.Protection Vol.9 No.9, Sep:1989
5. S.Kammatchiammal and C.A.Sastry  
"Statistical method for estimating median lethal concentration in Toxicity Bio assays"  
Indian J.Env.Protection Vol.9.No.10.Oct.1989.
6. C.A.Sastry  
"Application of polarographic Techniques in the field of water pollution"  
Indian J.Env.Protection Vol.9,No.11,Nov.1989.
7. C.A.Sastry  
"Public Health considerations of waste Recycling"  
Indian J.Env.Protection Vol.10.No.1. Jan 1990.
8. Shanthi Krishnan and Lalitha K,  
"Interactive metabolic regulations during Biomethanation of Leucaena leucocephala"  
Applied Biochemistry and Bio technology, 26 (In press) 1990

9. Shanthi Krishnan and Lalitha K.  
"Physiology and Biochemistry of a novel methanogen & Isolate in microbiology and Bio chemistry of strict anaerobes involved in interspecies Hydrogen transfer"  
E.D.J.P. Belaich, plenum publishing corporation N.Y.p.403-405
10. S.Soundar & T.S.Chandra  
"Anaerobic degradation ----- cultures"  
Jour Industrial Microbiology No.4, pl-18(1989)
11. M.V.S. Murthy & T.S.Chandra  
"Expression of xylanase ----- in clostridium Sp/SA.IV"
12. Enzyme & Microbial Technol USA - Accepted  
M.V.S MURTHY & T.S.CHANDRA  
"Characterization of a new species of clostridium degrading xylan"  
Archives Microbiology (Germany) - Accepted
13. M.V.S.Murthy & T.S.Chandra  
"Purification of xylanase ----- C.dp.SA IV)  
Communicated to Antone Van Leaven 10 etc 1990.
14. M.V.S.Murthy & T.S.Chandra  
"Fermentation of xylose & xylan" communicated to J.Ind.Microb USA 1990
15. N.Bhuvarahamurthy, T.S.Chandra & A.Baradarajan  
"Kinetics of biotransformation ----- E.coli cells"  
Commun - J.Chem Engg USA 1989.
16. S.Soundar & T.S.Chandra  
"Purification & Properties of Aviceladsorbing CMC are from a mesophelic fungus  
Humicola gresea Fb  
Indian J.Microb 29 (1) 15-24 (1989).

#### 8. Invited lectures (By IIT faculty):

Prof.C.A.Sastry

1. ESCI, Hyderabad
2. College of Engg. Guindy
3. TWAD Board, Madras
4. Enviro Systems, Madras
5. R.L.I. Madras.
6. Nircon Engg.Consultant, Madras
7. Administrative Staff College of India, Hyderabad.

## **CONTINUING EDUCATION PROGRAMME**

The Centre for Continuing Education was established in June 1986 by merging together the different units connected with continuing Education activities, Quality Improvement Programmes and Curriculum Development work at the Institute, so that all these activities might be organised in an optimal manner under a single agency. During the year the Centre for Continuing Education conducted 14 refresher/specialised courses and 3 sponsored courses. The Centre has conducted 113 courses so far and 2854 trainee officers from various organizations all over the country have participated in these courses.

### **QUALITY IMPROVEMENT PROGRAMME:**

Over the past 20 years, 268 teachers have completed their M.Tech. course and 284 teachers have completed their Ph.D Programme. 31 teachers were admitted to the M.Tech. course and 13 teachers joined the Ph.D Programme this year. Currently 46 teachers are pursuing the M.Tech course and 31 teachers are pursuing the Ph.D. Programme. The Centre also organized 51 short-term courses for the benefit of serving teachers in Engineering Colleges.

### **CURRICULUM DEVELOPMENT PROGRAMME:**

There are two Curriculum Development Cells in this Institute; one in Aerospace Engineering and other in Electrical Engineering.

The CD Cell in Aerospace Engineering has collected information on the curricula of various Aerospace Engineering courses in the country, and has also obtained information from user organizations about their requirements from Aerospace Engineering graduates. As a result of comparison of these two aspects, model curricula will be drawn up after detailed discussions in a Workshop.

The CD Cell in Electrical Engineering has engaged itself in the development of an integrated under-graduate curriculum in Electrical Engineering. The final model will be arrived at after detailed discussions, both within the IIT and also involving faculty members from other Institutions. In addition, a number of experimental kits in the area of Digital and Analog Electronic Circuits have been prepared, for use in the various engineering colleges.

## **EDUCATIONAL TECHNOLOGY CELL:**

This Cell was started in 1987 for the production of print and non-print forms of resource materials, to be used for improving the quality of engineering education throughout the country. A grant of Rs.55 lakhs from the Department of Education, Ministry of HRD, Government of India has been used to create the necessary infrastructure (video equipment, a studio and a class room) to facilitate the production of Educational Video films in-house. The ET cell recently conducted an ISTE Summer School on "Awareness Programme for Utilisation of Educational Television Facilities" for the benefit of Teachers of Engineering Colleges and Polytechnics.

# CENTRE FOR SYSTEMS AND DEVICES

## 1. New Projects initiated:

- Consultancy Project of: Hindustan Tele-Printers, Madras (Dr P R Vaya)

2. Visit of eminent faculty : Dr.O.Sulima  
/Scientists/Engineers : A.F.Iofee Physico Technical  
Institute, Leningrad, USSR.

## 3. Papers published in Journals:

- i) M.S. Narasimhan and K.Varadharangan, 'An efficient technique for spherical near-field to far-field transformations and evaluation of far fields of perfectly conducting scatterers', IEEE transactions on Antennas and Propagation, Vol.37, No.12, Dec.1989, pp.1529-1536.
- ii) K.M.M. Prabhu and K. Bhoopathy Bagan, 'Variable parameter window families for digital spectral analysis', IEEE Trans. Acoust., Speech and Signal processing, Vol.37, No.6, pp.946-949, June 1989.
- iii) K.M.M. Prabhu and K. Bhoopathy Bagan, 'Resolution capability of non-linear spectral-estimation methods for short data lengths', IEE Proc. Pt.F, Vol.136, No.3, pp.135-142, June 1989.
- iv) K.M.M. Prabhu and K.Bhoopathy Bagan, 'Non linear spectral-estimation methods for ground clutter analysis', IEE JL. of Electronics and Commn.Engg, Vol.1, No.4, pp.179-183, July/Aug.1989.
- v) K.M.M. Prabhu and Siva Bala Narayanan, 'Fixed-point error analysis of fast Hartley transform', Signal Processing, Vol.19, No.3, pp.191-198, March 1990.
- vi) K. Ponnuraju, P.R.Vaya and J.Sobhanadri 'The effects of substrate temperature on the optical properties of  $Pb_{1-x}Sn_x$  Te Films formed by Molecular beam epitaxy phy.Stat. Solidi, (a) 113, 477-481 (1989).

## 4. Papers presented in Conferences in India/Abroad:

- i) K.M.M. Prabhu and Siva Bala Narayanan, 'Comparison of three methods of Computing Wigner-Ville distribution', Proc. of the Indo-US Workshop on Spectral Analysis in One or Two Dimensions, held at New Delhi on Nov.27-29, 1989, pp.403-416.



- ii) P.R. Vaya, 'Semiconductor Opto-electronic Materials' (invited paper) Silver Jubilee Symposium on Frontier Materials. Regional Engineering College, Trichi, March 10-11, 1989.
- iii) P.R. Vaya 'Preparation and Characterization of Epi Films of PbSn Te for IR Detectors' (Invited paper) National Seminar on Recent trends in IR Devices and their Defence Applications, SSPL., New Delhi, March 17-18, (1989).
- iv) R.K. Gupta, J. Majhi and P.R. Vaya 'A comparative study of MOS capacitors thermally grown under different Ambient conditions' 17th Yugoslav Conference on Microelectronics, Nis, May 9-11, (1989).
- v) Kishore Kamath, K.Ponnuraju and P.R. Vaya, 'Photoluminescence studies on MBE Grown GaAs Films', 17th Yugoslav Conference on Microelectronics, Nis, May 9-11, 1989.
- vi) P.R. Vaya, K. Ponnuraju, K.J. Thomas, K. Kamath and J. Jayakodi, 'GaAs Epitaxy on Si-substrate by MBE', Third Inter.Nat.Symp. of MBE, Velico Tarnovo, Bulgaria, Oct.2-7, (1989).
- vii) P.R. Vaya, K. Ponnuraju, K.J. Thomas and Kishore Kamath, 'Investigations on the growth of GaAs on Si substrates' Symposium on Crystal Nucleation, Solution Growth and surface morphology', Anna University, Madras, Jan.8-9, 1990.

#### **5. Awards received by the faculty :**

Dr M S Narasimhan received Vasvik Award for Electronic Sciences & Technology for the year 1988.

#### **6. Any other item :**

Short Term Course entitled "Modern Spectral Analysis with Applications' from 27.3.1989 to 7.4.1989 conducted by Dr K M M Prabhu as Coordinator.

# FIBRE REINFORCED PLASTIC RESEARCH CENTRE

## 1. An Introduction to the Centre

Fibre Reinforced Plastics (FRP) Research Centre is one of the interdisciplinary research centres of IIT Madras. It was set up in 1974 with a view to take up effective research on composite material technology and its applications for making structures and products and thereby to participate in the national effort for developing this thrust area in the country. The following are the objectives of the Centre:-

- i. to work for the advancement of composites technology and its applications,
- ii. to undertake teaching, research, man-power training and other technical activities in order to develop the human resources required for this technology, and
- iii. to provide advice, consultancy and technical leadership to the FRP and other composite materials industry in the country.

Over the years, the Centre has built up one of the best research facilities on composites in the country. The facilities include composite materials and structures laboratories for testing and characterisation of composites, a FRP workshop where test specimens and products can be made by various mechanised and non-mechanised processes and a computing facility with hardware and programme packages for the analysis and design of composites.

The research activities of the Centre include both academic research leading to M.S. and Ph.D. degrees and R&D projects sponsored by various funding agencies. The Centre coordinates a sponsored M.Tech. programme on Composites conducted through departments for DRDL fellows and offers courses to the regular students. The Centre has established an effective rapport with the industries concerned offering them consultancy and conducting short term courses for them. A DST funded Composites Test Facility is being operated for providing testing and quality control guidance and services to the industries.

## 2. Faculty Expertise

1. B.J.C.Babu, B.E.(S.V.Univ.Tirupati),M.Tech.(IITM)  
Senior Design Engineer
2. S.K.Malhotra, B.Tech.(IITD),M.S.(IITM),Ph.D.(IITM).  
Chief Design Engineer
3. N.G.Nair,B.Sc.(Engg)(Ker. Univ.),M.E.(IISc),Ph.D.(IITK).  
Chief Design Engineer & Head
4. R.Palaninathan,B.E.(Mad.Univ.),M.Tech.(IITM),Ph.D.(IITM).  
Chief Design Engineer

### 3. New Courses Introduced during the year

- (i) CH772 - Composites Processing and Manufacture
- (ii) CH629 - Composites Technology has been modified as Technology of Polymers and Composites  
(Five elective courses were offered by the faculty during the year)

### 4. Research and Development Activities

The following Ph.D., M.S., M.Tech., and B.Tech. projects have been completed and the degrees have been awarded to the students:

#### M.S. Projects

- (i) Computer aided mould design for compression moulding of FRP Sheet Moulding Compound
- (ii) FRP products for electrical insulation and wear resistance applications

#### Ph.D. Projects

- (i) Development of Reinforced reaction injection moulding process for glass acrylic composites
- (ii) Thermal buckling of laminated composite plates and shells

#### M.Tech. thesis projects

- (i) Pulforming machine and dies for making FRP car leaf springs
- (ii) Some studies on drilling of GFRP and CFRP laminates
- (iii) Some studies on riveted joints between CFRP laminates and aluminium plates
- (iv) A study on Recession in Carbon/carbon composite Rocket nozzle throat
- (v) Development of fibre coating extrusion die for processing of long fibre reinforced thermoplastics

#### B.Tech. thesis projects

- (i) Development of vacuum assisted compression moulding for FRP sheet moulding compounds
- (ii) An Expert system for FRP Chemical Equipment design
- (iii) Studies on weld lines in Injection moulded thermo-plastics
- (iv) Design, development and testing of FRP tension link
- (v) Extrusion of metal matrix composites
- (vi) Investigation in metal-matrix composites

The following is a list of some of the areas in which academic research is being continued/taken up during the year:

- (i) Development of ceramic matrix composites by the solgel process
- (ii) Studies on reinforced reaction injection moulding of nylon
- (iii) Thermoforming of advanced reinforced thermoplastics
- (iv) Development of wood grain texture simulation in SMC
- (v) Fatigue of adhesively bonded joints
- (vi) Development of long fibre reinforced thermoplastics
- (vii) Development of FRP automobile leaf springs
- (viii) Finite element analysis of composite structures
- (ix) Impact damage of composites
- (x) Computer aided design of aerodynamically heated structures
- (xi) Development of wear resistant composites using UHMWHDPE

### 5. New Facilities added & Major items of equipment procured

A facility for coating of metals on reinforcement fibres by electroforming method has been set up during the year.

### 6. (i) Sponsored projects completed during the year

Title	Funding Agency	Period	Coordinator
Advanced composites Technology Development -Fibre Reinforced metal matrix & Plastic matrix composites	ICSR(IRDF)	1 year	Dr.Palaninathan and Dr.Gokularathnam

### (ii) Ongoing sponsored projects

S.No.	Title	Funding Agency	Period	Coordinator
1.	Development of rehabilitation aids with composites for the mobility of paraplegics	DST New Delhi Rs.1,43,000	2 years	Dr.N.G.Nair, & Mr.BJC Babu
2.	Advanced composite development - Fibre reinforced metal, ceramic and plastic matrix composites	Min.of Edn. Rs.25 lakhs	-	Dr.Palaninathan Dr.N.G.Nair, and Dr.S.K.Malhotra

S.No.	Title	Funding Agency	Period	Coordinator
3.	Reinforced plastics product design for bicycle components	DST, New Delhi, Rs.2.36 lakhs		Mr.BJC Babu, and Dr.S.K.Malhotra
4.	Computer Aided Design of Aerodynamically Heated Structures	ARDB Rs.11.80 lakhs		Dr.Palaninathan

## 7. Major Consultancy Assignments

SHAR Centre, Sriharikota, Design and development of FRP Vibration Test Fixtures, Rs.2.10 lakhs - Investigators: Dr.S.K.Malhotra, and Mr.B.J.C.Babu.

## 8. Papers presented at Conference

### A.Conference held abroad

G.Santhanakrishnan, R.Krishnamurthy and S.K.Malhotra, "A Study on the cutting process, chips, cutting forces and surface morphology in machining composites", paper accepted for presentation and publication in the Proceedings of Seventh International Conf. on Composite Materials (ICCM/7) Beijing, Aug.1989.

### B.Conference held in India

1. S.K.Malhotra, "Damping studies on Randomly oriented short fibre reinforced plastics beam specimens", presented at International Conference on Advanced in Composite Materials, Jan.15-18, 1990, Bombay (ICACM-90).
2. S.K.Malhotra, N.Ganesan and M.A.Veluswami, "Vibration and damping analysis of composite plates with cutouts", Proc. of Seminar on Science and Technology of Composites, Adhesives and Sealants, HAL, Bangalore, Sept.28-30, 1989, pp.239-244.
3. G.Santhanakrishnan, R.Krishnamurthy and S.K.Malhotra, "Studies on Friction characteristics of machined fibre reinforced plastics composites" - Seminar on Metallurgy and Developments in Material Science and Engineering, MET-MATS-89, at KREC, Surathkal, April 1989.
4. G.Santhanakrishnan, R.Krishnamurthy and S.K.Malhotra, "Principles of Mould design for GFRP products", 5th National Convention of Production Engineers, Dept.of Mech. and Industrial Engg, University of Roorkee, Sept.1989.

5. G.Santhanakrishnan, R.Krishnamurthy and S.K.Malhotra, "Preliminary studies on the surface produced during GFRP Machining", Proc.Seminar on Science and Technology of Compo,Adhesives and Sealants, HAL Bangalore, Sept.1989, pp. 369-376.
6. G.Santhanakrishnan, and R.Krishnamurthy "Environmental effects on Jute-polyester Conference on Advances in Composite materials, ASM International, India Chapter, IIT Bombay, Jan.1990.
7. G.Santhanakrishnan, R.Krishnamurthy and S.K.Malhotra, "Investigations on machining of GFRP,CFRP and KFRP using HSS tools", Proc. International Conference on Advances in Comp.Materials, ASM International,India Chapter,IIT Bombay, Jan.1990.

### **9. Research Publications**

1. S.K.Malhotra, N.Ganesan and M.A.Veluswami, "Vibration of stepped Orthotropic Square Plates", Computers and Structures", V-31, n-5, pp.657-661.
2. S.K.Malhotra, N.Ganesan and M.A.Veluswami, "Vibration and Damping Analysis of Orthotropic Triangular Plates", Journal of Sound and Vibrations, V-130, n-3, pp.379-386, 1989.
3. G.Santhanakrishnan, R.Krishnamurthy and S.K.Malhotra, "HSS Tool wear studies on machining glass fibre reinforced plastics", WEAR, V-132 (1989), pp.327-336.

### **10. Short Term Courses conducted**

Workshop on FRP Technology - 19th Feb. to 3rd Mar.1990 with 30 participants.

### **11. Visitors to the Centre**

Prof.Stephen Ogin of University of Surrey, Guildford, U.K. visited FRP Research Centre and delivered a lecture on Fracture Mechanics of Laminated Composites on 26th Dec.1989.

### **12. Future Plans**

The Centre is setting up an Advanced composites Laboratory for research on Ceramic Matrix and Metal Matrix Composites and CAD facility is planned to be created.

# MATERIALS SCIENCE RESEARCH CENTRE

## 1. Improvement/Development of new Laboratories:

For strengthening the activities of Materials Research (involving MSRC, Low Temp.Lab., and Magnetism and Mag.Matl.Lab., Dept.of Physics) at IIT Madras, an Indo-German GTZ project is under execution with a budget of 2.54 million DM out of which MSRC has obtained equipment worth 1.0 million DM (approx. Rs.100 lakhs) under the Project. The following sophisticated equipment have been received and commissioned:

1. X-ray diffraction systems (Seifert)
2. Glove box (Braun)
3. Comprehensive TG/DT system (Netzsch)
4. Faraday Suscep.System (Bruker)

An Indo-French (EEC) research project entitled "Studies on polycrystalline bulk thin films and single crystals of high temp. superconductors" in collaboration with CNRS, Meudon, France is under implementation with a financial outlay of ECU 84,000 (Rs.15 lakhs approx.).

## 2. Collaboration with Foreign Institutions:

Extensive collaboration has been established with the following Institutions:

1. Tech.University and Freie University, Berlin, W.Germany
2. CNRS, Meudon, France
3. Inst. of Solid State Phys., Max Planck Inst., Stuttgart, W.Germany
4. Anorganische Chem.Inst., Munster, W.Germany
5. Inst. of Solid State Chemistry and Inorganic Chem.,Novosibirsk, USSR
6. Inst. of Metal Physics, Sverlovsk, USSR and
7. Univ. of Texas at Austin, USA.

## 3. Any other major events:

More than 25 distinguished scientists from within the country and abroad visited the MSRC, gave invited talks and held discussions with faculty and students on aspects covering frontier areas of Materials Science. As part of collaborative programmes, Dr.W.Paulus and Herr P Rudolf of Tech. Univ., Berlin spent one month during the year at MSRC (under India GTZ (W.Germany) program) and Dr.A.Nemudry, Inst. of Solid State Chemistry, Novosibirsk, USSR is spending six months w.e.f. Feb. 1990 (under-USSR ILTP Project of DST) Prof.G.V.Subba Rao has been awarded the "MRSI Award" by the Materials Research Society of India, at its Annual General Meeting in Poona (1989-90) for his contribution in the area of 'Materials Science'.

# OCEAN ENGINEERING CENTRE

## [1] New Courses Introduced:

- |    |  |                               |
|----|--|-------------------------------|
| 1. | OE 607 Statics and Dynamics of Marine Vehicles | 4 0 0 4<br>S.K. Bhattacharyya |
| 2. | OE 775 Ocean Acoustics                         | 3 0 0 3<br>R. Mahadevan       |
| 3. | OE 795 Behaviour of Marine Clays               | 3 0 0 3<br>S. Narasimha Rao   |

The curriculum of M.Tech. (regular and user oriented) as well as B.Tech. (Naval Architecture) courses have been revised and updated during the year.

## [2] Improvement/Development of New Laboratories:

The length of the 4 m random wave flume has been extended to 80m from its present 40m. An overhead crane is fitted in the test section area and a new trolley is installed test section for better operation. The seakeeping tank has been fitted with 30 m long Kempf & Remmers wavemaker of regular frequency. This is in operation.

-Several computers and data acquisition systems have been added.

## [3] Instruments/Equipments designed and developed:

- A four component cylindrical force balance has been developed to measure forces and moments in an underwater body.
- An experimental facility for measurement of hydrodynamic forces on any floating body in heave and pitch modes has been developed.

## [4] Honours and Awards:

Dr.V.S.Raju,Professor & Dr.SR Gandhi,SSO II IGS-AFCONS Annual prize for best paper in Proceedings of Indian Geotechnical Conference 1988.

- Dr.V.S.Raju,Professor
1. Member evaluation committee,DRDO.
  2. Expert member,Project Advisory Committee on Civil Engg., DST.
  3. Expert member, National Geotechnical Centrifuge Facility,DST.
  4. Organising Secretary (Publications) XIII ICSMFE -1994.



Dr.MR Pranesh,  
Professor

1. Member, Executive Committee,  
Indian Geotechnical Society,  
Madras Chapter
2. National Advisory Committee  
Member, DHEC-89
3. Joint Organising Secretary  
(Publications) XIII ICSMFE-1994.

Dr.D. Sen, Lecturer

David Dunsiger Award of Excellence for  
best Ph.D.thesis in Memorial University,  
New Foundland, Canada, 1989.

#### **[5] Participation of Faculty in Conferences/Seminars/Symposia etc:**

Dr.V.S. Raju

Convention on Nonconventional Energy Sources - Perspectives of 2000 AD at Manipal Institute of Technology, Manipal, 22nd Sept.1989.(Delivered Plenary Lecture)

Dr.M. Ravindran

Dr.C. Ganapathy

Dr.M.R. Pranesh

Dr.K. Muthukrishnaiah

Dr.K. Ganesh Babu

Dr.V. Sundar

Dr.SP. Subramanian

Dr.J.S. Mani

Dr.R. Mahadevan

Third National Conference on Dock and  
Harbour Engineering, Suratkal, 6-9th  
Dec.1989. (presented paper)

#### **[6] Important visitors to Centre:**

1. German members of joint Indo-German Technology Group - High level committee from FRG to explore S & T collaborations between FRG and India on 9th Oct. 1989.
2. A delegation from the permanent Advisory Council of the Bundestat from FRG on 31st Oct. 1989.
3. Dr.P.C. Hauswedell, Deputy Director, South Asian Affairs Foreign office, Bonn on 19th Jan. 1990.

4. Dutch Expert Mission to observe ship Model Testing facilities and to discuss on establishment of a National Ship Hydrodynamics Centre on 8th Feb. 1990.
5. Prof.K. Peter Holz, Instt. of Fluid Mechanics and Computer Techniques, University of Hannover as short-term expert under GTZ programme for two weeks in Feb-Mar. 1990.
6. A High-powered German delegation of the Economic Affairs Committee of the German Parliament on 26th Feb. 1990.
7. Prof.Claus Marx, Institute of Petroleum Engg. and Deephole Drilling Technology, Technical University of Clausthal, West Germany to deliver lectures in the area of Deephole Drilling Technology, for a week in March 1990.

**[7] Visit of faculty members to other Institutions:**

Dr.C.P. Vendhan	Institut fur Schiffbau der Universitat Hamburg	DAAD Scholar Oct.5, 1989 to Jan.4,1990
Dr.S.K. Bhattacharyya and Shri R. Natarajan	Bulgarian Ship Hydrodynamics Centre Varna	To attend a UNIDO sponsored workshop on Ship Hydro- dynamics Oct. 23-Nov.4, 1989
Prof.C. Ganapthy and Prof.M. Ravindran	Universities of Hamburg, Berlin, Hannover, Clausthal, Hamburg- Harburg	Invitation from GTZ Sept-Oct. 1989

**[8] Collaboration with Foreign Institutions:**

Under Indo-German assistance Program to Ocean Engineering Centre, a number of Universities of FRG are collaborating with the Centre in the form of training, mutual exchange program of scientists, and collaborative research. Some of these Universities are :

- (i) University of Hamburg
- (ii) Technical University of Berlin
- (iii) University of Hannover
- (iv) Technical University of Hamburg-Hamburg
- (v) University of Karlsruhe
- (vi) Technical University of Aachen

The Centre has collaborative arrangement with Bulgarian Ship Hydrodynamics Centre, Varna under a UNIDO sponsored project which is likely to be enlarged in scope in future.

The Centre organised a training programme in "Management and conservation of marine resources: Seabed mining" under a collaborative arrangement with International Ocean Institute in 1989.

### **[9] Development and Planning:**

The Centre, under the Indo-German assistance program is receiving advanced instrumentation and equipment packages from F.R.G. for various research disciplines, especially in the area of wave and ship hydrodynamics, This is an ongoing project for the last few years. Under this program, joint research projects with universities of FRG are planned in several areas.

The Centre is initiating an inter-institutional program at the national level on Coastal Processes which is likely to be funded by Department of Ocean Development.

A proposal for UNIDO assistance to the Centre in the area of ship hydrodynamics and marine engineering with Bulgarian Ship Hydrodynamics Centre as the executing agency has been submitted to the Govt. of India.

The Centre is actively pursuing R & D proposals in the area of deepwater offshore structures with emphasis on deep ocean mining in the Eighth Plan.

### **[10] List of publications of Faculty Members:**

1. M. RAVINDRAN and V.S. RAJU  
"Energy from sea waves - A 150 KW system for sea trial", Marine Engineering Journal, CIE, India Vol.70, May 89, pp. 19-24.
2. M. RAVINDRAN, G. SWAMINATHAN and P.M. KOOLA  
"Model studies for the sea trial of a 150 KW wave energy system" 8th International Conference on Offshore Mechanics and Polar Engg. The Hague, Vol.1 paper No.8, March 19-23, 1989.
3. V.S. RAJU and S.R. GANDHI  
"Ultimate capacity of precast driven piles in stiff clay" Indian Geotechnical Journal, Dec. 1989.
4. C. GANAPATHY and S. PANDA  
"Non-linear analysis of pipe string for deep sea mining" Offshore Technology Conference, Houston Texas, May 1-4 1989, pp 633 - 640.

5. C. GANAPATHY  
"Welded joints in tubular structures" National Seminar on detailings of RC and steel structures, Indian Concrete Institute, Madras, Dec. 22-23, 1989..pa
6. M.R. PRANESH and J.S. MANI  
"Wave-tubular member - wave and current interaction" Journal of Waterways, Port, Coastal and Ocean Engineering, ASCE, Nov.1989, pp 760-774.
7. S. NEELAMANI, V. SUNDAR and C.P. VENDHAN  
"Dynamic Pressure distribution on a cylinder due to wave diffraction" Ocean Engg. Vol.4, 1989, pp 343-353 .
8. V. SUNDAR and K. SUBBIAH  
"Application of double bounded probability density function for analysis of ocean waves" Ocean Engg., 1989, pp 193-200.
9. P.N. ANANTH and V. SUNDAR  
"Sediment transport rate and its distribution across the surf zone off Paradip port" Proceedings, Ist Carribbean Conf. in Fluid Dynamics, Univ. of West Indies, Feb. 8-11,1989, pp 306-313.
10. S. NEELAMANI and V. SUNDAR  
"Wave induced pressure distribution around a vertical Cylinder" Proceedings, Ist Carribbean Conf. in Fluid Dynamics, Univ. of West Indies, Feb. 8-11, 1989, pp 112-120.
11. R. SUNDARAVADIVELU, V.G. IDICHANDY, S.R. GANDHI and V.S. RAJU  
"Tie rod force measurements in cargo berth" Journal of waterways, Port, Coastal and Ocean Engineering, ASCE, 1989.
12. K. GANESH BABU and R.V. RAO and M. DURAI SWAMY  
"Sulphate attack on concrete" 9th International Conf. on Offshore Mechanics and Arctic Engineering OMAE 1990, Houston, Feb. 1990.
13. K. GANESH BABU, P.V.S.N. RAJU and U.R. RAJU  
"Evaluation of rebar corrosion in concrete under marine environment" OMAE Feb. 1990.
14. V. SUBRAMANIAN, R. MAHADEVAN and D. SRINIVASAN  
"Effect of the open boundary conditions on storm surges simulations" Coastal Engineering, 1989, pp 293-302.

15. V. SUBRAMANIAN and R. MAHADEVAN  
"Proceedings of the symposium on preparedness, mitigation and management of natural disasters" Central Water commission, New Delhi, Aug. 1989, pp 4-41 to 4-44.
16. R. MAHADEVAN  
"Storm surge simulation studies - A review" Workshop on Coastal zone of Tamil Nadu, Anna University, 1989.
17. D. SEN  
"Two dimensional numerical modelling of large motions of floating bodies in waves" 5th Conf. on Numerical ship hydrodynamics, Hiroshima, Japan, Sept. 25-28, 1989.
18. D. SEN, J.S. PAWLOWSKI, J. LEVER and N.J. HINDRY  
"Two dimensional numerical modelling of large motions of floating bodies in waves" 5th Conf. on Numerical ship hydrodynamics, Hiroshima, Japan, Sept.25-28, 1989.
19. S. MEENAKSHISUNDARAM, K. GANESH BABU and P.A. ASWATHANARAYANA  
"Wave forces on a cylinder in an array due to random waves" Offshore Mechanics and Arctic Engg., A.S.M.E.Houston, Feb.1990.
20. C.G. NANDAKUMAR and K. RAJAGOPALAN  
"A bar finite element analogy for echinodome shells", Computers and Structures, Vol.33, No.4, 1989, pp 1085-1088.
21. K. RAJAGOPALAN  
"Software for buckling analysis of undersea shells" Intl. Conf. on Software , IIT Delhi, Dec.1989.
22. C. GANAPATHY and R. SUNDARAVADIVELU  
"Ultimate strength of ships" Seminar on shipbuilding, Indian shipbuilders association, New Delhi, Jan. 1989, pp 123-126.
23. J.S. MANI  
"Wave damping characteristics of floating barrier" Seventh Asian Federation of Engg. Organisation, Denpasar, Indonesia, Jan.16-18, 1989..pa
24. J.S. MANI  
"Y-frame floating breakwater for coastal protection" National Conf. on Coastal zone management, Cochin, Feb. 20-23, 1989, pp 35.
25. B. NAGENDRA KUMAR, M. RAVINDRAN and S. GOKCESU  
"Wave breaking on a beach - An overview" Third National Conf. on Dock and Harbour Engineering" Suratkal, Dec. 6-9, 1989, pp 93-100.

26. C. GANAPATHY and R. NATARAJAN  
"Experimental investigation on dynamics of mooring of ships" Third National Conf. on Dock and Harbour Engg., Suratkal, Dec. 6-9, 1989, pp 793-802.
27. J.S. MANI and M.R. PRANESH  
"Similitude techniques for wave breaking on pipeline" Proc. Third National Conf. on Dock and Harbour Engg. Suratkal, Dec. 6-9, 1989, pp 157-164.
28. M.R. PRANESH and J.S. MANI  
"Hydrodynamic forces on horizontal tubular members" Proc., Third National Conf. on Dock and Harbour Engg., Suratkal, Dec. 6-9, 1989, pp 165-172.
29. M.R. PRANESH and B. KAMESWARA RAO  
"Design of a satellite port for Vishakapatnam port" Proceedings, Third National Conf. on Dock and Harbour Engg., Suratkal, Dec. 8-9, 1989, pp 229-236.
30. M.R. PRANESH and N. RAMULU  
"Computer aided design of rubble mound breakwater" Proceedings, Third National Conf. on Dock and Harbour Engg., Suratkal, Dec. 8-9, 1989, pp 395-402.
31. M.R. PRANESH and S. SIVAKUMAR  
"Effect of port structures on coastal processes" Third National Conf. on Dock and Harbour Engg., Suratkal, Dec. 6-9, 1989, pp 525-532.
32. S. NEELAMANI, V. SUNDAR and C.P. VENDHAN  
"Diffraction of random waves by a vertical cylinder" Third National Conference on Dock and Harbour Engg., Suratkal Dec. 6-9, 1989, pp 173-180.
33. K. MUTHUKRISHNAIAH and A.V.R.S SESHAGIRI RAO  
"Experimental studies on wave-current-seabed interaction" Third National Conf. on Dock and Harbour Engg., Suratkal, Dec. 6-9 1989, pp 189-198.
34. SP. SUBRAMANIAN and B.V. MOHAN  
"Geomorphic features and tectonic setting of the Madras coast" Third National Conf. on Dock and Harbour Engg., Suratkal, Dec. 6-9, 1989, pp 561-568.
35. K. USHA and SP. SUBRAMANIAN  
"Analysis of waves and beach behaviour of Kanyakumari coast" Third National Conf. on Dock and Harbour Engg. Suratkal, Dec. 6-9, 1989, pp 561-568.

36. R. RAMASAMY, K. SHEPHERD, M. SHANMUGANANDAN and SP. SUBRAMANIAN  
"Tidal Ingress and the salinity of aquifers of Ennore area" Third National Conf. on Dock and Harbour Engg., Suratkal, Dec. 6-9, 1989, pp 641-648.
37. K. GANESH BABU and U. RANGA RAJU  
"Resistivity behaviour of superplasticized concrete in marine environment" Third National Conf. on Dock and Harbour Engg. Suratkal, Dec. 6-9, 1989, pp 885-888.
38. K. GANESH BABU, P.V.S.N. RAJU and D. SUNDARAM  
"Corrosion potentials of steel in concrete" Third National Conf. on Dock and Harbour Engg., Suratkal, Dec.6-9, 1989, pp 865-872.
39. K. GANESH BABU, K. VENKATESWARA RAO and M. DURAISWAMY  
"Concrete deterioration due to acid attack" Third National Conf. on Dock and Harbour Engg., Suratkal, Dec. 6-9, 1989, pp 879-884.
40. K. GANESH BABU and G.L.V. RAJA  
"Concrete mix specifications for marine environment - An Overview" Third National Conf. on Dock and Harbour Engg., Suratkal, Dec. 6-9, 1989, 873-878.
41. T. SWAMINATHAN and R. MAHADEVAN  
"Analysis of ocean surface waves" Third National Conf. on Dock and Harbour Engg., Suratkal, Dec.6-9, 1989, pp 51-56.
42. V. SUBRAMANIAN, R. MAHADEVAN and D. SRINIVASAN  
"Storm surge simulation for two offshore boundary conditions" Third National Conf. on Dock and Harbour Engg., Suratkal, Dec. 6-9, 1989, pp 775-780.
43. S. DANIEL JACOB and R. MAHADEVAN  
"Short term statistics of simulated ocean waves" Third National Conf. on Dock and Harbour Engg. Suratkal, Dec. 6-9, 1989, pp 65-70.
44. S. MEENAKSHISUNDARAM and C.K. MADHESWARAN  
"Wave force on single and group of cylinder in response to two wave spectra" Third National Conf. on Dock and Harbour Engg. Suratkal, Dec. 6-9, 1989, pp 129-140.
45. K. RAJAGOPALAN and P.V.R. REDDY  
"Monte Carlo simulation of iron ore facility at Vizag port" Third National Conf. on Dock and Harbour Engg., Suratkal, Dec. 6-9, 1989, pp 403-412.
46. V. ANANTHASUBRAMANIAN  
"Transient and Gaussian wave packets generation" Third National Conf. on Dock and Harbour Engg., Dec. 6-9, 1989, pp 121-128.

47. J.S. MANI  
"Wave damping characteristics of pile breakwaters" Third National Conf. on Dock and Harbour Engg., Suratkal, Dec. 6-9, 1989, pp 181-187.
48. S. NEELAMANI and V. SUNDAR  
"Simulation of random waves of predefined spectral characteristics" Third National Conf. on Dock and Harbour Engg., Suratkal, Dec. 6-9, 1989, pp 721-728.



# CENTRAL ELECTRONICS CENTRE

## [1] Introduction:

This Centre was established in 1971 to take care of maintenance of wide variety of electronic equipment available in the Institute. To facilitate this job, the need for conducting special training programme, the first of its kind in this country was started in the same year. Since then, conducting such programmes has become one of the important activities of this Centre. After the training programmes, the technicians are engaged in all the departments of the Institute to take care of the Maintenance of electronic equipment. Because of the spurt in the number of sophisticated electronic equipment in various departments and number of sponsored projects, training programme has nowadays become compulsory.

The Centre also conducts Short Term Courses from time to time for the benefit of practising engineers and technicians from numerous industries.

The Centre is involved in conducting Electronic Laboratory courses for M.Sc. (Chemistry) students.

The Centre plays an active role in offering unstinted help to the research scholars of non-electrical departments in their instrumentation work.

The PCB Laboratory has been acquired by this Centre and has been serving effectively to the needs of the entire Institute. In the present Indo-German project provision has been made to modernise the PCB facilities.

Apart from the above activities, the Centre undertakes several assignments from Industries. The assignments include servicing of electronic systems, measurement of physical parameters, development of electronic system/controller for various industrial applications and preparation of feasibility/technical reports for manufacturing electronic equipment.

With the already existing trainer kits, and with the help of modern training facilities that are received under Indo-German project, the Centre organises technical training programmes for the benefit of electronic technicians and service engineers.

Modern training facilities include latest trainer kits on various topics, sophisticated electronic measuring instruments and semi-automated diagnostic aids. New test and calibration standards that are being acquired updates the facilities for servicing and calibration of electronic equipment. Specially acquired video lessons, text books and manuals on various topics accelerate the process of learning.

[2] Staff expertise:

Name	Degree	Designation	Reference Data
T.N.Ranganathan	B.E. (Hons)	Chief Instrument Engineer	<ol style="list-style-type: none"><li>1. Design of development of Transducers &amp; Electronic Instrumentation for measurement of mechanical parameters and special industrial applications.</li><li>2. Servicing and calibration of sophisticated electronic equipment and controllers.</li></ol>
K.R.Venkatachalam	-	Instrument Engineer(SG)	Servicing and Calibration of sophisticated electronic equipment and controllers.
K. Raman	-	Technical Officer	Fabrication of Printed Circuit Boards.
M. Kumaravel	M.E.	Technical Officer	<ol style="list-style-type: none"><li>1. Design and Development of Electronic Instrumentation &amp; Transducers for special applications.</li><li>2. Servicing and calibration of sophisticated electronic equipment and controllers.</li><li>3. Organising the Training Programme for service personnel.</li></ol>

### [3] Details of Laboratory Courses:

<u>Course No.</u>	<u>Title</u>
CY	Electronics for chemists - I M.Sc.(Chy)

### [4] New facilities added and major items of equipment procured:

<u>S.No.</u>	<u>Description</u>
1	Analog Trainer Kits
2	Digital Trainer Kits
3	Thyristor Trainer Kits
4	Universal Trainer Kits
5	PLC Trainer Kits
6	Microprocessor Trainer Kits
7	Troubleshooting Kits
8	Precision Digital Multimeters
9	Programmable Pulse/Function Generators
10	Frequency Synthesizer
11	Electronic Counter
12	LCR Meter
13	Distortion Measuring Set
14	Calibration Standards
15	Video Lessons
16	Plotter
17	Uninterrupted Power Supplies

### [5] Assistance to students and major consultancy assignments:

#### a. Assistance to students:

<u>Name of staff</u>	<u>Degree/Department</u>	<u>Title of consultancy work</u>
MV Srinivasan	PhD/Mech.Engg.	Development of Telemetry to measure force and torque on a drill bit.
MV Srinivasan	PhD/Mech.Engg.	Development of an Adaptive Controller for Centreless Grinding Machine.
MV Srinivasan	PhD/Mech.Engg.	Development of an Adaptive Controller for a Milling Machine.

**b. Industrial Consultancy Assignments:**

Name of staff	Name of client	Title of consultancy work
TN Ranganathan	Trinity Nursing Home	Intra aortic balloon pump
M Kumaravel N Karthiyayini	Best & Crompton Ltd Madras	Calibration of Digital Tachometer
M Kumaravel	Padmavati Metals & Alloys (P) Ltd.Madras	Servicing of Temperature Programmer
M Kumaravel	Indian Organic Chemi- cals, Madras	Repair of Fuel Efficiency Monitor
M Kumaravel C Kuppuswamy	Padmavathy Metals & Alloys(P)Ltd.Madras	Fabrication of the Pulser Cards
M Kumaravel	Padmavathy Metals & Alloys	Servicing of safety cards
KR Venkatachalam	Dept. of Telecommuni- cations Annamalai University	Servicing of Micro Line Printer Servicing of Gauss Meter
MV Srinivasan	Trinity Hospital, Madras.	Servicing of UPS system
MV Srinivasan	Eastern Medical Services, Madras.	Servicing of power supply Unit.
MV Srinivasan	International Com- puter Ribbon Corpora- tion, Madras.	Servicing of Ultrasonic welding machine.
VK Ranganathan	Rane Power Steering Ltd., Trichi.	Strain gauging of Drop-arm

**[6] Books & Monographs brought out :**

Short Term Course Notes Vol. I, II, & III

**[7] Short Term Courses/Continuing Education Programmes conducted:**

- i) Apprentice Training Programme for technicians from August 1989 to July 1990.
- ii) Three weeks Short Term Course on "Industrial Electronics and Instrumentation" in July 1989.

**[8] Visitor to the Centre:**

Dr. Ing-Karl Heinz Georgi visited as Short Term Expert - in January 1990.

**[9] Future Plans:**

This Centre plans to set up service laboratory for the technicians as part of Indo-German Project and to modernise the servicing facilities.

# **INDUSTRIAL CONSULTANCY AND SPONSORED RESEARCH**

The Centre for Industrial Consultancy and Sponsored Research is responsible for providing administrative support for consultancy and sponsored research projects sanctioned to the Institute and also for promoting industrial and liaison activities of the Institute. These are:

- a. Sponsored Research Programmes
- b. Plan Schemes
- c. Consultancy Programmes
- d. Collaborative Research with foreign universities
- e. Industrial Associateship Scheme
- f. ISRO-IITM Cell Joint projects
- g. Entrepreneurship Development Programmes
- h. Technology Transfer
- i. Patents, etc.

## **1. SPONSORED RESEARCH:**

Around 170 projects with a total sanction of about Rs 8 crores for a 3-year period are handled by the Centre. Out of this 31 projects totalling to Rs 4.33 crores were received during 1989-90 alone.

## **2. PLAN SCHEMES:**

The Centre also provides administrative support for Plan Schemes of Ministry of Human Resources Development sanctioned to the Institute in the emerging areas of technology such as CAD-CAM, VLSI, Telematics, Fibre Optic Communication, Environmental Engg, etc.

## **3. CONSULTANCY PROGRAMMES:**

The consultancy programmes showed a growth of about Rs 20 lakhs during the year 89-90 increasing from Rs 87 lakhs in the last year to Rs 107 lakhs.

## **4. COLLABORATIVE RESEARCH PROJECTS:**

The four new projects sanctioned in the year 1989-90 under Indo-German agreement, for development of the facilities in Catalysis, Material Sciences, Electronics and Production Engineering, were continued. Five Guest Professors from FRG visited IIT. Four new projects under Indo-USSR and Indo-EEC & National Science Foundation of USA programmes were taken up.

## **5. INDUSTRIAL ASSOCIATESHIP SCHEME:**

The response from the Industry towards this scheme has been highly encouraging, with the membership increasing from 149 in the previous year to 170 during 1989-90. Six technology appreciation programmes were organised on the following topics:

1. Mathematics in Industry
2. Materials Handling
3. Advances in Welding
4. Computer Networking - State-of-the-art
5. Expert Systems in Mechanical Design
6. Office Automation

A new programme on Technology Requirements for automobile sector was organised, followed by visits to industries in this sector.

Abstracts of M.Tech, M.S. and Ph.D. programmes were published for the first time for the benefit of the Associates.

## **6. ISRO-IITM CELL JOINT PROJECTS:**

This is a joint research activity sponsored by the Indian Space Research Organisation where research projects of interest to ISRO are being taken. Apart from the 11 projects taken up during the year, two short-term courses were conducted in the following areas:

1. Expert Systems for Indian Space Programme
2. Random Vibration & Acoustics

## **7. M.S. ENTREPRENEURSHIP PROGRAMMES:**

Fresh Engineering graduates are admitted to the M.S. Entrepreneurship Programme every year. Out of the four candidates who joined during this year three have initiated steps to set up their industries.

## **8. TECHNOLOGY TRANSFER:**

Agreements were entered into with the following industries:

1. M/s Zaphyr Industries for "Thermocouple welding Gadget"
2. With NRDC for M/s Carborandum Universal Ltd. for an improved Grinding Wheel

## **9. PATENTS:**

Eight patent applications were made during the year and five patents were issued.

# REGIONAL SOPHISTICATED INSTRUMENTATION CENTRE

## [1] Introduction:

The Regional Sophisticated Instrumentation Centre (RSIC), was established in 1974 at IIT, Madras by the Department of Science and Technology, Government of India. The objectives of the centre are to provide analytical and investigative spectroscopic and allied services to scientists from the Southern Region in sophisticated electronic equipment. RSIC/Madras was the first of a series of such centres established in DST, the others being at IIT/Bombay, CDRI/Lucknow, Bose Institute/Calcutta, Nagpur University/Nagpur, NEHU/Shillong, Punjab University/Chandigarh.

RSIC, Madras has been concentrating on spectroscopic instrumentation in general, besides facilities for SEM, XRD, Mass spectrometry, etc. Although regional by nomenclature, scientists from the length and breadth of India are using our facilities regularly. Currently equipment worth nearly 4 crores are being maintained and a band of faculty, electronic and operations personnel man these equipment to provide service to scientists.

Apart from managing the services to internal / external users, RSIC faculty are involved in research in frontier areas of chemical physics including Magnetic Resonance spectroscopy (NMR/EPR), Magnetic susceptibility, IR/Raman spectroscopy, UV/VIS spectroscopy, ESCA, Mossbauer spectroscopy, Heat and Mass transfer, solute solvent interactions, molecular force fields, magnetic exchange interactions in condensed phase as well as three dimensional structure of molecules. The centre has 4 Faculty members and nearly 25 supporting staff.

## [2] Instruments/Equipment Designed and Developed:

### MICROPROCESSOR BASED LEAK DETECTOR

A microprocessor based leak detector was recently designed, fabricated and delivered to a private firm dealing in radiators by RSIC, IIT, Madras. The leak detector is used for quality control on an "on line" basis in the manufacture of car radiators. The instrument works on the comparative principle in which a radiator under test is compared with a standard radiator for the leak rate. The differential pressure fall rate is measured after filling both the radiators with compressed air at about 50 psig. "Pass" and "Fail" levels for the differential pressure fall rate are set at the desired levels and the instrument will automatically perform the filling-measuring operations and indicate whether the radiator under test is acceptable or not acceptable.

The leak detector is dry type (avoids immersion under water as is normally done) and hence avoids costly drying process before painting of the radiators.



### [3] Research Publications:

#### Prof.P.T.MANOHARAN

1. S. Lalitha and P.T. Manoharan, X-Ray photoelectron spectroscopic study of some dithiolene complexes, *J. Electron Spectroscopy*, **49**, 61 (1989).
2. A. Levy, P.T. Manoharan, J. M. Rifkind, J.C. Walker, F.C. Haberle, N.G. Kumar, J.D. Glickson, G.A. Elgavish, Mossbauer, EPR and NMR studies of the acid-Induced Reduction and changes in Spin State of Ferric- Bleomycin, *Biochim. et. Biophys.Acta*, **991**, 97 (1989).
3. N.Venkatalakshmi, Babu Varghese, S. Lalitha, R.F.X. Williams, and P.T. Manoharan, A Weak ferromagnetic exchange coupled dimer structure and magnetism of  $\text{Cu}(\text{dcmtdcroc})_2$ , *J.Am.Chem.Soc.* **111**, 5748-5757 (1989).
4. S.Venkatachalam, K. V. C. Rao and P. T. Manoharan, Electrically conductive polymeric phthalocyanito polysiloxane containing cyano end groups - *Polymer*, **30** 1633 (1989).
5. S. Purohit, A. P. Koley, L. S. Prasad, P.T. Manoharan and S. Ghosh, Chemistry of Molybdenum with Hard-Soft donor ligands - 2' Molybdenum (VI),(V),and (IV) oxo complexes with tridentate Schiff base ligands - *Inorganic Chemistry*, **28**, 3735 (1989).
6. M.V. Rajasekharan, G.V.R. Chandramouli and P.T. Manoharan, Polarized Electronic Spectral Studies on some Diethyldithio-carbamate Complexes of Ni(II) and Pd(II), *Chem.Phys.Let.***162**, 110 (1989).
7. P. T. Manoharan, K. Alston and J. M. Rifkind, The Interaction of copper(II) with Hemoglobins in the unliganded conformation, *Biochemistry*,**28**, 7148 (1989).

#### Prof.SURJIT SINGH

1. Raman spectral studies on interaction of  $\text{Br}^-$  ions with  $\text{CD}_3$  group of deuterated acetonitrile, nitromethane and dimethyl sulfoxide, K.Venkata Ramana and Surjit Singh *J.Mol.Struct.* **194**, 73 (1989).
2. O-H stretching force constant in associated methanol species and cooperativity effect M.C.Shivaglal and Surjit Singh, *Intl.J.Quant.Chem.***36**, 105 (1989).
3. Raman spectral studies on ion-molecular interactions of lithium bromide and lithium iodide with dimethyl sulfoxide, K.Venkata Ramana and Surjit Singh *J.Raman Spectrosc.* **20**, 169 (1989).

4. Raman Spectral studies on ion molecular interactions in solutions of alkali metal halides and TBAB in acetone K.Venkata Ramana and Surjit Singh, Ind.J.Phys. 63, 5105 (1989).
5. Raman spectral studies on molecular interactions in liquids and solutions, Surjit Singh and M.I.S.Sastry, Vibrational Spectra and Structure, 17B, 423 (1989).
6. Effect of cooperativity and Self Association on Stretching Force Constants of Acetonitrile, M.C.Shivaglal and Surjit Singh, Chemical Physics Letters 64, 63 (1989).

**Prof.S. SUBRAMANIAN**

1. Ring Puckering in the compensation of Dibenzo-18-crown-6 with KI studied by 2D NOESY, S.V.Santhana Mariappan, G.V.Visalakshi and S.Subramanian, Bull. Magn. Res., 11, 254 (1989).
2. Optimization of NOESY and ROESY through computer simulation, S.V.Santhana Mariappan and S.Subramanian, Bull. Magn.Res., 11, 258 (1989).
3. Ab initio finite perturbation theory calculations of nuclear magnetic shielding tensors of  $\text{Li}^+$  and  $\text{Na}^+$  complexes, R.Nirmala and S.Subramanian, Chem. Phys. Lett. 166, 326 (1990).

**Prof.T.K.K. SRINIVASAN**

1. Raman Spectroscopic Structural Studies on the Stepwise Dehydration of  $\text{Zn}(\text{BrO}_3)_2 \cdot 6\text{H}_2\text{O}$  T.K.K.Srinivasan and T.Devanathan J.Raman Spectroscopy, 21, 91-98 (1990).
2. Raman Spectral Studies of Dehydration of  $\text{Sr}(\text{BrO}_3)_2 \cdot \text{H}_2\text{O}$  T.K.K.Srinivasan and T.Devanathan J.Raman Spectroscopy, 21, 98-102 (1990).

**[4] Honours and awards:**

Name of the Awardee	Designation	Dept.	Honour
Dr.P.T.Manoharan	Professor	Chemistry/ RSIC	FICCI for Physical Sciences
Dr.S.Subramanian	Professor	Chemistry/ RSIC	Elected to the Fellowship of Indian National Science Academy, New Delhi

### [5] Visit of Faculty members to other Institutions:

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Name of the Faculty	Institutions visited/Purpose of visit/ duration of visit
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#### Indian :

Dr.P.T.Manoharan	TIFR, Bombay - December 1989 JIT, Bombay - December 1989 IACS, Calcutta - January 1990
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#### Foreign :

Dr.P.T.Manoharan	IX ISMAR, Morizon, France - July 1989 HAIFA, Israel - August 1989
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Dr.S.Subramanian	IX ISMAR, Morizon, France - July 1989
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### [6] Participation of Faculty in Conferences/Seminars/Symposia etc

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Name of Faculty	Particulars of Participation in Conference/ Seminars/Symposia/Short Term Courses Nature of participation Date Venue
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Dr.P.T.Manoharan	IX ISMAR, Morizon, France - July 1989 HAIFA, Israel - August 1989
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Dr.S.Subramanian	IX ISMAR, Morizon, France - July 1989
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### [7] Distinguished Visitors to Departments:

1. Prof.R.J. Butcher, Howard University, Washington, USA.
2. Prof.Yurii V. Rakitin, Institute of Chemistry and Technology, USSR.
3. Dr.K. Balasubramanian, Department of Chemistry, Arizona State University, Tempe, Arizona, USA.

4. Prof.N. Figgis, University of Western Australia, Australia.
  5. Dr.H.C. Mez, CIBA-GEIGY Limited, Barel, Switzerland.
  6. Dr.Edwin D. Becker, National Institute of Health, USA.
  7. Dr.Reiner Luek, CIIC, DDR, Berlin.
  8. Prof.Doughlas X. West, Department of Chemistry Illinois State University, Illinois.
  9. Prof.A.T. Tu, Colorado University, Colorado, USA.
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**[8] Seminar/Symposia organised by Department:**

Summer School on Scientific Instruments in May, 1989.

## CENTRAL GAS SUPPLIES UNIT

The Central Gas Supplies Unit is administered by a Professor. It procures the following Industrial Gases and Special Gases from various manufacturers/suppliers and issues to various Departments/Laboratories of the Institute.

### INDUSTRIAL GASES

1. Oxygen
2. Nitrogen
3. Dissolved Acetylene
4. Argon
5. Hydrogen

### SPECIAL GASES

1. High Pure Argon Gr.I
2. High Pure Oxygen
3. High Pure Nitrogen Gr.I
4. Zero Air

### **FUTURE PLAN :**

If the staff strength is increased, all the needed Gases will be procured in time and issued to the needy Departments/Laboratories.

## CENTRAL GLASS BLOWING SECTION

Prof. D.V. Ramana            Chairman  
Sri. N.T. Kumarasamy      Technical Officer

The Central Glass Blowing Section is one of the most important infrastructural facilities of the INSTITUTE since its inception in 1972. Being a central facility this section undertakes design and fabrication of sophisticated scientific glass apparatus for research and development in various departments. Besides meeting the in-house needs, this section also frequently undertakes jobs for the industry under the industrial consultancy programme.

This section has a range of modern glass working equipments largely procured from the Federal Republic of Germany as a component of the collaborative programme and these include Horizontal cum vertical lathe, Universal lathe, Forming lathe and High Vacuum Systems. It is also well equipped with a good number of sophisticated burners drilling and cutting machines, grinding and polishing equipments, and such other tools necessary for fashioning out a variety of glass apparatus and instruments. Though the services of the section are utilised by the student community and researchers of different departments, its contribution in specialised area like Cryogenic Glass Systems, high vacuum system is quite significant in recent years. The section has adequate facilities for Quartz Working and has developed high level of expertise in this area.

As part of industrial consultancy programme this section has to its credit the following specialised works:

Cryostat, Spherical, cylindrical and tail Dewars (Window silvering), Luggin probe, Adibetic calorimetre, Laser housing tube with water jacket, Mercury container for voluminometer, Reaction kettles, Reactor tube, Jet electropolisher, Double walled transfer tube, Vacuum tube collector for solar energy, Quartz wares (Crucible, combustion tube, crystal growing quartz sheath etc).

Research and Development : The service regarding glass apparatus repair work and fabrication of precision glass instruments, sophisticated glass systems of this section is fully utilized by the departments. This centre also procuring new tools to help in the fabrication of most sophisticated equipments for R and D of the departments.

Professional activities : Sri N.T. Kumarasamy, Technical Officer(-)  
: Treasurer of Indian society of Scientific Glass blowers's.  
: Sri A.G. Venugopal, S.T.A and Sri A.Jayaraman  
Senior Mechanic are members of I.S.S.G.

Future plan : Construction of a separate building with safety precautions.

## CENTRAL PHOTOGRAPHIC SECTION

The Section with the staff strength of five experienced technical personnel caters to the need of various departments/centres of the Institute. It is mainly involved in Slide Preparations, Photo-taking of research activities of the faculty members and research workers. It also undertakes development, enlarging and printing and helps various IC and SR activities. It covers the different Institute functions such as Convocation, Sports-meet, Seminarss, Symposia etc.

### FUTURE PLAN:

It is proposed to introduce Video facilities to assist the faculty in preparing Audio Visual Programmes and Colour slide preparations.

# AEROSPACE ENGINEERING

## (1) Visit of Faculty Members to other Institutions

Faculty Name	Institutions visited / Purpose / duration of visit
Dr.E.G.Tulapurkara	i) Dept. of Mech.Engg., University of Newcastle, Australia on Sabbatical Leave - May to Aug.1989
	ii) Dept.of Mech.Engg., Stanford University, California, U.S.A. - To attend conference - 21-25 Aug.1989.
Dr.T.K.Bose	University of Kentucky, Lexington, USA, NSF Sponsored Project - April 15 - July 15, 1989
Dr.K.A.Damodaran	Dept. of Mech.Engg., Univ.of Melbourne, Australia, To give a lecture - October 1989

## (2) Participation of Faculty in Conferences/Seminars/Symposia etc.

Faculty Name	Particulars of Conference/Seminar/Symposium/Short Term Course
Dr.E.G.Tulapurkara	7th Symposium on "Turbulent Shear Flows" at Stanford Univ., USA, Aug.21-23, 1989 - Presented paper
Dr.T.K.Bose	10th National Heat and Mass Transfer Conference, Srinagar, Aug.1989, - Presented Paper Workshop and Symposium on Beam and Plasma - Applications in Materials Technology, Bombay, 1990 - invited special lecture.
Dr.Job Kurian	17th Int.Symp.on Shock Waves and Shock Tubes - Lehigh University, USA, July 1989 - presented paper XI National Conference on IC Engines and Combustion, Madras, December 1989 - presented paper
Dr.K.A.Damodaran	Australian Aeronautical Conference - Oct.9-11, 1989 - presented paper XI National Conference on IC Engines and Combustion, Madras, December 1989 - presented paper IV Indian Engineering Congress, Dec.30, 1989 to 2nd Jan., 1990 - presented paper
Dr.T.K.Varadan	21st Midwestern Mechanical Conference, Michigan Technological University, Houghton, USA, Aug.1989 - Presented paper

### (3) Research Publications

1. B.H.LAXMANA GOWDA and E.G.TULAPURKARA  
"Reverse flow in a channel with obstruction at entry", J. Fluid Mech., Vol.204, July 1989, pp.229-244.
2. E.G.TULAPURKARA and R.A.ANTONIA  
"The  $k-\epsilon$  model of turbulence evolution and current status", Dept. of Mech.Engg., Univ. of New Castle, Tech.Note FM/89/2 July 1989.
3. V.RAMJEE, E.G.TULAPURKARA and R.RAJASEKAR  
"Development of wakes of bluff body and streamlined body in a longitudinally curved stream", Proc. of 4th Asian Congress of Fluid Mech., Hong Kong, Aug.19-23, 1989, pp.C39 to C42.
4. E.G.TULAPURKARA, R.A.ANTONIA and L.W.B.BROWNE  
"Optimisation of a  $k-\epsilon$  model for a turbulent far-wake, Proc. 7th Sym.on Turbulent Shear Flows,Stanford,Aug.21-25,1989,pp.29.2.1- 29.2.6.
5. T.K.BOSE and C.J.CREMERS  
"Thermal conductivity of an argon helium mixture at high temperatures", J. Thermal Conductivity, Vol.21, Plenum Press (NY), 1990.
6. T.K.BOSE  
"One-dimensional analysis of wall region for multiple temperature argon plasma", Chem.Engg. and Plasma Process, March 1990.
7. R.M.SIDDAVEERE GOWDA  
"Vibration of orthotropic rectangular plates by equivalent isotropic plate method", J. Aero.Soc. of India, Feb.1990, pp.63-66,
8. ANILKUMAR NARAYANAN and K.A.DAMODARAN  
"Experimental investigations on flow through a petal nozzle", J. of Inst.of Engrs., Vol.70, March 1990, pp.1-4.
9. P.ARUNACHALAM and K.A.DAMODARAN  
"Pattern factor co-relation for reverse flow annular combustors of small gas turbine engines", J. of Inst. Engrs, Vol.70, March 1990, pp.19-23.
10. T.K.VARADAN , G.PRATHAP and H.V.RAMANI  
"Nonlinear free flexural vibration of thin circular cylindrical shells", AIAA J, Vol.27, No.9, Sept,1989, pp.1303-1304.



11. K.BHASKAR and T.K.VARADAN  
"Refinement of higher order laminated plate theories", AIAA J, Vol.27, No.12, Dec.1989, pp.1830-1831.
12. R.SIVARAMAKRISHNAN, C.VENKATESAN and T.K.VARADAN  
"Rotor/fuselage vibration isolation studies by a floquet-harmonic iteration technique", J. of Aircraft, Vol.27, No.1, Jan.1990, pp.81-89.
13. S.KRISHNAN and R.JEENU  
"Subatmospheric burning characteristics of AP/CTPB composite propellants with burning rate modifiers", Combustion & Flame, Vol.80, Jan.1990, pp.1-6.
14. G.SUBRAMANIAN and KOLLI SRINIVAS REDDY  
"A single color grating technique for fringe sharpening in Moire' analysis", Proc. Int. W/Shop. on Holography and Speckle Phenomena and their Industrial Applications, World Scientific, 1990.
15. JOB KURIAN and A.K.SREEKANTH  
"Shock tube study of vibrational relaxation in moist air", Proc. of 17th Int.Symposium on Shock Tubes & Shock Waves, Lehigh University, July 1989.
16. JOB KURIAN, MICHAEL HUTH and W.LEUCKEL  
"Light extinction measurements of soot concentration in flames", Proc. of XI National Conference on IC Engines & Combustion, Dec.1989, pp.929-36.
17. T.S.BALASUBRAMANIAN, G.SUBRAMANIAN, T.S.RAMANI  
"Significance and use of very high order derivatives as nodal degrees of freedom in stepped beam vibration analysis", J.Sound and Vib., Vol.137(2), 1990, pp.353-356.

#### (4) Distinguished Visitors to Department

Name and affiliation	Dates
i) from Abroad: Prof.K.W.Willmert, Chairman, Dept. of Mech.& Industrial Engg., Clarkson University, New York	May 1989
Prof.M.Satyamoorthy, Dept. of Mech. and Industrial Engg., Clarkson Univ., New York	May 1989
Dr.A.Krothapalli, Prof.& Chairman, Mech.Engg., Florida State Univ., Tallahassee, FL/USA	Aug.1989

Prof.A.Das, Institut fur Entwurfsarro-dynamik DFVLR, Braunschweig, West Germany (under DAAD)	Sept.1989
Dr.B.Chandrasekharan, Scientist, Vigyan Research Associates, Hampton, Va., USA.	Sept.1989
Dr.J.R.Banerjee, Aeronautics Dept., The City University, London	Dec.1989
Dr.V.Sumantran,Scientist,General Motors Corpn.,USA	Dec.1989
Dr.N.P.Weatherhill,Univ.College of Swansea,UK	Jan.1990
ii) from India: Dr.V.K.Arora,Defence Science Centre, Delhi	Mar.1990

# APPLIED MECHANICS

## (1) Honours and Awards.

Dr.V.Ramamurti, Professor.

Fellow of Indian National  
Academy of Engineering

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Fellow of Indian National  
Science Academy

## (2) Visit of Faculty members to other Institutions.

Prof. K.M. Patil

Eindhoven Univ. of Technology - Netherlands  
from Dec. 89 - Nov 90 - on a joint  
collaborative project on foot deformities.

Prof. Megha Singh

Cardiothoracic Surgery Division, North Carolina  
from April 89 - Sept. 90 as Visiting Professor.

Dr. J. Ramachandran

University of Singapore, Invited Lecture on Astrology.

Dr. J. Ramachandran

NSTL, VIZAG, Invited Lecture on Boundary Element  
Method.

Dr. B.H. Lakshmana Gowda

University of Windsor, Canada from Dec.89 -  
Nov.90 as Visiting Professor

Dr. P.A. Aswatha Narayana

Virginia Polytechnic Institutes and State  
University, Blacksburg, U.S.A. 3 weeks in  
Nov. 1989, Indo US Cooperation NSF Project.

Dr. P.A. Aswatha Narayana

College of Engineering, Swansea Wales, 5  
weeks in Nov. - Dec. 1989, Indo British  
Link Programme.

Dr. J. Lakshminarasimhan

Institute fur Computer - Anwendungen,  
University of Stuttgart, FRG, 3 months from  
May to July 1990, DAAD Fellowship.

**(3) Participation of Faculty in Conferences/ Seminars/ Symposia, etc.**

Dr.V.Ramjee	Asian Congress of Fluid Mechanics Under Indian National Committee for the Asian Congress of Fluid Mechanics (INCOAF)	Presented paper	Aug. 1989	Hong Kong
Dr.P.A.Aswatha Narayana	Asian Congress of Fluid Mechanics Under Indian National Committee for the Asian Congress of Fluid Mechanics (INCOAF)	Presented Paper	Aug. 1989	Hong Kong
Dr.S.Narayanan	IUTAM Symposium on Dynamics in Engineering Systems	Presented an invited paper	Aug. 1989	Stuttgart West Germany
Dr.V.Ramamurti	12th Biennial ASME Conf.on Mech.Vibrn. and Noise	Intern. Ambassador Chairman of Sessions, Presented paper	Sept. 1989	Montreal Canada
Dr.V.Ramamurti	15th Design Automation Conference	Presented paper	Sept. 1989	Montreal Canada
Dr.V.Ramamurti	8th Failure Analysis and prevention conference	Presented paper	Sept. 1989	Montreal Canada
Dr.B.V.A.Rao	Intern. Congress on Recent Developments in Air and Structure borne Sound and Vibrn.	Chairman of Session Presented paper	March 1990	Auburn USA

#### **(4) Distinguished Visitors to Department.**

Dr. Mladonov, Higher Institute of Architecture & Civil Engg. Sofia, Bulgaria (Jan. 1990)

Prof. Dr. M. Heckl, Institute of Acoustics, University of Berlin, West Germany (1978, 1984, 1990)

Dr. H. Irretier, Professor of Engineering Mechanics, University of Kassel, West Germany (1987, 1990)

Dr. B.L. Dhoopar, Professor, Mechanical Engineering, IIT, Kanpur (1989, 1990)

Dr. M.G. Prasad, Department of Mechanical Engineering, Stevens Institute of Technology, New Jersey, USA (1982, 1990) (Former student)

Prof. E. Kramer, Professor of Mechanical Engineering, University of Darmstadt, West Germany (1989)

Prof. Arvind Shah, Professor of Civil Engineering, University of Monitoba, Canada (1989)

Prof. S.S. Rao, Professor of Mechanical Engineering, Purdue University, USA (1989)

Dr. J.S. Rao, Professor, Mechanical Engineering, IIT, New Delhi (1989)

#### **(5) Seminars/Symposia/Short term courses organized:**

September 1989 - ISRO - IITM Space Technology Cell organized course on RANDOM VIBRATION AND ACOUSTICS of ISRO Engineers and outside participants  
(Coordinators : Dr. S. Narayanan and Dr. T.K. Bose)

#### **(6) Major sponsored Research Schemes & Consultancy Projects:**

1. Improved Bioengineering Technologies for research and development of Handicapped Aids and Programmes for manpower development (Value Rs.57 lakhs)  
Coordinators Dr. Mega Singh, Dr. K.M. Patil and Dr. S. Radhakrishnan.
2. Development of blood flow visualization techniques to analyse hemorheological changes in Capillaries in health and disease - (Value Rs.6.8 lakhs ) Coordinators Dr. Mega Singh, Dr. K.M. Patil and Dr. S. Swarnamani.
3. Development of electronic speckle pattern interferometry for Cardiac function analysis in health and disease - (Value Rs.17.5 lakhs) - Coordinators Dr. Mega Singh and Dr. S. Swarnamani.

4. Design and Development of Microprocessor based Cardiac monitor - Institute Interdepartmental - Coordinators Prof. Eswaran, Prof. K.M.Patil and Dr. S. Radhakrishnan.
5. Structural Integrity of Gas Turbine components. (Sponsored by BHEL, Hyderabad), (Value Rs.One lakh two thousand) Coordinator : Prof. R.S. Alwar.
6. Experimental Stress Analysis of Helicopter Landing Grid (For L & T McNeil Ltd., Madras) (Value Rs.75 thousands) Coordinators Prof. R.S.Alwar and G. Thomas.
7. Stress Analysis of Bellows (For Metallic Bellows Pvt. Ltd. Madras) Coordinator Dr. J. Ramachandran.
8. Wake Development in a Longitudinally Curved Stream (ARDB Project, Value Rs.8.6 lakhs) Coordinators Dr. V. Ramjee and Dr. J.L. Narasimhan.
9. Development of pump turbines : Design and analysis of 'S' Cambered profiles for fully reversible axial flow pump turbines. (CBIP Project Value Rs.3.11 lakhs) Coordinators Dr. H.C. Radhakrishna, Dr. V. Balabaskaran and Dr. P.A. Aswatha Narayana.
10. Generation of aero dynamic data for blade section of wind energy system (DNES Project - Value Rs.5.2 lakhs) Coordinators Dr. N.V.C. Swamy and Dr. P.A. Aswatha Narayana.
11. Numerical modelling of complex flows with heat transfer. (NSF Project - Value Rs.17.39 lakhs) Coordinators Dr. K.N. Seetharamu and Dr. P.A. Aswatha Narayana.
12. 3-D conduction code for temperature distribution using FEM for GT blades. (ARDB Project - Value Rs.6.75 lakhs) Coordinators Dr. K.N. Seetharamu and Dr. P.A. Aswatha Narayana.
13. Computer aided design of aerodynamically heated structures. (ARDB Project - Value Rs.8 lakhs) Coordinators Dr. R. Palaninathan, Dr. M. Balakrishnan and Dr. T.K. Bose.
14. VolksWagonStiftung : Dynamic investigation of bladed discs, (1989-90) 78,000 D.M. Coordinators H. Irretier, V. Ramamurti, S. Swarnamani and Mrs. Sujatha.
15. CBIP : Rewitching transients and their effects on the design and operation of large induction motor drives. Rs.6.31 lakhs. Coordinators S.S. Yegnanarayanan, G. Sridhara Rao, C. Venkateshaiya and S. Narayanan.
16. Performance Evaluation of their CSWS. (M/s. General Optics (Asia) Ltd.,

Pondicherry).

17. Analysis of the revolving base unit and the cradle unit. (M/s. Marshall Sons and Co., (I) Ltd., Madras).
18. Performance evaluation of their TFCS items. (M/s. Bharat Electronics Ltd., Madras).
19. Acoustic transmission characteristics of engines and control rooms at HVF, Avadi. (M/s. Saravana Constructions, Bangalore).
20. Noise level measurements on their escalators. (M/s. Otis Elevator Co., (I) Ltd., Madras 18).
21. Sound level measurements at Hazira, Surat. (National Productivity Council, Madras).
22. Performance evaluation and seismic qualification on their control panel. (M/s. Instrumentation Ltd., Palghat, Kerala).
23. Studies on riding comfort for Pallavan Transport Buses. (Institute of Road Transport, Madras).
24. Earthquake qualification and performance evaluation of their pump. (M/s. Khimline Pumps, Ltd., Thana).
25. Vibration analysis of FLWI. (M/s. Brakes India Ltd., Madras).
26. Performance evaluation and earthquake withstand of butterfly valve. (M/s. Fouress Engg. (I) Pvt. Ltd., Madras).
27. Seismic qualification and earthquake withstand test on Junction boxes and field panel. (M/s. Electronics Corporation of India Ltd., Madras).
28. Noise measurements at India Cement Factory, Tirunelveli. (M/s. T.I. and M. Ltd., Madras).
29. Frequency analysis program for fan impellers. (M/s. Thermax (P) Ltd., Pune).
30. Performance evaluation and earthquake withstand test on their panel. (M/s. Crompton Greaves Ltd., Nasik).
31. Performance evaluation and earthquake withstand test on SF6 Circuit Breaker. (M/s. Hindustan Brown Boveri Ltd., Baroda).

32. Four ball tests for reclaimed oils. (M/s. LUCAS-TVS Ltd., Madras).
33. Earthquake withstand test for battery chargers. (M/s. SAB NIFE POWER SYSTEMS LTD., Secunderabad).
34. Vibration test on HF Receivers. (M/s. Electronics Corporation of Tamil Nadu Ltd., (ELCOT), Madras).
35. Analysis and dynamic characteristics of SB dampers. (IAC Electricals Pvt. Ltd., Calcutta).
36. Seismic qualification test on their arresters. (W.S. Industries (India) Ltd., Madras).
37. Seismic qualification and earthquake withstand test on centre break isolator. (S and S Power Switchgears Ltd., Madras).
38. Dynamic analysis of hydrogenerator rotor. (Bharat Heavy Electricals Ltd., Bhopal).
39. Seismic analysis on battery packs. (M/s. SAB NIFE Power Systems Ltd., Secunderabad).
40. Vibration test on insulator string. (W.S. Industries (India) Ltd., Madras).
41. Dynamic response on Tiruvalluvar Transport Corpn. Buses. (M/s. Wheels India Ltd., Madras).
42. Earthquake withstand test on busduct. (KLK Electrical Industries Ltd., Madras).
43. Experimental determination of natural frequencies and mode shapes of PFBR main vessel. (Indira Gandhi Centre for Atomic Research, Kalpakkam).
44. Dyanmic charac. of SB dampers. (Burma Electro Corporation, Jullundhar).
45. Noise level of diesel generator set at MICO. (Motor Industries Ltd., Madras).
46. Stress analysis on battery racks. (M/s. SAB NIFE Power Systems Ltd., Secunderabad).
47. Analysis of stress for the ducts. (M/s. GUHA Systems, Madras).
48. Vibration test on their core pockets. (Crompton Greaves, Bombay).



49. Earthquake withstand test on current transformer. (Bharat Heavy Electricals Ltd., Bhopal).
50. Noise level measurements. (M/s. ITC Ltd., Madras).
51. Seismic qualification and earthquake withstand test on 400 KV SF6 Circuit Breaker. (M/s. NGEF Ltd., Bangalore).
52. Checking of vibration calculations. (International Development and Engg. Associates (P) Ltd., IDEA), Madras).

**(7) New Course Introduced:**

Course No.	Title	Structure	Faculty
AM 643	Boundary Element Method	3 0 0 3	Dr.J.Raamachandran

**(8) Improvement/Development of New Laboratories:**

Work on foot and Hand pressure measurements in Collaboration with Central leprosy teaching and Research Institute has been undertaken. This involves the use of a force platform with online image processing system. In this connection a measurement system for recording and evaluating pressure distribution on flat and curved surfaces has been obtained from West Germany.

Studies on 'Assessment of Scoliosis and Effectiveness of different treatment modalities' is being carried out. This study combines both theoretical modelling and patient data study. In assessing the patient data an optical scanner has been acquired which gives the profile of the back in 3-planes from which the deformity can be quantified. This study involves participation from the Government Royapettah Hospital, Madras.

Studies on blood flow in capillaries, EEG analysis and Microprocessor based Instrument development for Clinical Diagnosis is also underway.

### **(9) Instruments/Equipment Designed and Developed:**

In a project funded by ARDB, a new blower tunnel facility is designed and fabricated. This tunnel can have two different test sections namely 1000 mm x 330 mm and 400 mm x 300 mm. This test facility will be used to study wake development in a curved flow.

### **(10) Research Publications:**

1. S. Swarnamani and M. Singh  
Erythrocyte aggregation mechanics by ultrasonic scattering technique -  
Biorheology, 26, 847-862, 1989.
2. S. Swarnamani and M. Singh  
Ultrasonic characterization of structural parameters of Fibrosarcome during tumor  
growth and regression in albino rats and its comparison with laser reflectometry -  
Innov Tech Bio.Med Vo.11, No.3, 267-283, 1990.
3. Ramachandran G. and Singh M.  
Cardiac Functional analysis by Laser Speckle Interferometry, J. Optics and Lasers  
Engg. 11, 233-239, 1989.
4. Ramachandran G. and Singh M.  
Three Dimensional Reconstruction of Cardiac Displacement Patterns on the  
Chest Wall During P, QRS and T Segments of ECG by Laser Speckle  
Interferometry, Med. Biol. Eng. and Comp. 27, 525-530, 1989.
5. Singh M. and Ramachandran G.  
Reconstruction of Sequential Cardiac In-plane Displacement patterns on the  
chest Wall by Laser speckle Interferometry, IEEE Trans. Biomed.Eng. Accepted  
for publication.
6. Prakash B., Gowda B.H.L. and Singh M.  
Theoretical analysis of Influence of Shape and Size of the stenosis on steady flow  
through tubes. Monographs on Atherosclerosis, Basel, Karger, 1990, Vol.15,  
pp.240-249.
7. Muralidharan E. and Megha Singh  
Influence of diabetes mellitus on the aggregation mechanism as analysed by He-  
Ne laser light scattering. Clinical Hemorheology, 1990. (Accepted for  
publication).

8. Muralidharan E. and Singh M.  
Optical and rheological parameters of blood and their applications to Cardiovascular disease. Indian Journal of Medical Research, 1990. (Accepted for publication).
9. M. Sukumar and T.M. Srinivasan  
Enhancement of 2D Echocardiographic Images through fuzzy set techniques, IV National symposium on Ultrasonics Sep. 21-22, 1989.
10. R.S. Srinivasan and P.A. Krishnan  
Dynamic analysis of Stiffened Conical Shell Panels, Computers and Structures, Vol. 33, pp.831-838, 1989.
11. R.S. Srinivasan and P.A. Krishnan  
Dynamic Response of Layered Conical Shell Panel using Integral equation technique, Computers and Structures, Vol. 31, pp. 897-905, 1989.
12. R.S. Srinivasan and L.S. Ramachandra  
Axisymmetric Nonlinear dynamic Response of Bimodulus Annular Plates, Journal of Vibration & Acoustics, Trans. of ASME, Vol.112, pp. 202-205, 1990.
13. R.S. Srinivasan and L.S. Ramachandra  
Axisymmetric buckling and post buckling of bimodulus annular plates, Engg. Structures, Vol. 11, pp. 195-198, 1989.
14. R.S. Srinivasan and L.S. Ramachandra  
Large deflection analysis of Bimodulus Annular and Circular Plates using finite elements Computers and Structures, Vol. 31, pp. 681-691, 1989.
15. J. Raamachandran, R. Kartithangarathnam and Palaninathan  
Buckling of composite cylindrical shells, J. Aero soc. Feb. 1989, pp. 47-54.
16. J. Raamachandran and G.C. Bhaskar Reddy  
Bending of Circular Plates supported at number of points, J. of Engg. Mech. Trans ASCE, Feb. 1989, pp. 437-441.
17. J. Raamachandran  
Vibration of Plates using Charge Simulation Method, Proc. 11th Int. Conf. on Boundary Element Methods in Engg. Mass. USA, Aug. 1989.
18. V. Ramjee and D. Neelakandan  
Development of wake of a rectangular cylinder in a curved stream, Experiments in fluids 1989, Vol.7, pp 395 - 399.

19. V. Ramjee, E.G. Tulapurkara and R. Rajasekar  
Development of wakes of a bluff body and a streamlined body in a longitudinally curved stream, 4th Asian Congress of fluid Mechanics, 1989 (August), Hong Kong.
20. V. Ramjee, J.L. Narasimhan and P.M. Diwakar  
Numerical prediction of wakes of different bodies, J. Aero. Soc. India, 1989. Vol. 41, pp 375 - 380.
21. V. Ramjee and D. Neelakandan  
Curvature effects on airfoil wake, J. Aero. Soc. 1990, Vol. 42, pp. 173-180.
22. V. Ramjee and D. Neelakandan  
Curvature effects on wake of an airfoil and other bodies, Fluid Dynamic Research, 1990, Vol. 6, pp. 1-13.
23. P.A. Aswatha Narayana  
Comparative representation of the complete smooth wall velocity profile in a turbulent boundary layer, J. Aeronautical Society of India, 41, 431-434, 1989.
24. S.G. Ravikumar, P.A. Aswatha Narayana, K.N. Seetharamu and B. Ramaswamy  
Laminar flow and heat transfer over a two-dimensional triangular step, Int. J. for Numerical Methods in fluids, 9, 1165-1177, 1989.
25. S.G. Ravikumar, K.N. Seetharamu and P.A. Aswatha Narayana  
Performance evaluation of cross flow compact heat exchangers using finite elements, Int. J. Heat Mass Transfer, 32, 889-894, 1989.
26. S.G. Ravikumar, P.A. Aswatha Narayana, Sriram Nilakantan, K.N. Seetharamu and B. Ramaswamy  
Finite element analysis of flow over a square step with heat transfer, Seventh International Conference on finite element method in flow problems, Huntsville, Alabama, 1989.
27. S.G. Ravikumar, P.A. Aswatha Narayana, K.N. Seetharamu and B. Ramaswamy  
Finite element analysis of convective heat transfer using velocity correction algorithm, Fourth Asian Congress of Fluid Mechanics, Hong Kong, 1989, H29-H32.
28. M.S. Ravishankar, K.N. Seetharamu, P.A. Aswatha Narayana and V.T.V.S. Ramachandra Rao  
FEM analysis of piston insulation in an adiabatic engine, Proc. of the XI National Conference on IC Engines & Combustion, 261-270, Madras, 1989.

29. P.A. Aswatha Narayana  
Turbulent boundary layer flow over rough surface, Conference on Hydromechanics & Water Resources Engg., I.I.Sc. Bangalore, May 1990, 61-68.
30. M. Balakrishnan and G. Anandakumar  
Vortex Lattice Method applied to Performance prediction of horizontal axis wind mills, Presented at 34th ISTAM Conf. at Coimbatore, Dec. 1989.
31. J. Lakshminarasimhan and P.S. Srinivasan  
Prediction of Low speed flow development in diffusers with inlet velocity distortions, JI. of Aero. Soc. of India. Vol.41 pp.413-418, Nov. 1989
32. B.H. Lakshmana Gowda and M. Mohamed Sitheeq  
Effect of interference on the pressure distribution on the ground plane around two low-rise prismatic bodies in tandem arrangements, Applied Scientific Research, The Netherlands, Vol.47, 1990 pp. 129-149.
33. B.H.L. Gowda and M. Mohamed Sitheeq  
Interference effects on the wind pressure distribution on a tall prismatic body in tandem arrangement, Second Asia Pacific sym. on Wind Engineering, Beijing, China, June 1989.
34. B.H.L. Gowda and M. Mohamed Sitheeq  
Interference effects on the wind pressure distribution on a tall prismatic body exposed to high shear velocity profile. 8th Colloquium on Industrial Aerodynamics, Aachen, West Germany, Sep. 1989.
35. B.H.L. Gowda and M. Mohamed Sitheeq  
Effects of interference on the pressure distribution on a three-dimensional bluff body in tandem arrangement. 16th National Conference on Fluid Mechanics and Fluid Power, Kanpur, India. Dec. 1988.
36. B.H.L. Gowda and M. Mohamed sitheeq  
Wind pressure distribution on three-dimensional prismatic bodies. 34th congress of Indian soc. of Theoretical and App. Mech., Dec. 1989.
37. B.H.L. Gowda and M. Mohamed sitheeq  
Interference effects on the wind pressure distribution on low-rise prismatic bodies exposed to high shear velocity profile, 5th National Conference on Aerodynamics, Pune, India, May 1990.
38. Dynamic analysis of heavy duty wheels, V.Ramamurti, Hari Srinivas, R.Sekar, S.Sekar and S.Sivakumar, Computers and structures, Vol.31, N2, pp.275-285 (1989).

39. Dynamic stress analysis of rotating turbo machinery bladed systems, V.Omprakash and V.Ramamurti, Computers and structures, Vol.32, N2, pp.477-488 (1989).
40. Design aspects of continuous sugar centrifugals-A critical study, V.Ramamurti, C.Sujatha & S.Swarnamani, Int.Sugar Journal vol.91, pp.124-129(1989)
41. Automatic mesh generation in 2D and 3D objects, K.Nagesh, A.Srikant and V.Ramamurti, Advances in Engg.Software, vol.11, N1, pp.19-25 (1989).
42. Dynamics of roller clutch sleeve, V.Ramamurti and N.C.Narayanan, Computers and structures, vol.33, N2, pp.403-410 (1989).
43. Transient characteristics of a bladed disc during run-up during partial admission, V.Omprakash and V.Ramamurti, Proc. 12th Biennial Vibr. Conf., vol.DE 18-3, pp.249-254, J. Vibration, Acoustics, Stress and Reliability in design, Trans. ASME, to appear).
44. Two plane in situ balancing, V.Ramamurti and Kumaran V. Anantharaman, Jou. of Sound and vib., vol.134, N2, pp.343-352 (1989).
45. Stress analysis of circular cylindrical shells with flange and rib assemblies using cyclic symmetry, M. Ananda Rao, V.Ramamurti and R.V.Dukkipati, Proceeding of the 8th Biennial Failure prevention and reliability Conf., Montreal, Sept. 1989, DE 16, pp.187-194, published in Trans. C.S.M.E., vol.13, N3 (1989)
46. Design parameters of fabricated girth gears, V.Ramamurti, S.Murugan and B.Shanker, TIZ International Powder Magazine, vol.113, No.9, pp.739-742 (1989).
47. Comparative performance of isotropic and composite bladed discs, P.Seshu and V.Ramamurti, Proc. 15th Design automation Conf., DE 19-3, pp.187-194; J. of Mechanical Design, Trans. ASME, (to appear).
48. Erythrocyte aggregation mechanics by ultrasonic scattering technique, S.Swarnamani and M.Singh, Biorheology, 26, 847-862 (1989).
49. Modelling of R-C-P-R-C Spatial mechanism for its kinematic analysis using Danavit-Hartenberg transformation matrix, K.V.Sri Ramarao, B.V.A.Rao and T.Nagarajan, Modelling simulation & control, B, vol.25, No.3, pp.35-43 (1989).
50. Stochastic optimal control of nonstationary response of a single degree of freedom vehicle model, S.Narayanan and G.V.Raju, Journal of Sound and vibration, Vol. 140(3),1990

51. Chaotic vibration in nonlinear oscillator with coulomb damping, S.Narayanan and K.Jayaraman, Journal of Sound and vibration, Vol. 143,(1990).
52. Lanczos method applied to solution of eigen value problems of cyclic symmetric structures, D.G. Mangsuli and V.Ramamurti, Computers and structures, 1990.
53. Optimal independent modal- Space control of flexible beam subjected to constant disturbance, K.Venkatraman and S.Narayanan, Jou. of Sound and vibration, 1990.
54. Cyclic symmetric analysis of fabricated gear wheels, V.Ramamurti, S.Murugan and B.Shankar, Proc. 15th Design automation Conf., ASME, 17-20, Sept., Montreal, 1989, vol.DE 19-3 pp.253-258. (to appear in Jou. of Mech. Design, Tran. ASME).
55. Structural dynamic analysis of composite beams, J.K.Suresh, C.Venkatesan and V.Ramamurti, Jou. of Sound and vibration (1990).
56. On the principle of cyclic symmetry in machine dynamics, V.Ramamurti and P.Seshu, Comm. Applied Numerical methods (1990).
57. Analysis of macro and micro structures of normal and pathological tissues by ultrasonic Backscattering, S.Swarnamani and M.Singh, Med. Biol. Engg. & Computing, 1990.
58. Ultrasonic characterization of structure and mechanism of tumor growth and regression in Albino rats and comparison with Laser reflectometry data, S.Swarnamani and M.Singh, Innov. Tech. Biol. Med. (1990).
59. Coupled free vibration characteristics of rotating tuned bladed disc systems, V. Omprakash and V.Ramamurti, Jou. of Sound and vibration, vol.140, No.2 (1990).
60. Chaotic motion in nonlinear system with coulomb damping, S.Narayanan and K.Jayaraman, Invited paper presented at IUTAM symposium on Nonlinear dynamics in engineering systems, Aug.21-25, 1989. Will be published in the proceedings by Springer-Verlag, Berlin, Heidelberg, W.Germany.
61. Control of chaotic oscillations by vibration absorber, S.Narayanan and K.Jayaraman, Proc. 12th Biennial ASME conf. on Mechanical vibration and noise, Montreal, Canada, DE vol.18-5 (1989).
62. Earth quake analysis of high voltage circuit breaker, V.Ramamurti, L.Balasubramanian and Amrit Thomas, Proc. of 7th International Modal analysis conference, Las Vegas, pp.208-212 (1989).

63. Vibration response of Buses, C.Sujatha and V.Ramamurti, Proc. of the fourth Int. conf. on CAD, CAM, Robotics and factories of future, New Delhi, vol.1, pp.334-346, Dec. 1989.
64. Free vibration studies on turbine stage using cyclic symmetry, A.S.Panwalkar, A.Rajamani and V.Ramamurti, Int. conf. on Engg. software, New Delhi, pp.459-466, Dec. 1989.
65. Active control of nonstationary response of a 2-DOF vehicle model, G.V.Raju and S.Narayanan, Int. congress on recent developments in air and structure borne sound and vibration, held in Auburn, USA, March 6-8, 1990, pp.687-694.
66. Active vibration control of flexible structures subjected to arbitrary excitation, K.Venkatraman and S.Narayanan, Int. congress on recent developments in air and structure borne sound and vibration, held in Auburn, USA, March 6-8, 1990.
67. Influence of taper on acoustic radiation, A.Ramachandraiah, N.Ganesan and B.V.A.Rao, ASME Winter annual meeting, 1989, San Fransisco.
68. Kinematic analysis of R-C-P-R-C spatial mechanism, K.V.Sri Ramarao, B.V.A.Rao and T.Nagarajan, Proc. Vth IFTOMM symposium on linkages and computer design methods, Bucharest, Romania, vol.II 2, pp.567-577 (1989).
69. Some studies on passive damping aspects of plates, A. Ramachandraiah, N.Ganesan and B.V.A.Rao, Int. congress on recent developments in air and structure borne sound and vibration,
70. Studies on variable cross sectional beams and plates using BEM, A. Ramachandraiah, Randheer Reddy, N.Ganesan and B.V.A. Rao, Int. congress on recent developments in air and structure borne sound and vibration, Auburn, USA, March 6-8, 1990.
71. Study of plate radiation in an enclosure using FEM, A.Ramachandraiah, N.Ganesan, G.Muthuveerappan and B.V.A.Rao, Int.congress on recent developments in air and structure borne sound and vibration, Auburn, USA, March 6-8, 1990.
72. Fault diagnosis of roller bearing through mechanical signature analysis, Ali Zabihi, S.Swarnamani and B.S.Prabu, Int. Conf. on signals and systems, AL-AIN (U.A.R.), Jan. 27-29,1990.



73. Active vibrational control of Mechanical systems subjected to orbital excitation, K. Venkatraman and S.Narayan. Int. Conf. on signals and systems, RABAT (Morocco), April 9-11, 1990.
74. Disturbance counteracting controllers for disturbed parameter systems, K.Venkataraman and S.Narayanan, Int. conf on Advances in structural testing, analysis and design, Bangalore (India), 29 July-03 August, 1990.
75. Effect of fictitious rotational stiffness coefficient on natural frequencies, P. Seshu and V. Ramamurti, Journal of Sound and Vibration, vol.133, n1, pp.177-179 (1989).
76. Design parameters of continuous sugar centrifugals, V.Ramamurti, Y.Ramakrishna and K.S. Ramaprasad, Jou. of Engg. for Industry, ASME, vol.111, N3, pp.291-294 (1989).
77. Vibration of twisted composite plates, P. Seshu and V.Ramamurti, J. of Aero. Soc. of India, V41, N1, pp.65-70 (1989).
78. Kinematic analysis of R-C-P-R-C spatial mechanism, B.V.A. Rao, T.Nagarajan and K.V.Sri Rama Rao, J. of Aero. Soc. of India (to be published).
79. Vibration of Composite plates with contacts, S.K.Malhotra, N.Ganesan and M.A.Veluswami, Jou. of Aero. Soc. of India, vol.41,
80. Axisymmetric vibration of polar anisotropic anealed plates of linearly varying thickness, V.Soamidas and N.Ganesan, Jou. of Aero. Soc. of India, vol.41, pp.75-80 (1989).
81. The accuracy of the conventional adiabatic characteristics of plain journal bearings, B.S.Prabhu and C.Rajalingham, NCIT, Trivandrum, 1989.
82. Influence of thermal aspects on the non-newtonian lubrication of journal bearings, B.S.Prabhu and C.Rajalingham, NCIT, Trivandrum, IV 3.1-3.6, (1989).
83. Finite element analysis of turbine rotor journal bearing, NCIT, J. Mathew, H.S.Kushwahi and B.V.A.Rao, Trivandrum (1989).
84. Performance of re-refined oils, Ramesh V. Rao and B.V.A.Rao, NCIT, Trivandrum (1989).
85. Inspection intervals for a multistate condition maintained system, N.D.Choudhry and B.V.A.Rao, Organised by LAPQR, New Delhi (1989).

86. Feasibility studies for maintenance and monitoring of induction machines, Ali Zabihi and B.S.Prabhu, AL-AZHAR Engg. 1st Conf.(Cairo) (AEC-89) Dec. 9-12, 1989, Egypt.
87. Optimal active suspension of a two degrees of freedom vehicle model and frequency response, G.V.Raju and S.Narayanan, 7th ISME Conference on Mechanical Engineering, New Delhi, Feb.1-3 (1990).
88. Interpolated cell mapping for nonlinear dynamical systems, K.Jayaraman and S. Narayanan, National conference on Methods in continuum mechanics, Madras, Jan. 1990.
89. Active suspension for control of transient non-stationary vehicle response, S. Narayanan and G.V. Raju, National Seminar on Aerostructures, Bangalore, (1990).
90. Periodic and chaotic responses of nonlinear oscillator in fluid flow, K. Jayaraman and S.Narayanan, National Seminar on Aerostructures, Bangalore, (1990).

# CHEMICAL ENGINEERING

## (1) Visit of Faculty Members to other Institutions:

NAME OF FACULTY	INSTITUTIONS VISITED/PURPOSE OF VISIT/DURATION
Prof. Y.B.G. Varma Prof. Ch. Durgaprasada Rao Dr. K. Krishnaiah	Visited twice Karnataka Regional Engineering College, Surathkal to help in setting up of laboratories
Prof. M.S. Ananth Prof. M. Satyanarayana Prof. T. Venkatram Prof. N. Subramanian Dr. N.R. Neelakantan Prof. A. Baradarajan Dr. T. Panda	Visited Karnataka Regional Engineering College, Surathkal to help in setting up of laboratories

## (2) Participation in Seminars/Symposium/Short term courses:

Dr. A. Baradarajan Dr. T. Panda Dr. T.K. Ramanujam Dr. N.R. Neelakantan Dr. D.V.S. Murthy Dr. T. Venkatram	Participated in IChE Annual Conference 1989 at Trivandrum
Dr. K. Krishnaiah	Attended a 3 day course on Reaction Engg. given by Prof. S.P. Waldrum, University College of London arranged by IChE

## (3) Visitors to the Department:

Dr. Ranganarayanan, University of Florida, USA.

Dr. Keuchel, Ruhr University, Bochum, FRG.

Dr. M. Lalithkumar, Vice-President, Suprex Corporation, Pittsburg PA 15238, USA.

Dr. T. Shivaji Rao, Professor, Department of Chemical Engineering, Andhra University.

Dr.N.N.Bakshi, Professor, Department of Chemical Engineering, Univ. of Sakatechewan, Saskatoon, Canada S7N OWO.

#### **(4) Seminar/Symposium Organised by Department:**

A two week Winter School on 'Air-Pollution Monitoring and Control' sponsored by ISTE.

#### **(5) Quality Improvement Programme:**

During the year one teacher completed his M.Tech.course and two completed their Ph.D.Programme.Two teachers joined Ph.D. programme. Currently two teachers are pursuing the M.Tech.course and one teacher in Ph.D. programme.

#### **(6) Instruments/Equipment Designed and Developed:**

A Turbulent Contact Absorber (TCA) has been designed and developed for simultaneous removal of dust and pollutane gases from flue gases.

A high temperature fluidized bed has been constracted and used for treatilng super conducting powders for enrichment of their oxygen content.

#### **(7) List of papers published:**

1. Y.Pydisetty, K.Krishnaiah and Y.B.G.Varma, "Axial Dispersion of Solids in a Spiral Fluidized Bed", Powder Technol, 59, 1 (1989).
2. C.A.Sastry, "Bacterial Self Purification of Water Bodies". Biology Education 6(1)/January - March, 1989.
3. Y.V.Subramanyam and C.A.Sastry, "Two stage upflow anaerobic filter for the treatment of partially treated distillery waste water",I.J.E.P.,Vol.9, No.5, May, 1989.
4. P.V.Venkateswara Rao and C.A.Sastry, "Charging of submicron Aerosols by Uni-Polar Ions", Indian Journal Env.Protection, Vol.9, No.7, July 1989.
5. C.A.Sastry, "Microbial changes induced by Inorganic Pollutants", Biology Education, October - December, 1988.
6. C.A.Sastry, "Environment and Development", J.Indian, Assoc. for Env.Management, Vol.16, No.1, 1989.

7. T.P.Ramachandran, P.D.Devika and M.S.Ananth, "Self-consistent local composition theory for the excess free energy of non-electrolyte mixtures", *Advances in Chemical Engineering, Proceedings of ICACE held between 4th and 6th Jan., 1989 at I.I.T.Kanpur, Edited by D.N.Saraf and D.Kunzru, Tata McGraw Hill, 1989, pp. 360-368.*
8. T.P.Ramachandran, Sunder Ramachandran and M.S.Ananth, "Isothermal (vapour + liquid) Equilibria of Three Binary Mixtures at Four Temperatures, *J.Chemical Thermodynamics* 21, 131-138, 1989.
9. M.S.Ananth and Sunder Ramachandran, "Self-consistent Local Composition Model of Electrolyte Solutions", Accepted for publication in AICHE.
10. T.P.Ramachandran and M.S.Ananth, "Isothermal VLE of (4 methyl pentane 2-one + pyridine + 1,4 dioxane) at four temperatures, Accepted for publication in *J.Chemical Thermodynamics*.
11. D.Sengupta, K.A.Reddy and G.S.Davies, "Energy Conservation Studies on Existing Industrial Heat Exchanger Networks - A Case Study", *Journal of Institution of Engineers (India), Part CH2, Vol.70, pp 48-54 (1989).*
12. Richard H.Duncan and G.S.Davies, "Alkylation of DNA Bases by Carcinogenic N Nitrosoamine Metabolites - A Theoretical Study", *International Journal of Quantum Chemistry Vol.XXXV, pp.665-677 (1989).*
13. Richard H.Duncan and G.S.Davies, "Mechanistic clues to the Mutagenicity of Alkylated DNA Bases - A Theoretical Study", *Journal of Theoretical Biology, Vol.140(3), pp 345-354 (1989).*
14. Richard H. Duncan and Gerard S Davies, "The Product Distribution of DNA base Alkylation by N.Nitroso Compounds an INDO SCF MO Theoretical Study", *J.Chem.Soc., Perkin Trans 2 pp 2127-2131 (1989).*
15. S.Deepak & T.Venkatram, "Short cut methods for the computation of Heat Transfer data in the Design of Vapor-noncondensable gas condensers", *Indian Chemical Engineer* 31(2), Trans. 75-78, (1989).
16. P.Salam Rajendra Babu & T.Venkatram, Immobilization of Amylase and Gluco-amyase on a modified cellulose Matrix", *Indian Chemical Engineer* 31(2), Trans. 49-54 (1989).
17. S.Deepak & T.Venkatram, "Thermal design of condensers with different components of steam-non condensable gas systems", *Indian Chemical Engineer* 31(4), 12-16 (1989).

18. P.Salam Rajendra Babu & T.Venkatram, "Biochemical Pathways for the conversion of starch to Ethanol", Proc.National Seminar on Bioconversion of Agro-cellulosic Residues, Visakhapatnam 20pp (Oct.1989).
19. Effect of oxide additives on the properties of high temperature super conductor YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub>-K.D.Chandrasekaran, V.V.Varadarajan, A.Baradarajan & G.V.Subba Rao, - Bulletin of Maths Sc. 12(1) 81-93 (1989).
20. Enrichment of oxygen of YBa<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> using fluidization technique - V.V.Varadarajan, G.V.Subba Rao, K.D.Chandrasekaran, A.Baradarajan and others -Bulletin of Mat.Sc., 12(1) 63-80 (1989).
21. Studies on a tubular flow reactor with motionless mixing elements - K.Balu, A.Baradarajan and M.Satyanarayana - Modelling, Simulation and Control B 23(2), 17-32 (1989).
22. Studies on coimmobilization of amyloglucoxidase and *S.cerevisiae* for direct conversion of starch to ethanol - Process Biochemistry December, 1989.
23. D.V.S.Murthy, A.P.Rao, "Effect of binding agents in NP granulation", Indian Journal of Technology, Vol.27, pp 121-124, 1989.
24. G.V.Subba Rao, U.V.V.Raju, K.D.Chandrasekharan, K.Krishnaiah etc. "Oxygen Enrichment of YBa<sub>2</sub>CU<sub>3</sub>O<sub>7</sub> using the Fluidization Technique", Bull. Mater. Sci. 12(1), 63-80 (1989).
25. Y.Pydi Setty, K.Krishnaiah & Y.B.G.Varma, "Axial Dispersion of Solids in spiral fluidized beds", Powder Technol. 59, 1-9 (1989).
26. Ramachandra Rao, V.S., Thurner, F.Schlunder E.U."Convective Drying of Porous materials", Indian Chemical Engineer, July - September, 1989, vol.XXX1, No.3, pp.22-26.
27. Ramachandra Rao, V.S. "An Alternative Method of Evaluation", The open-page on Education, The Hindu (Tuesday, 03.10.1989).
28. T.Panda, V.Thukral & S.Dey, "Multiple pH and temperature optimum of extracellular xylanase from T.reesei QM 9414:Bioprocess Engg. (FRG), 4, 43-45, 1989.
29. T.Panda, V.S.Bisaria & T.K.Ghose, "Method to estimate growth of T.reesei & A.wentii in mixed culture on cellulosic substrates: Appl.Environ. Microbio. (USA), 55 (4), 1044-1046, 1989.

30. T.Panda, "Simulation of shake flask conditions in a bioreactor for the biosynthesis of cellulase & xylanase by a mixed culture of T.reesei D1-6 & A.wentii Pt 2804, Process Biochemistry (UK),24(8), 104-108, 1989.
31. A.R.Balakrishnan and K.G.T.Hollands, "Spectrally selective surface for solar energy applications", Regional Journal of Energy, Heat and Mass Transfer, Vol. 10. No.4, 1988.
32. Two papers accepted for publication: one in International J. of Energy Research and the other in Powder Technology. Details will be furnished in next year's FAP.
33. A.Baradarajan, P. Padmini and S.K.Rakshit, "Studies on the fermentations production of Lipase", Indian Chemical Engineer (Accepted for publication 11.10.89)
34. S.K.Rakshit, H.J.Prabha and A.Baradarajan, "Studies on Biomethanation of water hyacenth", Research and Industry (accepted for publication 25.1.90).
35. S.K.Rakshit and V.Sahai, "Optimal control strategy for production of cellulase enzyme lusing the new mutant T.reesei E-12", Bioprocess Engineering Vol.6/2, Prospective date of actual publication, February 1991.
36. S.K.Rakshit and V.Sahai, "Cellulase production by a partiallycatabolite resistant mutant of T.reesei", J. of Gen. & Applied Microbiology, Vol.31, No.6, 1990.

#### (8) List of papers presented:

##### A.In International Conferences/Seminars:

1. Satyanarayana, M. "Mass Transfer considerations in fixed bed immobilised enzyme reactor" - Int. Symp. on Biotech. Health & Environment - Aug.89 at Boston, Proceedings yet to come.
2. Satyanarayana, M. "Vitamin B12 fermentation from cane molasses", Int. symp. on Biotech., Health & Environment, Aug.89 at Boston, Proceedings yet to come.
3. Ramachandran T.P., Devika P.D. and Ananth M.S., "Self consistent local composition theory for the excess free energy and enthalpy of non-electrolyte mixtures" presented at the Int.Conference on Advances in Chemical Engineering held between 3rd and 6th Jan. 89 at IIT Kanpur.
4. Chithra N. and Baradarajan A., "Modelling of Biochemical Reactors", Int. ASME Conference in Signals and Systems, Miami, Florida, March 7-9, 1989.

5. Chithra N. and Baradarajan A. "Studies on Simultaneous saccharification and fermentation of starch in a continuous flow reactor", Accepted for presentation at the 9th Miami Int. Congress on Energy & Environment, Dec. 11-13, 1989, Miami, USA.
6. Mathew J., Babu, P.S.R. & Panda T. "Studies on the dynamics of mixed culture fermentation of T.reesei and A.wentii and its necro-trophic character during the synthesis of cellulase", 4th Int. Conf. on Biotechnology in the Pulp & Paper Industry, Raleigh, North Carolina State Univ. USA, May 16-19, 1989.
7. Babu P.S.R. & Panda T. "Utilization of phenylacetic acid containing waste for the biosynthesis of penicillin amidase", 9th Miami, Int. Cong. on Energy & Environment, Miami, Florida, USA, Dec. 11-13, 1989.
8. Velan M. and Ramanujam T.K., "Comparison of gas hold up Studies in Reverse Flow Jet Loop Reactor with Newtonian and non-Newtonian fluids", Proceedings of Asian Bio-Chemical Engineering Conference, Kyungju, Seoul, South Korea, 1990.
9. Bhavsar, V.C. & Balakrishnan, A.R. "Latent Heat Thermal Storage for Solar Thermo-Electric Power Systems"; 9th Miami Int. Cong. on Energy and Environment, Miami Beach, Florida, USA, 11th -13th Dec. 1989.

**B. In National Conferences/Seminars:**

1. Satyanarayana M. "Biosynthesis of Vitamin B12 - Training Program for Industrial Personnel in 'Process Tech. in Biological industries' May 1989 at Madras.
2. Giri T.V. & Satyanarayana M. "Modelling of Vitamin B12 fermentation, 42nd Annual Session of IChE, Dec. 89 at Trivandrum.
3. Reji John, Neelakantan, N.R., Subramanian, N. & Athithan, S.K., "Rheological Studies related to curing reaction of ISRO-Polyol with TDI", Chemcon 1989, Dec. 1989, Trivandrum.
4. Nelson, T.J., Subramanian, N., & Srinivasan, P.R. "Morphology and Mechanical properties of Nylon/LDPE blends", Chemcon 1989, Dec. 1989, Trivandrum.
5. Subramanian, N.: (i) Rheology of polymers (ii) Mixing in Polymer Processing, ISTE Winter School in Technical Processes in Polymer Industries, Oct. 1989, Mysore.
6. Subramanian, N. "Energy - its production and storage, ISTE Winter School on Nonconventional Energy resources - Technology and Management Dec. 1989, Trichy.



7. Sastry, C.A. Plenary lecture on "Industrial waste biodegradation" National Con. of Chem. Engg., Trivandrum, Dec. 1989.
8. Babu Rao, K. Venkata Rao, K., & Durgaprasad Rao, Ch. "Modelling and Simulation of Retrograde Pipeline New Work", Seminar of Math. Modelling, Bangalore, June 1989.,
9. Babu, P.S.R. & Venkatram, T. "Biochemical Pathways for the conversion of Starch to Ethanol", National Seminar on Bioconversion of Agro/Cellulosic Residues to Energy, Food & Chemicals, Oct. 9, Andhra Univ.
10. Chandrasekharan, R. & Venkatram, T. "Heat Transfer coefficients during the condensation of Organic vapors on DTFE coated and plain mild steel substrates", 42nd IChE Conference, Dec. 89, Trivandrum.
11. Chithra, N. & Baradarajan, A. "Modelling of packed bed coimmobilized biochemical reactor", 2nd National Symp. on Math. Modelling and Simulation in Chemical Engg., IISc., Bangalore July 89.
12. Prabhu, H.J., Rakshit, S.K. Baradarajan, A. & Satyanarayana, M. "Recent Trends in Biomethanation processes", Bioconversion of Agro residues for Energy, Food & Chemicals, Andhra Univ., Oct. 89.
13. Prabhu, H.J. Rakshit, S.K., Baradarajan, A., & Satyanarayana M. "Some aspects of Lignocellulosics to Ethanol Process", Bioconversion of Agro residues for Energy, Food & Chemicals, Andhra Univ., Oct. 89.
14. Padmini P., Rakshit, S.K. & Baradrarajan, A. "Application of Imm. Lipase to hydrolysis of Rice bran oil", Indian them .Engg. Congres, 1989.
15. Subba Rao, S. "Capacitance Model to Simulate Dispersion dening Miscible Displacement in Porous Media", Ind. Inst. of Chemical Engineers, Trivandrum, Dec. 89.
16. Reji John, Neelakantan, N.R., Subramanian, N., & Athithan, S.K. "Rheological Studies related to curing reaction of ISRO Polyol with TDI Ind.Chem.Engg.Cong., Trivandrum. 1989.
17. Karunakaran, V.V., Neelakantan, N.R., & Govindaraman, K.N. "Microceleular Polyurethane Elastomers Based on ISRO polyols & other Polyols, Ind.Chem.Engg.Cong.1989, Trivandrum.
18. Gopakumar, B. & Ramanujam, T.K. "Rotating Biological Contactor for Dairy waste water Treatment", National Symp. on 'Impact of Pollution in and from food industries & its management' May 89, Mysore.

19. Velan, M. & Ramanujam, T.K. "Hydrodynamics of reverse jet loop reactor", Indian Chem.Engg. Cong. Annual Session, IChE.89, Trivandrum, Dec.89.
20. Gopakumar, B. & Ramanujam, T.K. "Removal of Organics and Ammonia-Nitrogen using Rotating Biological Contactor", Ind.Che.Eng.Cong., Annual session of IChE. Dec. 89, Trivandrum.
21. Murthy, D.V.S. "Solid waste management", Seminar on Profits from waste and effluent management in industry, by confederation of Engg. Industry Southern region, Nov.89, Madras.
22. Lila Manuel, M., Chandrasekharan, K.D., Raju, U.V.V. & Krishnaiah, K. "Oxygen Enrichment of high temperature (High Tc) Super conductor Yttrium Barium copper oxide ( $YBa_2Cu_3O_7$ ) using Fluidized Bed Reactor", 42nd IChE Annual Conference, Trivandrum, Dec. 89.
23. Vaidyanathan, N., Venkatesh, K.V., Soundararajan, K. & Krishnaiah, K. "Hydrodynamic studies in a Turbulent contact Absorber", 42nd IChE Annual Conf., Trivandrum, Dec.89.
24. John Kirubakaran, C., Seshadri, S.K. & Krishnaiah, K. "Some Studies on activated carbon production from coconut shells using a fluidized bed reactor", 42nd IChE Annual Conf. Trivandrum, Dec. 89.
25. Panda, T. "Studies on the development of reactor for mixed fungal interaction during the growth of T.reesei QM 9414 and A.wentii Pt 2804", Abst.in 29th Annual Conf.of Association of Microbiologists of India, Haryana Agri. Univ. 1989.
26. Babu P.S.R. & Panda, T. "Pencillin amidase-origin, selection and improvement", Abst. in Seminar on Recent Advances in Biochemical Engg., Banaras Hindu Univ. 1989.
27. Babu PSR., & Panda, T. "Immobilized pencillin amidase", Abst. in Seminar on Recent Adv. in Biochemical Engg. BHU, Feb. 1989.
28. Babu, PSR., & Panda, T "Effect of aeration on the biosynthesis of pencillin amidase in E.coli", CHEMCON '89 (42nd Annual Session of IChE), Trivandrum 1989.
29. Anjani Kumari, J. & Panda, T. "Protoplast fusion - An integrated approach", CHEMCON '89, 42nd Annual Session of IChE., 89 Trivandrum.
30. Singh, S., Babu, PSR., Prakash, J. & Panda, T. "Process development for volatile fatty acids biosynthesis using cowdung and condensed tannin ", Trivandrum 1989.

31. Rakshit, S.K. & Sahai, V. "Modeling and Optimization of cellulase biosynthesis using a mutant of T.reesei E12", 2nd National Symp. in Modelling and simulation in Chem.Engg. IISc., Bangalore, July 1989.
32. Sadasivamurthy, P. & Rakshit, S.K. "Extractive fermentation of acetone - butanol-ethanol by Clostridium acetobutylicum using lignocellulosic residues, National seminar on bioconversion of agro cellulosic residues to energy, food & chemicals, Andhra Univ. Oct. 1989.

### **9. Development and Planning:**

Construction work of Environmental Engineering Laboratory has been started. M.Tech. courses have to be modified and reduced to 4 specializations. Starting of a centre of Process Synthesis and Equipment Development/Engineering Experimental centre using the facilities available in the Department is thought of.

## CHEMISTRY

### (1) HONOURS AND AWARDS:

<u>Name of the award</u>	<u>Designation</u>	<u>Honour</u>
Best Research paper	Dr.T.S. Chandra Asst. Professor	Cash Prize of Rs. 250/-
S.R. Palit Award	Dr.P.T.Manoharan	Awarded for Physical Chemistry
Best paper Metals & Plastics publica- tions Hacken Sack New Jercy, USA.	Dr.N. Bala- subramanian	Cash award \$ 225

### (2) VISIT OF FACULTY MEMBERS TO OTHER INSTITUTIONS:

<u>Name of Faculty</u>	<u>Institution visited/purpose/duration</u>
M.SRINIVASAN	M/s.Shriram Fibres, Manali, Madras. Chief of R and D (2 years)
S. VANCHEESAN	University of Alabama, Birmingham, USA. Fulbright visiting fellow.
K.K.BALASUBRAMANIAN	CLRI, Madras - 20. Invited Lecture under "Dr.Naidumma Memorial Lecture Series for 1989"  Calcutta University. Invited Lecture in the "UGC Symposium on natural products organised by Science College, Calcutta . University, March 1989.
R.NARAYAN	Invited lectures at 1. Electrochemical Society of India, Bangalore, July 1989.  2. University of Jodhpur, Dec.1989.

M.N.S.RAO

Invited lectures at

1. American College, Chemistry Department, Madurai.
2. Dept. of Chemistry, Gulburga
3. Chemistry Dept., Central University, Pondicherry.

**(3) PARTICIPATION OF FACULTY IN CONFERENCES/SEMINARS/SYMPOSIA:**

<u>Name of Faculty</u>	<u>Conference on, Type of participation, Name of University &amp; Dates.</u>
M.S. GOPINTHAN	Discussion meeting on Electronic Structure theory of molecules paper: Development of a fully correlated relation for atoms and molecules. 1-3 Nov.1989, IISc, Bangalore.
T.K.SREEKUMAR AND C. KALIDAS	International Chemical Congress of Pacific Basin Societies, Honolulu, Hawaii, paper - Selective Solvation of copper (II) salts in methanol-DMSO mixtures. Dec.17-22, 1989, Hawaii.
T.S. CHANDRA	29th Annual Conference of Assoc. Microb of India, papers-Energy from anaerobic system, Feb,1989, Hisar.
S. SOUNDAR AND T.S.CHANDRA	Ibid, paper-Novel-avicel absorbing carboxy methyl cellulose from Humicola grisea Fb, Feb 1989, Hisar.
M.V.S MURTHY AND T.S.CHANDRA	Ibid, paper-Xylanolytic and cellulolytic properties of clostridium xylanolyticum. Sp.Nov.Feb.1989, Hisar.
J.A.KUMARI AND T.S.CHANDRA	Ibid, paper Fermentative biosynthesis and microbial degradation of xanthan IM-8 Feb.1989, Hisar
M.V.S.MURTHY AND T.S. CHANDRA	30th Annual Conference AMJ purification of xylanase from clostridium SA IV 1989 Annamalai Nagar.

- G. SUNDARARAJAN  
AND  
V.SHIVASUBRAMANIAN  
International Symposium on olefin metathesis  
- paper -A facile metaahetical polymerization  
of alkynes with group VI metal carbonyl as  
cattalysts September 1989, Univ of Bayreuth FRG.
- H. MAHESWARAN  
G. SUNDARARAJAN  
AND R. RAMASWAMY  
National Symposium on Newer perspectives in  
synthetic organic chemistry-paper-metathe-  
tical polymerization of alkynes with group VI  
metal carbonyls as catalysts under thermal  
and electro-catalytic conditions. March 1990.  
Madurai Kamaraj University, Madurai.
- J.CHRISTOPHER AND  
C.S. SWAMY  
Faraday Discussion on Catalysis by well  
characterized materials - paper: Effect  
of valence state on catalytic activity  
of copper containing ternary oxides.  
April 1989, Liverpool, UK.
- V. PADMASUBHASHINI  
I.A.P.S.MURTHY,  
M.P.SRIDHAR KUMAR  
AND C.S.SWAMY  
Second European Conference on Catalysis  
paper: Intermetallics as potential hydro-  
genation - dehydrogenation catalysts,  
July 1989, Berlin, Spanden.
- J.CHRISTOPHER AND  
C.S.SWAMY  
Fifth National Workshop in Catalysis paper  
Catalytic activity of  $\text{La}_2\text{CuO}_4$ : method of  
preparation and xps study, Dec 1989,  
Bombay.
- V.PADMASUBHASHINI,  
I.A.P.S.MURTHY  
M.P.SRIDHAR KUMAR  
AND C.S.SWAMY  
Ibid, paper: Studies on hydrogen storage  
alloy  $\text{Mg}_2\text{N}_2$  - Catalytic activity and xps  
Dec.1989, Bombay.
- N.V.S.RAMAKRISHNA  
AND D.V.RAMANA  
Second International Conference on heteroatom  
Chemistry paper: Oxidation of sulfur and allenic  
carbons by the ortho nitro group in  
O-nitrophenyl allenyl sulfides on electron  
impact, July 1989 State Univ. of New York at  
Albany, USA.
- P. MAHALAKSHMI AND  
D.V.RAMANA  
14th Annual Symposium in Chemistry.Paper:  
Unusual concerted neutral losses in 2'-  
substituted N-phenyl anthranilic acids on electron  
impact, March 1989, IIT Madras.

**T.V.RAMAKRISNA  
AND K. PALANIVELU**

International Seminar on analytical techniques in monitoring the environment. Paper: Concentration and determination of traces of arsenic and phosphorous in natural waters. Jan.1989 S.V.University, Tirupati.

**SHANTI KRISHNAN  
AND K. LALITHA**

International Conference organised by federation of European microbiological societies, paper: Physiology and metabolic features of a novel methanogenic isolate Oct.89, Marseille, France,

**LIBNU SAUD  
AND N.SUNDARAM**

National Symposium on trends in heterocyclic chemistry - Paper - A new synthetic route to a triazine system, Sept.89.RRL, Hyderabad.

**K.A.REDDY AND  
M.SRINIVASAN**

14th Annual Symposium in Chemistry - Paper Synthesis of aromatic and aliphatic cardo polyamides containing phenoxanthin and thianthrene heterocyclic units, March 1989 IIT Madras.

**K.A.REDDY AND  
M. SRINIVASAN**

Symposium on trends in heterocyclic chemistry - Paper - preparation and properties of thermally stable polyamides from Normal dicarboxylic acids. Sept.1989 Indian Institute of Chemical Technology, Hyderabad.

**K.A.REDDY AND  
M.SRINIVASAN**

Seventh National Symposium and Workshop on thermal analysis - paper - Thermal characterisation and heat resistant polyamides containing double strand heterocyclic unit Oct.1989 Srinagar

**K.K.BALASUBRAMANIAN  
AND T.SUMATHI**

12th International Congress of Heterocyclic Chemistry - Paper - Synthesis of 2-ethonyl-3aryl and 2-ethonyl-3-aryl benzofurans by photochemical transformations Aug.13-17,1989 Israel

- K.K.BALASUBRAMANIAN AND R.SANKARASUBRAMANIAN 2nd International Conference on Heteroatom Chemistry, Paper - Investigations on the Mitsunobu reaction in tertiary systems July 1989 Albany, USA.
- C.N.PILLAI V.PUSHPA AND K.GANESAN 2nd European Conference on Catalysis - paper - Dehydration of Ketones over Zeolites, "G.M.Sewab", July 16-21,1989 Berlin, West Germany.
- C.N.PILLAI First Indo-French Symposium on catalysis by oxides and Zeolites - paper - Synthetically useful organic transformations on oxide catalysts by oxides and zeolites, Dec.5-7,1989 NCL,Pune.
- R.RAMASWAMY AND P.V.LALITHA 4th International Conference on the frontiers of electrochemistry - paper - Potentiometric behaviour of aqueous bromine and its application in the trace determination of certain substances, Nov.14-16,1989 Taj Coramandal, Madras.
- JOYCE MATHEW REGINA XAVIER AND V.MAHADEVAN 14th Annual Symposium in Chemistry - paper - Transition metal ions supported on hydrogel as hydrogenation catalysts, March 1989, IIT Madras.
- K.S.RAMAH AND V.MAHADEVAN Ibid -paper -Electro initiated copolymerisation of a few vinyl monomes with acrylamide,1989, IIT Madras.
- J.SHEILA ANNIE AND P.T.MANOCHARAN 9th ISMAR paper -Analysis of spin flip satellited in the single crystal EPR spectra of Cu doped (n-Bu<sub>4</sub>N) pt (dtsq)<sub>2</sub>, July 1989 Israel.
- J.M.RIFKIND, L.ZHANG A.LEVY AND P.T.MANOCHARAN HALFA Paper - The hypoxic stress on erythrocytes associated with super oxide formation Aug.1989. Israel.
- P.T.MANOCHARAN MTIC Paper -Reconstituted haemoglobin Dec.1989 TIFR,Bombay.



- P.T.MANOCHARAN  
Sym on Chem. dynamics Paper - spin dynamics in biradicals, metal nitroxide systems, Dec.1989 TIFR, Bombay.
- P.T.MANOCHARAN  
Recent trends in Chemistry - Paper - Exchange interactions in metal dithiolenes Dec.1989 Bombay.
- I.BERNARD RUFUS,  
V.RAMAKRISHNAN AND  
B.VISWANATHAN  
International Confernce of Photochemistry in synthesis and catalysis - paper - Metallised CdS as a photocatalyst for the photocatalytic decomposition of aqueous H<sub>2</sub>S, Ferrara, June 1989,Italy.
- "  
2nd IPAC winter conference paper - effect of photodeposition of Ru on PEC properties of Cds.1989, Florida,USA.
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Proceedings on the National Symposium on environmental pollution -chemistry. Paper - photocatalytic decomposition of H<sub>2</sub>S - a pollutant, JNTU, College of Engineering March 1989 Ananthapur, A.P., India.
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Proc 5th National Workshop on Spectroscopic methods in heterogeneous catalysis - paper - Surface characterisation of CdS photocatalyst, Dec.1989 BARC, Bombay.
- K.SUBA AND  
M.R.UDUPA  
5th National Seminar on high energy materials Paper - Thermal Investigations of the reactions in  $KClO_4(NH_4)_2Cr_2O_7$  systems Feb.1989 ERDL,Pune.
- K.SUBA,  
K.ESAKKIMUTHU  
AND M.R.UDUPA  
9th National Symposium on thermal analysis - paper -Thermal decomposition studies of  $K_3Cr(C_2O_4)3.3 H_2O$ .Oct.1989, REC, Srinagar.
- K.SUBA AND  
M.R.UDUPA  
Ibid-Paper-Studies on thermal decomposition of Nickel iodate in presence of MoO<sub>3</sub>, Oct. 1989, REC, Srinagar.

- S.SAMPATH AND  
R.NARAYAN
- National Conference, The Solar Energy Society  
- Paper - PEC Studies with pMOSe<sub>2</sub> in molten amides,  
Dec. 1989, Udayapur.
- N.S.RAMAN,  
B.VISWANATHAN AND  
T.K.VARADARAJAN
- National workshop cum seminar on  
spectroscopic methods in heterogeneous  
catalysis - Paper - Conversion of isopropyl  
alcohol on Y-Ba-Cu oxide system, IR study,  
Dec 1989, BARC ,Bombay.
- S.SAMPATH AND  
R.NARAYAN
- 4th International Conference on Electroche-  
mistry paper- P.T.O.P.E.C. in molten amides  
using layered dichalcogenides, Nov 1989,  
Madras.
- B.SRINIVAS,  
V.R.S.RAO AND  
J.C.KURIAKOSE
- Symposium on Advanced methods for  
characterising the surface/interface of  
materials - paper - XPS characterisation  
of gamma-irradiated LaMnO<sub>3</sub>, Nov.28-30, 1988  
Boston,USA.
- M.SUBHASHINI  
M.S.SUBRAMANIAN  
AND V.R.S.RAO
- Third International Symposium on Drug  
Analysis - paper -Determination of isoniazid  
by radiochloramine-B in pharmaceutical  
preparations May 16-19, 1989 Antwerp Belgium
- B.SRINIVAS,  
V.R.S.RAO AND  
J.C.KURIAKOSE
- Symposium A: Beam-solid interactions:  
physical phenomena - High-Energy Ion  
Irradiation Effects; Phase Formation - paper  
Effect of gamma- Radiation on physico-chemical  
properties of Lanthanum Cobaltate (LaCoO<sub>3</sub>),  
Nov.27 to Dec.2,1989 Boston,USA.
- R.SAI GANESH,  
K.K.BALASUBRAMANIAN  
AND C.S.VENKATA-  
CHALAM
- 4th International Symposium on frontiers of  
electrochemistry (Science and Technology) -  
Paper - Electrochemical behaviour of chloro-  
vinylimines in aprotic media, Nov.1989 Madras.
- V.KAMESHWARA RAO  
C.S.VENKATACHALAM  
AND C.KALIDAS
- Ibid paper Electrochemical reduction of some  
substituted diphenyl hydrozones in dimethyl  
sulphoxide Nov.1989, Madras.

B.VISWANATHAN,  
U.D.MARY AND  
R.P.VISWANATH

5th National workshop on spectroscopic  
methods in heterogeneous catalysis - paper  
photocatalytic dehydrogenation of methanol  
on Pt/TiO<sub>2</sub>, Dec.1989 BARC, Bombay.

T.MOHAN  
M.N.S.RAO AND  
G.ARAVAMUDAN

14th Annual Symposium in Chemistry - paper  
synthesis and Mass Spectral Studies -  
phosphines (ph) (DCA) (PR) 1989 IIT Madras.

C.XAVIER RAJAN AND  
M.N.S.RAO

Ibid paper - Synthesis and u,v visible  
spectral study 1989 IIT Madras.

#### (4) SEMINAR/SYMPOSIA ORGANISED BY DEPARTMENT:

<u>Department</u>	<u>Seminar/Symposia/Short term course Organised</u>
Chemistry RSIC	14th Annual Symposium National Environmental awareness campaign

#### (5) DISTINGUISHED VISITORS TO DEPARTMENT FROM ABROAD:

<u>Name</u>	<u>Affiliation</u>
1. Dr.S.Ishi	Tomakomai National College of Techniques, 443 MISHIKIOHA, TOMAKOMAI, Hokkaido, Japan
2. Dr.Johan C.Van de Grampel	Dept of polymer chemistry, University of Groningen, Holland The Netherlands.
3. Dr. J.H.Block	Director, Fritz-Haber-Institut der Max planck-Gesellschaft, Berlin
4. Dr.M.E.Volpin	Soviet delegate
5. Prof.Ray J.Butcher	Howard University, Washington, USA
6. Prof.V.N.Figgis	University of Western Australia
7. Dr.Karel Klusacek	Institute of Chemical Process Fundamentals, Czechoslovakia
8. Dr.Cooper H.Langford	Concordia University, Canada
9. Prof.R.G.Weiss	Georgetown University, USA.

## (6) IMPROVEMENT/DEVELOPMENT OF NEW LABS:

Low Temperature down to 77K measurements for susceptibility  
-Dr.P.T.Manoharan

## (7) RESEARCH PUBLICATIONS:

1. PRABHA SIDDARTH AND M.S.GOPINATHAN  
"Relationship between valency and heat of molecules atomization". Proc. Ind. Acad. Sci (Chem.Soc)101,37-41,1989.
2. PRABHA SIDDARTH AND M.S.GOPINATHAN  
"Strain in Heterocycles", J.Molec Str187, 169-176,1989.
3. M.VIJAYAKUMAR, N.VAIDEHI AND M.S.GOPINATHAN  
"Fermi and coulomb correlated relativistic local density method for atoms"  
Phys.Rev.A 40, 6839-6851, 1989.
4. T.K.SREEKUMAR AND C.KALIDAS  
"Solvent transport and ion solvation of some Copper (II) salts in methanol-DMSO mixtures", J.Ind.Chem.Soc.56,615, 1989.
5. C.KALIDAS, V.KAMESWARA RAO AND C.S.VENKATACHALAM,  
"Electrochemical behaviour of 2,2 dimethyl-1,3 dioxan-4,5,6 trione and its phenyl derivatives" Bull.Electrochem. 5, 553-8, 1989.
6. D.MURALI MOHAN RAO AND C.KALIDAS  
"Protonation behaviour of dephenylamine in water-DMF mixtures", Bull.Chem.Belg 98, 363-5, 1989.
7. G.RAJENDRAN, T.K.SREEKUMAR AND C.KALIDAS,  
"Preferential solvation of Copper (II) salts in water-pyridine and water-DMSO mixtures", Fluid phase equilibria, 46, 249-88, 1989.
8. S.ARAVAMUTHAN, C.KALIDAS AND C.S.VENKATACHALAM,  
"Electrochemical reduction of 2,3"-dinitrobenzidine in buffered aqueous methanol", J.Appl.Electrochem.,19, 897-900,1989.
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10. S.SOUNDAR AND T.S.CHANDRA,  
"Anaerobic digestion of cellulose by pure and mixed bacterial cultures", J.Indust. Microbiol (USA) No.4,1-8, 1989.
11. M.V.S.MURTHY AND T.S.CHANDRA  
"Isolation and characterization of xylose and xylan-utilizing anaerobic bacteria" J.Microb & Serol (Netherlands) 55, 153-63,1989.
12. G.SUNDARARAJAN AND V.SHIVASUBRAMANIAN  
"Metal clusters and surface science", J.Sci. Ind.Res.48 417-27 1989.
13. M.P.SREEDHARKUMAR B.VISWANATHAN C.S.SWAMY AND V.SRINIVASAN,  
"Decomposition of isopropyl alcohol on oxidised intermetallic compound  $\text{LaNi}_5$ " Ind.J.Chem.28A 19-22,1989.
14. J.CHRISTOPHER & C.S.SWAMY  
"Catalytic decomposition of  $\text{N}_2\text{O}$  in  $\text{La}_2\text{CuO}_4$  in the presence of  $\text{LaNi}_5$  alloy", Reacl Kinet.Catal Lett.39 129-35, 1989.
15. P.SELVAM, B.VISWANATHAN,C.S.SWAMY AND V.SRINIVASAN  
"Surface studies of some hydrogen storage materials" Zeit physik chemie N.F. 164 1199-1206,1989.
16. M.P.SREEDHARKUMAR,B.VISWANATHAN,C.S.SWAMY AND V.SRINIVASAN  
"Interaction of carbon monoxide in the hydrogen storage alloy  $\text{CaNi}_5$ ,Kinectic and surface studies", Reactivity of solids,7 157-66,1989.
17. M.P.SRIDHARKUMAR,B.VISWANATHAN,C.S.SWAMY AND V.SRINIVASAN,  
"Surface properties of  $\text{CaNi}_5$  Hydrogen storage alloy" J.Mat. Sci.24,4387-4391,1989.
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19. P.V.PADMANABHAN, D.V.RAMANA AND S.R.RAMADAS  
"Spiro nitrogen heterocycles from Indan 1,3-dione" Ind. J.Chem 28B, 428-430,1989.
20. D.V.RAMANA N.SUNDARAM AND M.GEORGE  
"Ortho effects in organic molecules on electron impact. Part 15 - Oxygen transfers from nitro group to both sulfur and olefinic double bond in allyl 0-nitrophenyl sulfide" Org.Mass Spectrum., 24 63-65 1989.

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"Ortho effects in organic molecules on electron impact. Part 16 - Novel oxygen transfers from the nitro group to acetylenic carbons in 2-nitrophenylacetylenes", *Org.Mass Spectrum* 24 66-69 1989.
22. D.V.RAMANA AND N.V.S.RAMAKRISHNA  
Ortho effects in organic molecules on electron impact. Page 18 - Novel hydrogen transfer from the methoxy group to acetylenic carbon in 2-methoxyphenyl -acetylene and 2-methoxydiphenyl acetylenes", *Org.Mass Spectrum*, 24 317-322 1989.
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"Ortho effects in organic molecules on electron impact part 19. Competing oxygen transfers from nitro group to sulfur and acetylenic carbons in 2-nitrophenylphenyl-ethynylsulfides", *Org.Mass Spectrum*,24 485-489 1989.
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waters", Ind.J.Env.Protection,9 265-271 1989.
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 "Crystal and molecular structure of chlorotriethanol-aminatocobalt(II)", Acta Cryst. C45, 882-84 (1989).

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"Crystal and molecular structure of bis (dipropyldithiocarbamate) tellurium (II)", Acta Cryst.C 45, 1506-8 (1989).
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"Kinetics of isotopic exchange between chloramine-B and radioactive chlorine" J. Radioanal. Nucl.Chem.Letters135/5/359/371/1989.
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"Determination of carbon disulphide through xanthate by radiorelease method employing radiochloramine-T" J.Radioanal Nucl. Chem. Letters 136/5/325-330/1989.
103. S.SRIMAN NARAYAN AND V.R.S.RAO  
"Determination of hydrogen sulphide and sulphur dioxide in a mixture" J.Radioanal. and Nucl.Chem. Letters 137/2/105-111/1989.

## CIVIL ENGINEERING

### (1) Honours/Award

S.No	Name of the Award	Name and Designation of the Faculty	Department	Date of Award
1.	Marine Engineering Gold Medal for 1989 Institute of Engineers (India)	Dr. H. Raman Professor	Civil Engineering	1.1.90 at Fourth Indian Engg.Conf.
2.	Norman Medal American Society of Civil Engineers.	Dr.A.Meher Prasad Lecturer	Civil Engineering	7.11.90

### (2) Visit of Faculty members to other Institutions

	Name of the faculty	Institution Visited	Purpose of visit and duration
1.	Dr. V.Paramasivam	Nuclear Research Institute Julich, West Germany.	Collaborative Research Programme- Indo-German Bilateral Collaborative Scheme 7.9.1988 to 3.1.1990.
2.	Mr. S. Rajeev	Cornegie Mellon University Pittsburgh, USA.	Indo US Collaborative Research Scheme on Knowledge Based Expert Systems - 22.1.90 to 21.4.90.

### (3) Participation of Faculty in Conferences/Seminars/Symposia, etc

Name of the Faculty & Nature of participation	Particulars of Seminar/ Symposia/Conference	Venue & Date
1. Prof. P. S. Rao Delivered lecture on 330m tall TV Tower	Seminar on Recent Advances in Structural Engineering	Kakinada 18th & 19th March 1989.

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| 2. Prof. P. S. Rao<br>Delivered lecture<br>on behaviour of<br>Concrete at higher<br>temperature.      | National Workshop on<br>Advances in Concrete<br>Technology.  | Ananthapur<br>27th & 28th March 1989       |
| 3. Prof. V.Kalyanaraman<br>Delivered lectures on<br>Expert Systems in<br>Structural Design.           | Expert Systems in<br>Engineering organised<br>by Tata Consultancy<br>Engineers.  | Bangalore March 1989                       |
| 4. Prof. D. J. Victor<br>Chairman Technical<br>Session.   | Third International<br>Meeting on Urban<br>Development - Japan.  | Toyohaslin/Japan<br>16th to 18th July 1989 |
| 5. Prof. C.S. Krishnamoorthy<br>Delivered lecture on<br>Finite Element<br>Method for stress analysis. | Advanced Technical<br>Education Programme -<br>B.H.E.L.  | Trichy<br>June-September 1989.             |
| 6. Dr. V. Tamlarasam<br>presentation of<br>a paper.   | Fiftieth Annual<br>Convention of IRC.  | Ahmedabad<br>October 1989.                 |
| 7. Prof. T.S. Ramanatha Iyer<br>Delivered lectures<br>on geotextiles                                  | International Workshop on<br>on Geo Textiles.  | Bangalore<br>November 1989.                |
| 8. Prof. T. P. Ganesan<br>Organiser   | National Seminar on<br>Housing for Low Income<br>groups  | IIT Madras<br>November 1989.               |
| 9. Prof. C.S. Krishnamoorthy<br>Delivered lecture<br>on Finite Element<br>Method of Analysis.         | Seminar on Finite Element<br>Method organised by<br>Institution of Automobile<br>Engineers and Computer<br>Society of India. | Madras<br>19.11.89                         |
| 10. Prof. T.S. Ramanatha Iyer<br>Presented a paper  | Indian Geo Technical<br>Society.   | Visakhapatnam<br>December 1989.            |
| 11. Prof. C.S. Krishnamoorthy<br>Expert member on<br>National Advisory<br>Committee.                  | International Conference<br>on Engineering Software.   | Delhi<br>4th to 7th December 1989          |

12. Mr. S. Rajeev Delegate	International Conference on Engineering Software.	Delhi 4th to 7th December '89
13. Prof. T.P.Ganesan Keynote speaker	National Seminar on Human settlement.	Annamalai Nagar January 1990.
14. Prof.T.S.Ramanatha Iyer Chairman, Technical Session	Technology 2000 Seminar	Calcutta January 1990.
15. Dr. V. Tamilarasan Presented a paper	Fifth Annual National Convention of Civil Engineers.	Calcutta. 18th to 20th January 1990.
16. Prof.D.J.Victor Chairman, Technical Session.	Sixth Conference of Road Engg. Association of Asia and Australia.	Kulalumpur 4th to 10th March 1990.
17. Prof.T.S.Ramanatha Iyer Inagural address.	National Convention of Civil Architectural Engineers.	Calicut March 1990.
18. Prof. H. Raman Keynote speaker	National Water Resources Day.	Madras April 1990.
19. Prof.Nainan P Kurian Delegate & Chairman for a Technical Session.	International Conference on Structural Engineering Computations.	Bejing, China 25th to 28th April 1990.
20. Prof. T.P.Ganesan Inagural address.	Two day Rowing Seminar on Modular Coordination & Prefabrication.	Anna University April 1990.
21. Prof.P.Kalyanasundaram Delivered lectures on Concrete Technology.	Short Term Course for Housing Board Engineers.	Madras IIT Campus 25.5.90.
22. Prof. H. Raman Keynote speaker.	Indian Water Resources Day, Anna University.	Madras March 1990.

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#### (4) Distinguished visitors to the Department

No	Visitor's name	Affiliation	Purpose of visit
1.	Dr.D.Sriram	M.I.T. Cambridge, U.S.A.	To deliver - Guest lectures in Department of Civil Engg.
2.	Prof.C.V.Giri- javallabhan	Texas Technological University U.S.A.	To deliver - Guest lectures in Department of Civil Engg.
3.	Prof.H.C.Shah	Stanford University, U.S.A.	To deliver - Guest lectures in Department of Civil Engg.
4.	Prof.J.N.Reddi	Virginia Polytechnic Institute and State University, U.S.A.	Participation in programme of Advanced Institute for Finite Element Method.
5.	Prof.S.N.Atluri	Georgia Institute of Technology, Georgia, U.S.A.	Participation in programme of Advanced Institute for Finite Element Method.
6.	Prof.R.D.Cook	University of Wisconsin, Wisconsin, U.S.A.	Participation in programme of Advanced Institute for Finite Element Method.
7.	Prof.B.Engleman	Lawrence Livermore National Laboratory, U.S.A.	Participation in programme of Advanced Institute for Finite Element Method.
8.	Prof.G.W.Mustee	Colorado School of Mines, Colorado, U.S.A.	Participation in programme of Advanced Institute for Finite Element Method.
9.	Dr.A.K.Neighbours	Marshall Space Flight Centre, U.S.A.	Participation in programme of Advanced Institute for Finite Element Method.
10.	Dr.I.S.Raju	Analytical Services & Materials Inc. Hampton, U.S.A.	Participation in programme of Advanced Institute for Finite Element Method.

11.	Prof.P.D.Spanos	Rice University, U.S.A.	Participation in programme of Advanced Institute for Finite Element Method.
12.	Dr.R.K.Dhir	University of Dundee United Kingdom.	Delegate on oneday seminar on durability of concrete.
13.	Prof.L.Christians	Technology University of Berlin, West Germany.	Delivered lecture on Housing for low income groups.
14.	Prof.K.R.Rao	National University of Singapore.	Delivered lecture on Functional Design of Buildings.
15.	Prof.N.S.Trahair	Challis Professor of Civil Engineering - University of Sydney, Australia.	Invited speaker on National Symposium on "Advances in Steel Structures".
16.	Prof.R.Narayanan	The Steel Construction Institute - Ascot, England.	Invited speaker on National Symposium on "Advances in Steel Structures".
17.	Prof.P.J.Dowling	British Steel Professor of Steel Structures - England Imperial College of Science Technology, Pardue University,U.S.A.	Invited speaker on National Symposium on "Advances in Steel Structures".
18.	Prof.Shan Somayaji	University of California at San Louis Obispo. U.S.A.	Visiting faculty in Structural Engineering Lab.
19.	Prof.T.S.Ramanatha Ayyar	Kerala State Department of Technical Education.	Guest faculty.

### (5) Seminar/Symposia/Courses organised by the Department

No	Name of the Seminar/ Symposia/Courses	Coordinator/ Organiser	Duration
1.	Winter School on Functional Design of Buildings - An integrated approach.	Prof.P.Kalyanasundaram Dr.M.S.Mathews	15th to 27th November 1989
2.	ISTE Winter School on Computer Aided Design in Civil Engineering.	Prof.C.S.Krishnamoorthy Mr.S.Rajeev	11th to 22nd December 1989
3.	Seminar on Housing for Low Income groups.	Prof.P.Kalyanasundaram Prof.T.P.Ganesan	27th to 29th November 1989
4.	National Symposium on "Advances in Steel Structures".	Prof.T.P.Ganesan Prof.C.S.Krishnamoorthy	7th to 9th February 1989
5.	National Workshop on Water Resources Project Management.	Prof.H.Raman Dr.S.Mohan	18th to 20th February 1990
6.	Seminar on Durability of Concrete.	Dr.M.S.Mathews	26th April 1990
7.	Short Term Course on Structures for Nuclear Reactor Plants.	Prof.V.Paramasivam Prof.H.Achyutha	18th to 30th June 1990

## (6) Major Sponsored Research Scheme/Consultancy assignments

### A. Sponsored Research

No	Name of the Scheme	Funding organisation & Amount in lakhs	Investigators
1.	Knowledge Based Expert System in Civil Engg.	Indo US Project National Scheme 19.87 lakhs	Prof.CS Krishnamoorthy Prof.N.Rajagopalan Prof.V.Kalyanaraman Prof.P.Kalyanasundaram Mr. S. Rajeev
2.	Expert System Based Engineering of Steel Structures.	Department of Science & Technology - 16.37 lakhs	Prof.V.Kalyanaraman Mr.S.Rajeev
3.	Non-linear Analysis of Fibre Composite Stiffened Plate.	ARDB-Aeronautical Research Development Board - 3.45 lakhs	Prof.V.Kalyanaraman
4.	Local Buckling and Post Buckling Behaviour of Carbon Fibre Composites.	Aeronautical Development Agency - 1.10 lakhs	Prof.V.Kalyanaraman
5.	Research Cell for Structures for Nuclear Power Reactor Technology.	MHRD Plan Scheme Rs. 15 lakhs	Prof.V.Paramasivam Prof.H.Achyutha
6.	Water Resources Project Management.	MHRD - 7.5 lakhs	Prof.H.Raman
7.	Multiobjective operation of Adyar River System.	Central Board of Irrigation & Power - 7.96 lakhs.	Prof.H.Raman

## B. Major Consultancy Assignments

	Title of Assignments	Amount	Client	Investigator/Coordinators
1.	Design of Tall R.C. TV Towers.	5.5 lakhs	All India Radio	Prof.P.S.Rao Prof.P.K.Aravindan
2.	Design of Micro Communication Towers.	1.8 lakhs	Department of Tele-communication Bombay.	Prof.P.S.Rao Prof.P.K.Aravindan
3.	Checking of design and site supervision of supporting structure.	3.5 lakhs	BHEL - Trichy	Prof.P.S.Rao Prof.L.N.Ramamurthy Prof.V.Kalyanaraman Prof.P.K.Aravindan
4.	Checking the safety of a Chimney.	1.8 lakhs	FACT - Cochin	Prof.P.S.Rao Prof.P.K.Aravindan Prof.H.Achyutha
5.	Advice on Technical knowhow for manufacture of PSC sleepers.	2.0 lakhs	KEK Limited Kerala	Prof.P.S.Rao Prof.P.K.Aravindan
6.	Design of foundations for oil refineries.	2.0 lakhs	ONGC - Madras	Prof.P.S.Rao Prof.P.K.Aravindan
7.	Optmisation of design of Water Towers.	1.28 lakhs	TWAD Board Tamil Nadu	Prof.N.Rajagopalan
8.	Design of aesthetically pleasing bridges.	3.5 lakhs	Ministry of Surface Transport RITES - Himachal Pradesh Govt.	Prof.N.Rajagopalan
9.	Design of intake tower and pipe bridges.	0.60 lakhs	TWAD Board	Prof.N.Rajagopalan

10.	Remedial measures and repairs for major tower like structure.	-	SPIC & TWAD Board.	Prof.N.Rajagopalan
11.	Advice on structural soundness.	Retainer consultancy	SPIC Tuticorin	Prof.N.Rajagopalan
12.	Design of VHF Towers.	0.9 lakhs	Telecom Factory Jabalpur	Prof.L.N.Ramamurthy Prof.C.S.Krishnamoorthy
13.	Design of 14 m and 7.5 m dia M. S. T. Antenna	1.4 lakhs	Prabhakar Products.	Prof.L.N.Ramamurthy Prof.V.Kalyanaraman
14.	Kuttiadi Augmentation Scheme.	Retainer Consultancy	Kerala Electricity Board.	Prof.T.S.Ramanatha Iyer
15.	Investigation on damages to buildings- suggestions and remedial measures.	-	Government & Public Sector agencies.	Prof.P.Kalyanasundaram
16.	Transfer of Technical knowhow on partial prefab hallow block roof system.	-	Best Blue Metals Rajeswari Enterprises.	Prof.P.Kalyanasundaram
17.	Geo Technical Investigation and recommendations for foundations for various buildings.	-	Government and Public sector agencies.	Prof.Nainan P Kurian

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**(7) Papers presented at the International Conferences/Journals:**

Radhakrishnan, R. and Ravi Prasad, 'Bridges in Seismic Regions', International Conference on Earthquake Resistant Construction and Design, June 13-16,1989, Berlin, West Germany.

Krishnamoorthy, C.S., S.Rajeev and Sooryanarayana Sharma, 'A Finite Element Analysis Software in C', Proc. of the Intl. Conference on Engineering Software, Engineering Software, Ed. C.V.Ramakrishnan and A.Varadarajan, 4-7th Dec., 1989, Narosa Publishing House, New Delhi, pp.697-704.

Krishnamoorthy, C.S., R.Krishnakumar and S.Rajeev, 'An Expert System Framework for Finite Element Analysis', Proc. of the Intl. Conference on Engineering Software, Engineering Software, Ed. C.V.Ramakrishnan and A.Varadarajan, 4-7th Dec., 1989, Narosa Publishing House, New Delhi, pp.775-783.

Victor, D.J., 'Road accidents in India', IATSS Research, (Intl. Association of Traffic and Safety Sciences, Tokyo, Japan), Vol.13, No.1, 1989, pp.82-83.

Malini, E. and Victor, D.J. 'Road safety education for children' 6th Conference of Road Engineering Association of Asia and Australia, Kuala Lumpur, Malaysia, Vol.2, March 1990.

Victor, D.J. 'Motorised two-wheeler traffic in Madras' 6th Conference of Road Engineering Association of Asia and Australia, Kuala Lumpur, Malaysia, Vol.2, March 1990.

Raman, H. Vasudevan, S. and Kapil Gupta, Multi objective Planning in small water sheds, Journal of Institution of Engineers [India], Vol.70, No.3, March 1990, pp.58-64.

Raman, H. Vasudevan, S. and Rao B.S., 'Reservoir operation optimisation using General Programming, Journal of Indian Water Resources Society, Vol.10, No.2, April 1990, pp.33-38.

Raman, H. and Abdul Bukhari, 'Growth and Equilibrium of wind generated waves', Journal of Institution of Engineers (India), Vol.70, Part MA2, November 1989, pp.52-57.

Mohan, S. and Amlan, S. 'Environmental Information System', Journal of Institution of Public Health Engineers, Vol.9, No.2, 1989, pp.24-35.

Kurian, N.P. 'Ultimate strength of Hyperbolic Paraboloidal combined shell footings subjected to vertical loads and moments', International Conference on Structural Engineering and Computation, Beijing, China, April 1990, Proc. pp.829-836.

Srinivasa Reddy, L. and Elango, K. 'Analysis of Water Distribution Networks with Head-dependent outlets', Civil Engineering Systems, Vol.6, No.2, 1989, pp.102-110.

Pattnaik, S.B. 'Transportation System Management with Scarce Resources and threatened Environments', Journal of Institute of Town Planners, India, Vol.7, No.4(138), June, 1989.

# COMPUTER SCIENCE & ENGINEERING

## (1) Continuing Education Programme

### A. New Course Introduced

Course No.	Title	Structure	Faculty
CS 789	Computational Geometry	4 0 0 4	Kamala Krithivasan

### B. New courses in the continuing education programme

S.No.	Title	Duration	No.of participants
1.	Local Area Network Concepts(May 12 & 13,89)	2 days	30
2.	Local Area Network Concepts(May 29 & 30,89)	2 days	19
3.	AI in Diagnosis	1 day	35
4.	Artificial Intelligence based mechanical design	1 day	35

## (2) Improvement/Development of new Laboratories:

1. The KBCS Laboratory was augmented with the purchase of Macintosh II, ULTRIX32, Ver. 3.1, OS running on Microvax II and CAD for VLSI lab. with Modi Olivetti M250 running OS/2.
2. The Department's general purpose computing facilities have been largely PC-based. In March 1990, the SUN Lab. with 18 SUN workstations was set up. Each workstation has a 68000-series microprocessor and runs the UNIX operating system. They are interconnected via an Ethernet network to provide users with access to 1.9 GB of shared disk storage from any one of the workstations. With a rich complement of compilers and other development tools, the lab. will support activities in many areas of computer science, including distributed systems and networking.
3. Information Technology Laboratory has been augmented with SUN workstations facilitating work in distributed computing.



### **(3) Curriculum Development Programme**

In view of the increase in the number of computer science graduates being available, the curriculum of the M.Tech. Programme is under revision. The objective is to discontinue some elementary courses and introduce some advanced material to make the master's education more relevant and attractive to students with a CS bachelor's degree.

While a complete change is targeted for a few years from now, an interim curriculum incorporating some of the benefits has been designed and put into effect for the batch entering in 1990. Also, a mini project has been included in the B.Tech. curriculum.

### **(4) Any other major events:**

A book titled "Local Area Networks-The Indian Context" authored by Dr. S.V. Raghavan has been published by M/s. Tata McGraw Hill.

### **(5) Research Publications**

1. K.R. MURALIDHAR, H.N. MAHABALA  
IITM-RISC - A Reduced Instruction Set Computer, Proc. NACONECS-89 Nov. 2-4, 1989, Roorkee, India.
2. VISSA V. GIRI AND H.N. MAHABALA  
Knowledge based system for formulation Tasks, Presented at International Conference on Artificial Intelligence in Industry and Government, Nov. 23-25, 1989, Hyderabad, India.
3. B.I.B. MADHAV, NARAYAN HEGDE AND H.N. MAHABALA  
A Callable Rule-based Inference Engine in C, Presented at International Conference on Artificial Intelligence in Industry and Government, Nov. 23-25, 1989, Hyderabad, India.
4. M.S. SOMASUNDARAM AND JAIDEV  
A knowledge representation framework for Planning, Proc. NACONECS-89, Roorkee, Tata McGraw Hill Publications, 1989
5. M.S. SOMASUNDARAM, N. PARAMESWARAN AND H.N. MAHABALA  
Reasoning with temporal abstractions, ICARV-90, Singapore, 1990.
6. K.R. MURALIDHAR AND H.N. MAHABALA  
Architecture for a 32-BIT pipelined RISC Processor, Proc. VLSI Design 90, January 5-9, 1990, Bangalore, India.
7. RAMAMURTHY, UMA MAHESH AND H.N. MAHABALA  
Proc. VLSI Design 90, January 5-9, 1990, Bangalore, India

8. H.N. MAHABALA  
STITCH - A stitchable DRC and Extractor for a multiprocessor network, Proc. VLSI Design 90, January 5-9, 1990, Bangalore, India.
9. H.N. MAHABALA, UMA MAHESH AND RAINA  
A Deflection Processor Unit for Digital TV, Proc. VLSI Design 90, January 5-9, 1990, Bangalore, India.
10. SANJAY KHULLAR, K. VIJAYANANDA and S.V. RAGHAVAN  
OSI Device Driver for an Ethernet Controller, Proceedings of the Joint Conference of ERNET Working Groups held at New Delhi in May 1989.
11. B PRABHAKARAN AND S.V. RAGHAVAN  
Distributed Environment for Open Systems, Proceedings of the Joint Conference on ERNET Working Groups held at New Delhi, in May 1989.
12. R.S. KRIPANANDAN AND S.V. RAGHAVAN  
Porting OSINET over Novell Netware - IPX Approach, Proceedings of the Joint Conference of ERNET Working Groups held at New Delhi, in May 1989.
13. C.K. VENKATRAMAN AND S.V. RAGHAVAN  
Experiences in installing and operating a LAN, Proceedings of the Joint Conference of ERNET Working Groups held at New Delhi in May 1989.
14. T.K. SURESH AND S.V. RAGHAVAN  
Performance Evaluation of Token Based Networks - A survey, Proceedings of IETE National Convention held at Madras in May 1989.
15. G. NARAYANAN AND S.V. RAGHAVAN  
Model implementation of OSI Session Layer, Proceedings of IETE National Convention held at Madras in May 1989.
16. K.K. RAMAKRISHNAN AND S.V. RAGHAVAN  
Model Implementation of OSI Presentation Layer, Proceedings of IETE National Convention held at Madras in May 1989.
17. GANESH RAO B AND S.V. RAGHAVAN  
Model implementation of FTAM, Proceedings of IETE National Convention held at Madras in May 1989.
18. B. RAMASESHU AND S.V. RAGHAVAN  
CASE: A model implementation, Proceedings of IETE National Convention held at Madras in May 1989.

19. S.V. RAGHAVAN, R.S. KRIPANANDAN AND B. PRABHAKARAN  
RSMAC-MAC layer support for serial lines, Proceedings of IETE National Convention held at Madras in May 1989.
20. B PRABHAKARAN AND S.V. RAGHVAN  
Protocol Specification - A Tutorial, Proceedings of IETE National Convention held at Madras in May 1989.
21. T.K. SURESH AND S.V. RAGHAVAN  
Simulation studies on Token ring network with standrad and exhaustie strategies, Proceedings of ICCS-89, Symposium, Beijing, China, Sept. 1989.
22. S.V. RAGHAVAN, M.K. SURESH AND B. PRABHAKARAN  
Implementation of Distributed information management system over TCP/IP, Proceedings of COMAD 89 held at Hyderabad in November 1989.
23. K. VIJAYANANDA AND S.V. RAGHAVAN  
OSINET - Implementation of a network using the ISO layer, Proceedings of COMNET 89 held at Calcutta in December 1989.
24. D. VASUKIAMMAIYAR AND S.V. RAGHAVAN  
Implementation of File Server using FTAM services, Proceedings of COMNET 89 held at Calcutta in December 1989.
25. R.S. KRIPANANDAN, C.K. VENKATRAMAN AND S.V. RAGHAVAN  
Design and implementaion of an asynchronous communication server, Proceedings of COMNET 89 held at Calcutta in December 1989.
26. M.K. SURESH AND S.V. RAGHAVAN  
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27. S.V. RAGHAVAN AND C.K. VENKATRAMAN  
IITMLAN - A dream realised, Proceedings of COMNET 89 held at Calcutta in December 1989.
28. SANJAY KHULLAR AND S.V. RAGHAVAN  
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29. S.V. RAGHAVAN  
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31. T.A. GONSALVES AND F.A. TOBAGI  
Comparative performance of voice/data local area networks, IEEE Jour. Selected Areas Commun., Vol. 7, No.5, June 89, pp.657-669.
32. X. MENG R.E. KINICKI AND T.A. GONSALVES  
Delay analysis of a metropolitan area network, Proc. 9th IEEE Intl. Phoenix Conf. Comp. & Commun., Scottsdale, Arizona, Mar 90, pp.568-574.
33. DEEPAK KHEMANI, AND R.S. RAMAKRISHNA  
Bridge: A Benchmark for knowledge based planning, CC-AI (The Journal for the integrated study of Artificial Intelligence, Cognitive Science and Applied Epistemology), Vol.6, No.2/3, 1989.
34. C. SIVA RAM MURTHY  
An efficient parallel algorithm for the iterative solution of large, dense linear systems on hypercubes, Proc. 4th International Conference on Supercomputing, CA, USA, April 30-May 5, 1990.
35. C. SIVA RAM MURTHY  
Synchronous and asynchronous algorithms for evaluating polynomials on a tree machine, Proc. 4th International Conference on Supercomputing, CA, USA, April 30-May 5, 1989.
36. C. SIVA RAM MURTHY  
Parallel, iterative solution of large sparse linear systems on hypercubes, Proc. 22nd IEEE International Symposium on Circuits and Systems, OR, USA, May 9-11, 1989.
37. C. SIVA RAM MURTHY  
Solving nonlinear partial differential equations on hypercubes, Proc. 1989 Summer Computer Simulation Conference, TX, USA, July 24-27.
38. C. SIVA RAM MURTHY  
A scheduling strategy for multiprocessor simulation systems, 4th SIAM Conference on Parallel Processing for Scientific Computing, IL, USA, December 11-13, 1989.
39. V.V.R. PRASAD AND C. SIVA RAM MURTHY  
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40. C. SIVA RAM MURTHY AND V. RAJARAMAN  
Task assignment in a multiprocessor system, *Microprocessing and Microprogramming, the Euromicro Journal*, Vol. 26, No.1, pp. 63-71, 1989.
41. C. SIVA RAM MURTHY  
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42. C. SIVA RAM MURTHY  
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43. C. SIVA RAM MURTHY  
Solving nonlinear partial differential equations on hypercubes, *Advances in Engineering Software*, Vol.12, No.1, pp.17-20, 1990.
44. C. SIVA RAM MURTHY  
Solving hyperbolic PDEs on hypercubes, to appear in *International Journal of Computers and Mathematics with Applications*, Invited paper.
45. C. SIVA RAM MURTHY AND V. RAJARAMAN  
Analytical and simulation studies of a multiprocessor system for high-speed numerical computations, to appear in *Mathematics and Computers in Simulation*.
46. A. DATTA AND K. KRITHIVASAN  
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47. K. KRITHIVASAN AND MEENA MAHAJAN  
Hexagonal cellular automata, in *A perspective in Theoretical Computer Science - Commomorative volume for Gift Siromoney Ed. R. Narasimhan*, World Scientific, Singapore 1989, pp.134-164.
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49. A. SRINIVASA RAO, C. PANDU RANGAN  
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50. A SRINIVASA RAO C. PANDU RANGAN  
Optimal parallel algorithms on circular ARC graphs, Inform. Proc. Letters, Vol. 33, pp.147-156, 1989.
51. S. VENKATASUBRAMANIAN, KAMALA KRITHIVASAN, C. PANDU RANGAN  
Algorithms for weighted graph problems on the modified cellular graph automation, Informatique Therique et Applications/Theoretical Informatics and Applications, Vol. 23, pp.251-279, 1989.
52. G. RAMALINGAM, C. PANDU RANGAN  
New sequential and parallel algorithms for recognising interval graphs, Inform. Proc. Lett. Vol. 34, pp. 147-151, 1990
53. S. SUDARSAN, C. PANDU RANGAN  
A fast algorithm for computing sparse visibility graphs, Algorithmica, Vol.5, pp. 201-214, 1990
54. A. SRINIVASA RAO, C. PANDU RANGAN  
An efficient algorithm to find two pair and its applications (to appear), Disc. App. Math.
55. S.V. KRISHNAN, C. PANDU RANGAN, S. SESHADRI  
A new linear algorithm for the two path problem on planar graphs (to appear), Disc Appl Math.
56. T. HARI KRISHNA PRASAD, C. PANDU RANGAN  
New efficient parallel aglorithm for maximum empty rectangle problem (to appear) Jl. of Parallel and Distributed Computing.
57. P.B. RAMPRASAD, C. PANDU RANGAN  
Linear algorithm for all bidirectional edges of a planar graphs (to appear Algorithmica)
58. S. ARAVIND, R. MAHESH, C. PANDU RANGAN  
Bandwidth minimisation problem revisited, (to appear Information and Computation).
59. A. SRINIVASA RAO, C. PANDU RANGAN  
Linear algorithm for the path cover problem on inteval graphs (to appear Inform. Proc. Letters).
60. GOVINDAN RAMESH, C. PANDU RANGAN  
An  $O(n \log n)$  solution for a maximum location problem (to appear Discrete Applied maths)

61. S. ARAVIND, C. PANDU RANGAN  
Efficient algorithms for the minimum weighted dominating clique problem on permutation graphs (to appear) Theoretical computer Science.
62. A. SRINIVASA RAO, C. PANDU RANGAN  
Linear algorithms for some path problems on circular-arc graphs, Accepted at WADS'89, DTTWA, Canada, August 1989 (to appear in Proceedings Springer-Verlag Lecture Notes in Computer Science LNCS 382).
63. GDS RAMKUMAR, C. PANDU RANGAN  
Efficient Parallel algorithms on interval graphs, International Conference on parallel, processing ICPP'90 Aug. 1990, Penn. U.S.A. (to appear in Proceedings).
64. HEMA A. MURTHY, K. V. MADHU MURTHY AND B. YEGNANARAYANA  
Formant extraction from Fourier transform phase, Proc. IEEE International Conference Acoust Speech and Signal Processing, May 1989, pp.484-487.
65. G. DUNCAN, B. YEGNANARAYANA AND HEMA A. MURTHY  
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68. M. PRAKASH, G. V. RAMANA RAO AND B. YEGNANARAYANA  
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69. B. YEGNANARAYANA, C. CHANDRA SEKHAR, G. V. RAMANA RAO, P. ESWAR & M. PRAKASH  
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70. R. SATYANARAYANAN AND C. R. MUTHUKRISHNAN  
A Task Allocation Scheme for Hypercube Distributed Computing Systems Using Affinity Graph Model, Proceedings of the IEEE Region 10 International Conference, Bombay, Nov. 1989.

71. R.SATYANARAYANAN AND C.R.MUTHUKRISHNAN  
Distributed Solutions to the Mutual Exclusion Problem, Proceedings of the IEEE Region 10 International Conference, Hong Kong, Sept. 1990.
72. R.SATYANARAYANAN AND C.R.MUTHUKRISHNAN  
A Diffusive Decentralised Method for Dynamic Load Balancing in Distributed Computing Systems, Proceedings of ISMM International conf. on Parallel and Distributed Computing, and Systems, New York, Oct.1990.
73. R.SATYANARAYANAN AND C.R.MUTHUKRISHNAN  
Static Allocation of Communicating Processes for Distributed Computing Systems with Resource Heterogeneity, Accepted for publication, Journal of Indian Institute of Science.
74. D.G.CHILDERS, KE WU, D.M.HICKS AND B.YEGNANARAYANA  
Voice conversion, Speech Communication, vol.8, No.2, June 1989.
75. K.V.MADHU MURTHY AND B.YEGNANARAYANA  
Effectiveness of representation of signals through Group delay functions, Signal Processing, vol.17, August 1989.
76. S.R.RAJESH KUMAR, R.SRIRAM AND B.YEGNANARAYANA  
A new approach to develop a text-to-speech conversion system for Indian languages, Proc. of the Regional Workshop on Computer Processing of Asian Languages, Bangkok, pp.327-336, September 1989.
77. S.RAJESH KUMAR AND B.YEGNANARAYANA  
Significance of durational knowledge for speech synthesis system in an Indian language, Proc. of TENCON'89, Bombay, pp.486-489. November 1989.
78. B.YEGNANARAYANA, R.RAMASESHAN AND A.RAVICHANDRAN  
Image reconstruction from multiple frames of sensor array data, Indo-US Workshop on Spectrum Analysis in One and Two Dimensions, Nov.27, 1989.
79. B.YEGNANARAYANA, C.P.MARIADASSOU AND PRAMOD SAINI  
Signal reconstruction from partial data for sensor array imaging application, Signal Processing, February 1990.
80. B.YEGNANARAYANA, R.RAMASESHAN AND A.RAVICHANDRAN  
An algorithm for thinning noisy images, Proc. of ICASSP-90, Vol.4, April 1990.
81. S. RAMAN AND N. ALWAR  
"An AI-based Approach to Translation in Indian Languages", "Communications of the ACM". May 1990. Vol 33, No 5, pp. 521-527.



82. N. ALWAR AND S. RAMAN  
"Phrase Markers in Indian Languages", "Journal of the IISc", Mar - Apr 1990, Vol 70, No 2, pp. 145- 158.
83. N. ALWAR, S. RAMAN AND R. DAMOR  
"A Natural Language Generator for Hindi", Proc. of the Regional Workshop on "Computer Processing of Asian Languages", Bangkok, Sep 1989. pp. 102- 109.
84. N. ALWAR et. al.  
"A Multipurpose Multilingual Package for Indian Languages", Proc. of the Regional Workshop on "Computer Processing of Asian Languages", Bangkok, Sep 1989. pp. 18-26.
85. C. MUTHUVEL, N. ALWAR AND S. RAMAN  
"A Font Generator for Indian Languages", Proc. of the Regional Workshop on "Computer Processing of Asian Languages", Bangkok, Sep 1989. pp. 154- 159.
86. N. ALWAR, S. RAMAN AND B. MOHAN KRISHNA  
"The Role of Articulation in Semantic Interpretation", Proc. of the Regional Workshop on "Computer Processing of Asian Languages", Bangkok, Sep 1989. pp. 175-179.
87. S. RAMAN AND N. ALWAR  
"TAMIL - Translation Automated for Multiple Indian Languages - A proposal for a system", Paper presented in IEEE technical convention on "Technologies on the Frontier Application & Impact on the Society", Pune, Feb 1989.

#### **(6) Honours and Awards**

Recipient of The Sheshgiri Kaikini Gold Medal + Rs.2,000/- cash prize for the best Ph.D. thesis for the academic year 1988-89 from the Indian Institute of Science. (Dr.C.Siva Ram Murthy).

### **(7) Visit of Faculty Members to Other Institutions**

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<b>Name of the Faculty</b>	<b>Institutions visited/purpose of visit/ Duration of visit.</b>
<b>Dr.C.Pandu Rangan</b>	University of Illinois at URBANA CHAMPAIGN, CHICAGO, USA, invited talk - 3 days. IBM, Yorktown Heights, NY, USA, Research discussion- 3days SIEMENS R&D centre, MUNICH, West Germany, For joint project studies, and research discussions - 15 days.
<b>Dr.Kamala Krithi- vasan</b>	University of Saarbrucken, FRG, discussion, 2 days University of Passan, FRG, delivering lecture, 1 day University of Oldenburg,FRG,delivering lecture-1 day
<b>Dr.T.A.Gonsalves</b>	IIT, Kanpur, discussions on networking research and library computerization, 3 days.
<b>Mr.G.Ravi Prakash</b>	Carnegie-Mellon University, Pittsburgh, USA, UNDP Fellowship, 8 months.
<b>Dr.B.Yegnanarayana</b>	University of Bremen, West Germany, Indo-German Project, one month.

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### **(8) Participation of Faculty in Conferences/Seminars/Symposia,etc.**

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<b>Name of Faculty</b>	<b>Particulars of participation in Conference/Seminars/ Symposia/Short Term Courses, Nature of participation Date &amp; Venue.</b>
<b>Dr.C.Pandu Rangan</b>	Workshop on Data Structures, and Algorithms (WADS'89), OTTAWA, CANADA, Sept.17-21, 1989. FSTTCS '9, Bangalore, India, Dec. 15-19, 1989.
<b>Dr.Kamala Krithivasan</b>	Conference on FSTTCS'9, Bangalore, Dec.15-19,1989. Workshop on Parallel Processing Systems, BARC,Bombay, February 1990. National Conference on Electronic Circuits & Systems,Roorkee, Nov.1989.

- National Seminar on Group Theoretic Techniques & Applications, Andhra University, Visakhapatnam, Feb.1990.  
 Graph Grammars Workshop, Bremen, FRG, March 1990.  
 3rd Centenary Commemoration Symposium at the Institute of Mathematics, Hamburg, FRG, March 1990.
- Dr.H.N.Mahabala** IJCAI'89 - Detroit - Michigan, Aug.20-25, 1989.  
 World Computer Congress, San Fransisco, Aug/28-Sept.1 1989.  
 Workshop on AI in Industry and Govt., Hyderabad, India Nov.23-25, 1989.  
 KBCS 89, Bombay, India, Dec. 11-13, 1989.  
 VLSI 90, Bangalore, India, Jan. 6-9, 1990  
 Workshop on Expert systems for Govt. Applications, New Jersey ISPR 89, Italy.
- Dr.S.V.Raghavan** IXPSTV Conference of IFIP, The Netherlands, May 1989.  
**Dr.T.A.Gonsalves** A low-cost, high-performance PC LAN, invited speaker, Seminar on Computer Communications, IEEE Madras Section, Oct. 1989.  
 INDOLAN 90, Performance of the Memnet Distributed shared memory architecture, Presentation, Madras, Jan.90.
- Mr.G.V.Ramana Rao** European Conference on Speech, Communication and Technology, Presenting papers, Paris, Sept.26-28, 1989.
- Dr.C.R.Muthukrishnan** 9th International conference on Foundations of Software Technology and Theoretical Computer Science, Programme Committee member and Session Chairman, Bangalore, India, Dec. 1989.
- Dr.B.Yegnanarayana** Seminar on Development of common core grammer for computers, CIIL, Mysore, March 12-14, 1990.  
 Seminar on Common phonetic matrix for the computers, CIIL, Mysore, March 14-16, 1990.  
 Speech Tech-90, New York, April 23-26, 1990.
- Mr.C.Chandrasekhar** Regional Workshop on Computer Processing in Asian Languages, Bangkok, September 26-29, 1989.  
 Seminar on Common phonetic matrix for Indian languages CIIL, Mysore, March 14-16, 1990.

**(9) Distinguished visitors to Department:**

Name	Affiliation
<b>From Abroad</b>	
Dr.Lokendra Sastry	Dept.of CS, University of Philadelphia
Dr.P.Molzberger	Budeswehr University, FRG
Dr.Arvind	Laboratory for CS, MIT

Dr.Peter Struss	AI Group, Siemens, FRG
Dr.Arvind Joshi	Dept of CS, Moore School of Engineering, USA.
Dr.Anandan	Dept.of Computer Science, Yale University
Dr.D.C.Brown	Dept of CS, Worcester Polytechnic Institute, US
Dr.PrabhakarRaghavan	IBM Labs, Yorktown Heights, USA.
Dr.Mukherjee	Univ. of Florida, Orlando, USA
Dr.Chandramouli Visweswaraiah	IBM Labs, Yorktown Heights, USA
Prof.S.K.Tripathi	Chairman, Dept.of CS, University of Maryland, USA.
Dr.G.V.Bochmann	Professor, University of Montreal, Canada
Dr.Arvind K.Joshi	University of Pennsylvania, USA

**From India**

Dr.V.Rajaraman	Indian Institute of Science, Bangalore.
Dr.Anshul Kumar	Indian Institute of Technology, Delhi
Mr.Atri Indiresan	PSI, Bangalore
Dr.Rani Siromoney	Professor Emeritus, Madras Christian College.

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**(10) Seminar/Symposia organised by Department**

International Conference on Local Area Networks (INDOLAN 90), Madras,  
Jan.29-31, 1990.

**(11) Major sponsored Research Schemes and Consultancy Projects**

1. KBCS Project - DOE (ongoing)  
Development of Expert Systems in the areas of Engineering Design and Medical Diagnosis.
2. CAD for VLSI - DOE(ongoing)
3. Design of Digital VLSI - Design of ASICs - MHRD (ongoing)
4. Collaboration with industries like Hindustan Motors, WIDIA and Sundaram Fasteners.
5. A software called OSINET, which is an implementation of a subset of the 7-layer Open System Interconnection (OSI) model, developed in the Network Systems Laborator under Project ERNET, was successfully demonstrated in the Expo held in New Delhi during Jan. 1990. Presently, discussions are underway, for technology transfer of OSINET to interested Indian parties.

6. Electronic Mail(E-Mail)service was made available in the Institute, from May/June 1989. Users of this service, can send messages to researchers and faculty members both within and outside India. The five IITs, IISc and CDoT Bangalore, NCST and TIFR Bombay, DoE and CDoT New Delhi are some of the Indian Institutions accessible through this network, while most of the major communication/research establishments, all over the world are also available. Presently about 15 departments/Offices in the Institute are using the e-mail service.
7. Cellular Automata and Applications - DST.  
Duration 3 years, Nov 87 - Nov 90.
8. Algorithms for Robot Motion Planning DAE, 3 years, August 89-August 92.

# ELECTRICAL ENGINEERING

## 1. NEW COURSES INTRODUCED:

1. EC 205 Computer Aided Drafting and Layout 1 0 5 3
2. EE 786 Digital Simulation of Power-Electronic Circuits and Systems 3 0 0 3
3. EE 741 Fibre Optic Comp.Sources and Detectors
4. EE 744 Advances in Fibre Optics and Photonics

## 2. INSTRUMENTS DEVELOPED:

### Machines:-

- i) Improved Smart Motor Controller with Software diagnostics - by Dr. V.V.Sastry
- ii) Current Source Converter based Reactive Power Compensator- by Dr. V.V. Sastry
- iii) Single Phase Ferro resonant Voltage Stabilisers(1KVA, 230 V (+/-20 %) input, 230 V (+/- 1%) Output) - by Dr.S.S.Yegnanarayanan
- iv) Single Phase Arno Converters for Kirloskar Electric Corp. ( 150 kVA ), End User: Indian Railways. by Dr. S.S.Yegnanarayanan
- v) Single Phase 230 V 50 Hz 2850 r.p.m., 1 H.P. Capacitor Start Induction Motor-by Dr. S.S. Yegnanarayanan

### Semiconductors:-

- i) High Pressure Oxidation System for Oxidation of Silicon and Gallium Arsenide at 1 to 10 atm by Dr.K.N.Bhat and Dr.S.Gopinath
- ii) Quasi Static C-V Measuring Instrument- by Dr. S.Karmalkar

### High Frequency Techniques:-

- i) Slow Start Regulated Power Supply for Gunn Oscillators, with Digital Display for Voltage and Current and Square wave Modulation - by D.K.Banerjee

### **[3] CONTINUING EDUCATION PROGRAMMES**

#### **Refresher Courses:-**

- 1) Module on Induction Motor Drives, submitted to CCE and ISTE
- 2) Intensive Short Term Course on Fibre Optic Applications
- 3) Present and Future Developments of TV Technology

#### **Sponsored Courses:-**

- 1) Power Electronics, 30 participants, Supported by Integral Coach Factory- June 19 to 30, 1989
- 2) CAD in Electrical Engineering, 25 participants, Supported by Indian Railways, Calcutta- Nov 20 to Dec 1, 1989

### **[4] QIP Programme:-**

Two M.Tech Scholars and One Ph.D.Scholar had successfully completed.

### **[5] SPONSORED RESEARCH:**

1. CBIP Project on Reswitching Transients and their Effect on Design and Operation of Large HT Induction Motors for Thermal Power Plants- Duration 2 years, Rs.4-Lakhs.  
Investigators:- Dr. S.S.Yegnanarayanan, Dr. G.Sridhara Rao and Dr.C.Venkataseshaiah
2. i) Process Simulator Studies on LPCVD Polycrystalline Silicon for multi layer structures- Duration 2-year, Rs.3.93.Lakhs  
ii) LPCVD Polycrystalline Silicon MOSFET Technology for 3-D Integration, Duration 3-Years, Rs. 36.77.Lakhs  
Investigators:-Dr.K.N.Bhat,Dr.S.Karmalkar and Mr.P.Ramaseshagiri Rao.
3. Development of Pulse Code Modulation Systems and TDMITDMA Rural Telephone Systems, Duration 2-years,Rs.23 Lakhs Investigator, Dr. Bhaskar Ramamoorthy

4.
  - i) Blue Green Laser for Under water Communication-duration 4 Years, Rs. 15.95 Lakhs (DOE)
  - ii) TDMA Radio Trunking Systems for Rural Communication, duration 2-years, Rs. 25 Lakhs (TRC)
  - iii) Fibre Optic Data Bus, duration 3-Years, Rs.38.66 Lakhs (ARDB)
  - iv) Telematics, duration 5 years, Rs. 0.75 Lakhs (HRD)
  - v) Model Study of Optical Scattering at Air-Water Interface, duration 8 months, Rs.1.22 Lakhs (NSTL)  
Investigator: Dr. A.Jhunjunwala
5.
  - i) Development of Optical Couplers duration 4.5 Years, Rs 46.8 Lakhs (ARDB)
  - ii) Development of Engineered Version of Fibre Optic System for internal Communications, duration 4 Years, Rs. 32.2 Lakhs (DRDO)
  - iii) Fibre Optic Systems for Service Sector Applications duration 3 Years, Rs 154.1 Lakhs (DOE)  
Investigators: Dr. J.P.Raina and Dr. A. Jhunjunwala
6.
  - i) Development of Compatible Digital Fibre Optic Communication System for a Strategic Aircraft
  - ii) Development of Fibre Optic Communication Link along EHT Power Lines duration 3 Years, 15.89 Lakhs, (WSI)
  - iii) Fibre Optics and Laser Technology, duration---,Rs 25lakhs
  - iv) Development of Optical Photonic Amplifiers duration--- Rs. 15 Lakhs
  - v) Development of manpower in the area of Engineering Applications .. duration --- Rs. 10 Lakhs
  - vi) Digital T.V. Receiver duration--- Rs 10.lakhs  
Investigator : Dr. J.P. Raina



## [6]DISTINGUISHED VISITORS AND LECTURES:

1. High Speed Optical Networking-  
Mr. Rajeev Ramaswamy, University of California USA and  
IBM research Corporation
2. Review of Neural Networks for Speech Recognition  
Dr. Richard Lippman, IEEE Neural Networks Committee USA
3. Regular Iterative Architecture for Signal Processing  
Dr. Sailesh K Rao, VLSI Systems Research Group,  
AT and T Bell Lab USA
4. Estimating and Cost of Electric Power Production  
Dr. Brian Manhire, Dept. of Electrical and Computer Engg.,  
Ohio University, USA
5. A Framework for Scheduling Multirate Circuit Simulation  
Dr. V. Viswanathan, AT and T Bell Labs, USA
6. Real Time Simulation of Electrical Systems for Load Despatcher  
and Power Plant Operator Training  
Mr. R. Ramanujam, International Development and Engineering  
Associates (P) Ltd., Bangalore
7. ASIC Design  
Dr. Srinivasagan, Telecommunication Research Center, New Delhi
8.
  - a) Real Time Optimisation methods with the Emphasis on Higher  
Order Systems
  - b) Applications of RTOM to Line Commutated Converters
  - c) Basic Ideas on PROMC, a Software for implementation of  
Precalculated Model Control Approach
  - d) Introduction to Modeling of Power Semi Conductors  
Prof. Dr. Shroeder, Institute for Electrical Drives  
Technology, TU Munich, West Germany
9.
  - a) Current Research in Lightning and High Voltage Labs
  - b) Multiple Strokes and Lightning Protection of Exposed  
Distribution Systems

- c) Lightning from Dream time to the Space Age  
by Prof. M. Darveniza University of Queensland USA
- 10. Power System Control as applied to TNEB Power Systems  
by Mr. K Krishnaswamy Rao, (Retd.) TNEB, Madras
- 11. Evaluation of Harmonic Impedances in Electric Power  
Systems by Dr.A.Chandrasekaran ,Tennesse Technical  
University, Cookeville, USA
- 12. Energy Management Systems by Dr. Krishna Prasad  
Three C Systems Ltd., Madras
- 13. A General approach to Treatment of Energy Conversion  
Theory and Processes by Prof H.K Messerle,  
University of Sydney, Australia
- 14. Current Trends in Analog VLSI by Mr. Srinagesh  
Columbia University, USA
- 15. Active Noise Cancellation in the Presence of Signal of  
Short Duration by Dr. Vijay Raman
- 16. Micromechanical Systems by Dr. Ramaswamy Mahadevan  
AT and T Bell Labs, USA
- 17. Communication Links in Industrial Automation  
by Prof. Dr.Ing.D.Popovic, University of Bremen,W.Germany
- 18. Application of Artificial Intelligence to Automated  
Distribution Systems by Prof. S.S. Venkata, University  
of Seattle, USA

#### [7] RESEARCH PUBLICATIONS:

- 1) R. Lakshmiathy, Y. Narayana Rao and G.Sridhara Rao  
Computation of Electrostatic Field Distribution in a Cable by Least Squares  
Smoothing Finite Element Method Applied Numerical Methods Vol 5, No 1, pp  
15-22, Jan/Feb, 1989
- 2) M.Jagadesh Kumar and K.N.Bhat  
The Effects of Emitter Region Recombination and Bandgap  
Narrowing on the Current Gain and Collector Life Time of High Voltage Bipolar  
Transistors, IEEE Transactions on Electron Devices, Vol 36, pp 1803-1809, Sept  
1989.

## **[8] HONOURS AND AWARDS:**

Dr. V.V. Sastry, Professor, Electrical Engineering had been honoured with VASWIK award for the year 1989.

## **[9] LECTURES BY THE FACULTY TO OTHER INSTITUTIONS**

1. Eine Halbautomatische Messeinrichtung zur schnellen Messung der Eigenschaften von Transformatorenblechen und Ringband kernen ,at the Institut fur Energieubertragung, Stuttgart & Institut fur Anlagen, Hannover by Dr. P.Sankaran
2. Blindleistungskompensation in Echtzeit bei nichtsinusformigen Spannungen und Stromen at the University of Hamburg , West Germany, By Dr. P.Sankaran
3. Electronic Materials  
at the Silver Jubilee Symposium on Frontier Materials, REC Trichy  
by Dr. K.N. Bhat
4. Finite Element and Other Methods of Electromagnetic Field  
Calculations for Electrical Machines and Case Studies  
at Kirloskar Electric, Bangalore, by Dr. S.S. Yegnanarayanan
5. FEM Techniques for EHV apparatus Design,  
at IISc, Bangalore, by Dr. S.S. Yegnanarayanan
6. Numerical Field Computation Techniques and Applications  
at Anna University by Dr. S.S.Yegnanarayanan
7. Power Conditioning of MHD Systems  
at BHEL by Dr. S.S.Yegnanarayanan
8. Microprocessor Applications to AC drives  
at JNTU College of Engineering, Hyderabad, by Dr. Vedam Subrahmanyam
9. Robots and Applications at MIT Chromepet, Madras,  
by Dr. P.A.Janakiraman

## **[10] SEMINARS AND SYMPOSIA ORGANISED**

1. Wokshop on Fibre Optics and Laser Technology, 30 participants,sponsored by HRD, April 1989
2. Annual Technical Convention , sponsored by IETE

## [11] PARTICIPATION IN CONFERENCES ETC

1. T.R.G.Rao, G Bhuvaneswari and V.V.Sastry  
Diagnostics and Protection for Induction Motor Controllers-  
International Conference . TENCON 89 , Nov 22-24, Bombay pp 1076-1080-1989
- 2) K.R.Ramani and V.V.Sastry,  
Optimal Reactive Power Compensator  
All India Symposium on Compensation for Magnetic Current of Induction Motor,  
R&D Wing, APSEB, Hyderabad 27-Nov 1989
- 3) R. Lakshmi pathy, Y. Narayana Rao and G.Sridhara Rao  
Computation of Electrostatic Field Distribution in a Cable by Least Squares  
Smoothing Finite Element Method, Applied Numerical Methods  
Vol 5, No 1, pp 15-22 Jan/Feb, 1989
4. R.J. Xavier and Y.N. Rao  
Surface Tracking Studies on Porcelain Insulating Materials,  
Seminar on Solid Insulating Materials for Electrical Applications
- 5) M.Jagadesh Kumar and K.N.Bhat  
The Effects of Emitter Region Recombination and Bandgap Narrowing on the  
Current Gain and Collector Life Time of High Voltage Bipolar Transistors  
IEEE Transactions on Electron Devices, Vol 36, pp 1803-1809, Sept 1989
- 6) C.Basavana Goud and K.N.Bhat,  
Effect of Oxide Thickness and Junction Curvature on the Breakdown Voltage of  
Planar Junctions Equipped with Field Path  
Proceedings of the Fifth International Workshop on Physics of Semiconductor  
Devices, Dec 11-15,1989
- 7) M.Jagadesh Kumar and K.N. Bhat  
A Novel Method of Extracting the Collector Recombination Lifetime of High  
Voltage Bipolar Transistors  
Proceedings of V International Workshop on Physics of Semiconductor Devices,  
Dec 11-15, pp 624-625, 1989
- 8) A.Jhunjunwala and Sai Ramesh  
Multiprotocol Network Controller Card for PC 's  
32 Annual Technical Convention, IETE, May 26-27, 1989
- 9) V.P.Badri and A. Jhunjunwala  
Asynchronous Adapter for 64 KBPS Slot in a 1 MBPS Link  
32 Annual Technical Convention IETE, May 26-27, 1989

- 10) Raghu Sastry and A Jhunjunwala  
An Optical TDM Ring Design for RS 232 Interconnection  
32 Annual Technical convention IETE May 26-27 1989
- 11) Murugesh and Uma Maheswari, A.Jhunjunwala  
A Fibre Optic Slotted Ring Network for Voice Data Communication  
32 Annual Technical Convention IETE May 26-27 1989
- 12) V.Bala Koteswar, M. Mathur, A.Jhunjunwala  
Design of TDMA Wan Supporting Remote Programmability and Omni Bus  
Channels  
32 Annual Technical Convention IETE May 26-27 1989
- 13) Raghu Shastry and A.Jhunjunwala  
A Low Cost Optical Slotted Ring Network for RS-232 Based Communications  
IEEE Region 10 International Conference Information Technologies for the 90's  
Proceedings TENCON 89 Bombay Nov 22-24, 1989
- 14) K.Vidyashankar and A.Jhunjunwala  
Fibre Optic Token Bus Network for Automation and Environments  
International Conference on CAD and Robotic Applications  
IIT New Delhi 19-29 Dec. 1989
- 15) D.K.Banerjee and Geetha Kannan  
Front End of a Satellite Reception System  
13th National Systems Conference(NSC89) IIT Karg.13-15 Dec 1989
- 16) D.K Banerjee and Subendu Joardar  
Dielectric Stabilised Microwave Oscillators for Direct Reception Satellites  
13th National Systems Conference (NSC89)IIT Karg. 13-15 Dec 1989

## [12] LIST OF SCHOLARS WHO COMPLETED THE DEGREES

Ph.D	-	5 Nos.
M.S.	-	7 Nos.

## [13] OTHER RELEVANT DATA

1. Prof.J.P.Raina visited USA, Japan, Geneva under UNDP Programme during 21Jan to 16-Feb 1990
2. Prof J.P.Raina was nominated as chairman of TDC working group of DOE for the development of Digital T.V.

3. Prof.Raina was nominated as member of Advisory Committee by the Ministry of HRD for Anna University
4. Prof.D.K. Banerjee visited the Technical University of Hamburg, West Germany during Nov-Dec, 1990
5. Dr.P.Sankaran worked in the Institut fur Energieubertragung, University of Stuttgart during Nov-June 1990 Supported by Alexander von Humboldt Foundation.

# DEPARTMENT OF HUMANITIES AND SOCIAL SCIENCES

## 1. New Courses Introduced:

S.No	Course No	Title	Structure	Faculty
1.	HS 402	Introduction to Modern Linguistics	3-0-0-3	S.C.Chaudhary
2.	HS 836	An Advanced Course in Modern Linguistics	3-0-0-3	S.C.Chaudhary
3.	HS 837	Sociolinguistics	3-0-0-3	S.C.Chaudhary
4.	HS 731	Generative Phonology	3-0-0-3	S.C.Chaudhary
5.	HS 337	Better Spoken English	3-0-0-3	S.C.Chaudhary
6.	HS 749	Data Analysis For Management	3-0-0-3	L.S.Ganesh

## 2. Improvement/Development of New Laboratories:

### 1. Dr R.N. Anantharaman

Organised 3 day programme on Manpower Management for Administrative Officers of IIT Madras during 9-11th February 1990 under the Ergonomics & Psychology Laboratory.

### 2. Dr Dipak Chaudhuri/Dr. R.N. Anantharaman

- a. Ergonomics & psychology Laboratory development has started with the purchase of a some equipment like Blood Flow Meters, Pain Simulator TENS etc. A Cardioline equipment has been ordered, but not yet received.
- b. Reliability Engineering Laboratory has been developed with several items of equipment including a computer to measure the causes and degree of machine failures.

### **3. Research Publications:**

#### **Publications in Journals**

##### **1. Dr V.R.Muraleedharan**

- a. Malady in Madras : The Colonial Government's Response to Malaria in the Early 1900's, to appear in Roy McLeod & Deepak Kumar (eds), Science and Roy (in print).
- b. Development of Preventive Health Care in the Madras Presidency During Inter-war years, to appear in GN. Rao et al(ed) South Indian Economic History (in print).

##### **2. Dr. Evangeline Manickam**

- a. E.Manickam and R. Kokila " The Melting Pot : A Recurring Symbol of American Civilisation ", IAAS, Hyderabad, February 1989.
- b. E. Manickam and M. Saxena, "Religion and Conservation in the Novels of R.P. Warren", IAAS, Hyderabad, February 1989.

##### **3. Dr R.N. Anantharaman**

- a. P.T. Srinivasan and R.N. Anantharaman (1989) Multidimensionality of Wagner and Morse Sense of Competence Index. Psychological, 1989, 65, 621622
- b. Mayadevi and R.N.Anantharaman (1990). The influence of sex, age and education on Consumer decision making. Indian Journal of Behavior 1990, 14, 1, 56-61
- c. Mayadevi and R.N. Anantharaman (1990) Factor Analysis of Familism scale. Journal of Psychological Researches (Communicated).

##### **4. Dr. T.T. Narendran**

- a. Srinivasan G., Narendran T.T. and Mahadevan B. "An assignment model for the part-families problem in group technology" International Journal of Production Research , Vol.28, No. 1, pp 145-152, 1990.
- b. Venugopal V. and Narendran T.T. "Interactive Procedure for multi objective Optimization Using Nash Bargaining Principle" to appear in Decision Support Systems.
- c. Mahadevan B. and Narendran T.T. "Design of an Automated Guided Vehicle -based Material Handling System" to appear in International Journal of Production Research.



## 5. Dr R. Malathy

- a. Estimating Substitution and Income Effects of Female Labour supply, Journal of Quantitative Economics, Vol.6, No.2, July 1990.
- b. Impact of Public Programs on Fertility and Gender Specific Investment in Human Capital of Children in Rural India : Cross Sectional and Time Series Analyses (with P.Duraisamy) in T. Paul Schultz (ed) Research in Population Economics Vol III, Jai Press, CT, USA.(1990).
- c. Labour Supply Behavior of Married Women in Urban India. Center, Discussion Paper No.585, Economic Growth Center, Yale University, USA, Dec 1989.

## 6. Dr S. Ambirajan

- a. 'This is New Economic Policy' Industrial Economist, June 1989.
- b. 'Political Economy of Indian Economic Development' in S.Uma Devi (Ed) Approaches to Economic Analysis ( Trivandrum 1989).
- c. 'Food, Famine and Hunger in Tamil Nadu : 1850-1900' in Singh,S.P. et al. (eds) Population Transition in India, (New Delhi 1989).
- d. 'The Delayed Emergence of Econometrics' (Working Paper, University of Queensland Economics Department, September 1989).
- e. 'Economic Wisdom of Ancient Tamil Society ' (Working Paper, University of Queensland , Economics Department, September 1989).
- f. 'The National Front's Economic Policy' Freedom First:A Quarterly of Liberal Ideas No. 405, April-June 1990.
- g. 'The Manipulation by Ideologues and Power brokers' Industrial Economist Vol. XXII, No.11 & 12, January/February 1990, Bicennial - Twentieth Annual Number.
- h. 'The Changing Attitudes Towards Business in India: A Long View' South Asia (to appear in June 1990 issue)
- i. 'The Content of Technical Education in South India' to appear in Roy McLeod & Deepak Kumar, (Eds) Science and Empire.

## 7. Dr. Dipak Chaudhuri

C.Rajendran and Dipak Chaudhuri -"An efficient heuristic approval to the scheduling of jobs in a flow shop" accepted for Publication in European Journal of Operations Research ( exact Vol No, etc are yet to be decided by the publisher.

## 8. Mr. C. Rajendran

- a. Manpower resource levelling in project planning network - A Computer simulation approach.
- b. Scheduling of maintenance activities in a sugar industry using simulation and resource levelling.

## Papers presented in Conferences

### 1. Dr V.R. Muraleedharan

- a. 'Health and Nutrition in Colonial South India', Seminar on Aspects of Structural Changes in the Colonial Indian Economy, New Delhi, March 1989.
- b. 'Economic Evaluation of Health Care System : Some Basic Issues', Workshop on Health Economics, M.G.R. Medical University, Madras.
- c. 'Pharmacy in Colonial South India : Some Basic Questions', International Conference for the History of Pharmacy, International Society for the History of Pharmacy, Athens (Greece), April 1989.

### 2. Dr Evangeline Manickam

- a. E. Manickam, "The Fiction Writer's Tools: Humour and Irony in R.K.Narayan's portrayal of South Indian Life". Seventh International Conference on Humour, World Humour and Irony Membership. April 18-22, 1989 at Brigham Young University, Hawaii.
- b. E. Manickam "I.T. Powers , Use of the Roman Catholic Church as a Strategy for Fiction" Indian Association for American Studies Annual Conference, Hyderabad, Feb 19-22 1989.

### 3. Dr R.N. Anantharaman

- a. "Self concept and adjustment in oldage" in UGC Seminar at SV University, Tirupathi.
- b. Participated in the Annual Conference of National Institute of Personnel Management, 15-17 March 1990.

#### 4. Dr. T.T. Narendran

- a. Srinivasan G. and Narendran T.T. " A Comparative study of algorithms for cellular manufacturing " 22nd Annual Convention of Operations Research Society of India, Dec 7-10, IIT, Kharagpur, pp42-45, 1989.
- b. Mahadevan B. and Narendran T.T. " A Simulation analysis of AGV dispatching rules in an FMS", 22nd Annual Cvention of Operations Research Society of India, Dec 7-10, IIT, Kharagpur, pp 59-63, 1989.
- c. Venugopal V. and Narendran T.T. "Machine-component grouping in cellular manufacturing through Simulated Annealing: An experimental evaluation", 7 th ISME conference on Mechanical Engineering, Feb 1-3 New Delhi, pp 287-294, 1990.
- d. Kochikar V.P. and Narendran T.T. "Coloured Petri-Net modelling and Flexible Manufacturing Systems", 7 th ISME conference on Mechanical Engineering, Feb 1-3, New Delhi, pp 336-345, 1990.

#### 5. Dr R. Malathy

- a. Labor Supply Behaviour of Married Women in Urban India, Paper presented at the Rockefeller Conference on Gender Differnces in the Family, Yale University, USA, Sept 1989.
- b. Education and Women's Time Allocation in a Developing Country, Paperpresented at the North American Winter Meetings of the Econometric Society, Atlanta, USA, Dec 1989.
- c. Impact of Female Employment on Child Schooling in India, National Workshop on Methodology of Local Area Planning of Education, National Institute of Educational Planning and Administration, New Delhi, May 1990.

#### 6. Dr S. Ambirajan

- a. 'Food, Famine and Hunger in Tamil Nadu 1850-1900' Seminar on Aspects of Structural Change in the Colonial Economy held at Jamia Millia Islamia and Nehru Memorial Museum & Library, New Delhi. 3-6 March, 1989.
- b. 'The Changing Attitudes Towards Business in India' Seminar on Business and Politics in India, Indian Institute of Management, Ahmedabad, 29 - 31 March 1989.
- c. 'Future Trends in Economic Development', 'Trends in Population Growth' - Lectures given at Seethalakshmi Ramaswamy College, Tiruchirapalli, 8 April 1989.

- d. 'Union Budget 1989-1990' to the Monthly Seminar, Madras Institute of Development Studies, 7 April 1989.
- e. 'Science and Technology Futures : Some problems' Seminar on Futurology, Stella Maris College, Madras 10 March 1990.
- f. 'Economic policy of the present Government of India' talk to a Seminar at the Madurai-Kamaraj University, Madurai 21 March 1990.
- g. 'Economic change in India since Independence : Some Reflections' Paper presented at a seminar Economic Development of India since Independence at the Bharatidasan University, Tiruchirapalli, 24 March 1990.
- h. 'Economic Development in the Western Zones of Occupation and in the Young Federal Republic with some comparisons with India in the Immediate post-independence period' Public lecture under the auspices of the Max Muller Bhavan, Madras 10 April 1990.
- i. 'Population Growth, Resources and Environment' Talk in the All India Radio , Madras 6 Oct 1989.
- j. 'Role of the Rural sector in Indian Planning' special talk broadcast in the All India Radio 16 April 1990.

#### **7. Dr Dipak Chaudhuri**

- a. FMS - A review of research - C. Eswara Reddy, OVK Chetty and D. Chaudhuri. Seminar on Computer Aided Design and Computer Aided Manufacturing, Coimbatore, Sept 22-24, 1989.
- b. An Heuristic Algorithm for Cost Optimization in Maintenance Scheduling - V. Jayabalan and D. Chaudhuri, XXXI National Convention of IIE, Bombay, Oct 12-14, 1989.
- c. Inspection Intervals for Multistate Condition Maintained system -K.Mohandas, D. Chaudhuri and BVA Rao, Asian Congress on Quality and Reliability, New Delhi, Oct 30- Nov 2, 1989.
- d. "Optimum Maintenance & Replacement Schedule for a Deteriorating System for a Finite Time Period" . Jayabalan & D. Chaudhuri, Annual convention of NIQR of Trivandrum Branch, Jan 24-25, 1990.
- e. "An Inspection Model with Minimal repair for Deteriorating Equipment" - Mohandas, D. Chaudhuri and BVA. Rao, Annual Convention of NIQR of Trivandrum Branch, Jan 24-25, 1990.

#### 8. Mr C. Rajendran

Ninth IASTED International Conference on Modelling, Identification and Control held at Innsbruck, Austria between Feb. 18-21, 1990.

#### 9. Dr Mrs. Elizabeth N. Kurian

- a. Elizabeth N. Kurian - " Religion and conservation in the fiction of J.D. Salinger", Indian Association for American Studies Annual Conference, Hyderabad, Feb 19-22, 1989.
- b. Presented a paper entitled "A Critique of Bernard Malamnd's The Tenants" at the workshop on Creative Writing held in the Department of HSS, February 26-28, 1990.

#### 10. Dr. S.C. Chaudhary

- a. Refresher Course for English Teachers at Vanavani Mat.Hr.Sec School, Madras Sept 9-21, 1989 - Resource person.
- b. Presented a paper on "Syllabus Reforms and the Need for Teaching English in India at the " Linguistics and Language Teaching" National Seminar at Aligarh Muslim Univ., Aligarh, Jan 16-18, 1990,
- c. Presented a paper on " Autonomous Character of Indian English" at the "Perspective on Indian English" International Conference, CIEFL, Hyderabad 14-16 Feb, 1990.
- d. Presented a paper on "Indianness in Indian writing in English : A Descriptive Approach" at the Workshop on Creative Writing in English, HSS DEPT, IIT Madras, 26-28 Feb, 1990.

#### 11. Dr L.V.L.N. Sarma

Participated in Seminar on "Management Education in India" Conducted by Madras University and Sponsored by UGC, Feb 1990.

#### 12. Dr A.V. Krishna Rao

- a. Presented a paper entitled "Historical Consciousness in the novels of Nayantara Sahal" at the ACLALS Conference University of Kent at Canterbury, Aug 24-31, 1989.

- b. Presented the paper "Mistaken Identity : A Study" at the All India English Teacher's Conference, Dec 26-29, 1989, Andhra University, Vizag.
- c. Presided over a session on the Indian Novels in English in the Second Commonwealth Conference at S.K.D. University, Anantapur from 22 nd March to 24 March 1990.
- d. Coordinated Creative Writing Workshop in English under the joint auspices of the Indian Institute of Technology, Madras and the USEFI Madras from Feb 26-28, 1990.

#### 4. Honours and Awards

Sl.No	Name	Details of award
1.	Dr R.Malathy	Post Doctoral Fellowship awarded by Rockefeller Foundation at Yale University, USA, Jan-Dec. 1989.
2.	Dr Dipak Chaudhuri	Awarded II Best Paper prize for the papers in the NIQR convention, Trivandrum

#### 5. Visits to other institutions by faculty

##### 1. Dr L.S.Ganesh

- a. UGC short term VISITING FELLOW at Devi Ahilya Vishwavidyalaya, Indore, May - June, 1989.
- b. Avinashilingam Institute, Coimbatore. To deliver a lecture series on Long Range Forecasting Techniques.

##### 2. Dr R.N. Anantharaman

- a. Psychology of Accident at Regional Labour Institute.
- b. Motivating Subordinates at Anna Institute of Management, Madras-25.
- c. Team Building at Bharath Heavy Electrical Ltd, Tiruchi - 14.

##### 3. Dr R. Malathy

- a. Economic Growth Center , Yale University, USA - Post Doctoral Research
- b. National Institute of Educational Planning and Administration, New Delhi, Workshop Invited status paper - May 28 - June 1, 1990.

#### **4. Dr S. Ambirajan**

- a. University of Queensland, Brisbane Australia, July - August 1989, as "S.W. Brookes Visiting Fellow".
- b. University of New England, Armidale, NSW Australia.
- c. Newcastle University, Newcastle, NSW Australia.
- d. University of Sydney, Sydney Australia.
- e. University of New South Wales, Sydney Australia.
- f. University of Western Australia, Perth Australia.

#### **5. Dr A.V. Krishna Rao**

Visited between August 20-31 the Univ. of Kent at Canterbury, U.K.

#### **6. Invited Lectures by Faculty :**

##### **Dr L.S. Ganesh**

- a. G.B. Prabhat and L.S. Ganesh - "Application of systems methodology in management - a case study" 13th National Systems Conference Dec 1989, IIT, Kharagpur.
- b. Engineering Staff College of India, Hyderabad.
- c. Institution of Engineers, Madras.
- d. Mother Theresa Women's University, Kodaikanal.
- e. Institute of Management in Government, Trivandrum.
- f. University of Calicut.
- g. Annamalai University.
- h. B.I.T.S. Pilani
- i. C.F.T.R.I., Mysore.
- j. Bharathidasan University, Trichy.

#### **7. Visitors to the Department**

- a. Dr Tom Timberg of United Nations - 20/12/1989
- b. Prof T. Paul Schultz, Director, Economic Growth Center, Yale University, 12/03/1990.
- c. Dr John Rothfork, Fulbright Visiting Professor of English from New Mexico Institute of Technology, New Mexico from Jan - Feb, 1990.
- d. Dr. Michael Shortland, Visiting Professor, University of Oxford for one year (1989).

## 8. Consultancy, Projects etc

Sl No	Name	Details of consultancy/ Project	Value (in Rs)
1.	Dr. Evangeline Manickam	Effective listening sponsored by Centre for continuing Education Co-consultant : Mr S. Mohan, Lecturer, HSS Dept. Duration : One Year.	15,000
2.	Dr. R. Malathy	Household Economic Demographic Behavior and Public programs in Urban areas of Tamil Nadu Sponsored by Rockefeller Foundation through Yale Univ, USA. Duration : 6 months	85,000
3.	Dr. Mrs. Elizabeth N. Kurian	Effective presentation Centre for continuing Education Co-consultant : Dr S.C. Chaudhary, Asst Prof , HSS Dept. Duration : One Year.	15,000
4.	Prof A.V.Krishna Rao	Business of Better Writing Centre for continuing Education Co-consultant : Dr S.C. Chaudhary, Asst Prof, HSS Dept. Duration : One Year.	15,000
5.	Mr V.S. Kumar	Basic Business Writing Centre for continuing Education Co-consultant : Dr S.C. Chaudhary, Asst Prof , HSS Dept. Duration : One Year.	15,000
6.	Prof A.V. Krishna Rao	Face to Face Communication Module Centre for continuing education Duration : One year	15,000



# MATHEMATICS

## [1] ADMISSION

No. of scholars admitted during the year:

- (i) For Ph.d. Programme ... 6
- (ii) For M.Sc. ... 24

## [2] OUTPUT

(i) Details of Ph.D. degree awarded during the year 1989-90:

NAME	TITLE OF THE THESIS	GUIDE
SUNDAR.S	STUDIES ON RATIONAL (PADE) APPROXIMANTS AND SOME APPLICATIONS	Prof. P.ACHUTHAN
ARUNDHATHIS	STUDIES IN REAL FUNCTION ALGEBRAS	Dr. S.H.KULKARNI

(ii) No. of M.Sc. degree awarded during the year 1989-90 : 13

## [3] PAPERS PUBLISHED

- 1) R.SUBRAMANIAN AND V.SRIDHARAN  
"An n Unit System with Spares", Micro-electronics and Reliability, Vol. 29, No.2, 95-105 (1989).
- 2) R.SUBRAMANIAN AND V.SRIDHARAN  
"Optimum Ordering Policies with Random Lead Times and Salvage Cost", Micro-electronics and Reliability, Vol.29, No.4, 523-527 (1989).
- 3) H.S.PAUL AND M.VENKATESAN  
"Wave Propagation in a Piezoelectric Ceramic Cylinder of Arbitrary Cross Section with a Circular Cylindrical Cavity", Journal of Acoustical Society of America Vol.85, 163-170 (1989).
- 4) H.S.PAUL AND M.VENKATESAN  
"Wave Propagation in a Piezoelectric Solid Cylinder of Arbitrary Cross Section of Class 6 (Bone)", International Journal of Engineering Sciences, Vol.27, 847-853 (1989).

- 5) R.NANDAKUMAR AND K.R.PARTHASARATHY  
"Wing-lenths in graphs", Jour.Math. and Phys. sci., 23, 117-133 (1989).
- 6) K.R.PARTHASARATHY  
"Graph Polynomials",Recent Studies in Graph Theory (Ed.V.R. Kulli) Vishwa International Publishers, 212-224 (1989).
- 7) P.ACHUTHAN AND S.SUNDAR  
"Ramanujan Functions, Continued Fraction and Rational Approximants", JMPS 23,6, 481-91 (1989).
- 8) P.ACHUTHAN AND S.SUNDAR  
"On a Recursive Algorithm for Matrix Pade' Approximants - The Divide and Conquer Approach", Comp. Math. Appln. 17, 10, 1359-67 (1989).
- 9) S.KALPAKAM AND G.ARIVARIGNAN  
"On Exhibiting Inventory Systems with Erlangian Life Times under Renewal Demand", Ann. Inst. Statist.Math. Vol.41, 601-616(1989).
- 10) S.KALPAKAM AND G.ARIVARIGNAN  
"(S,S) Inventory system with Lost Sales and Markov Renewal Demands", Jour. Math. Comput. Modelling Vol 12, 1511-1520 (1989).
- 11) S. KALPAKAM AND G. ARIVARIGNAN  
"A Lost Sales Inventory System in a Random Environment", Stoc. Anal. Appl., Vol 7, 367-385 (1989).
- 12) S.N.MAJHI AND S.KRISHNAMBAL  
"An Exact Solution for Laminar Flow through Porous Annuals with or without Slip",Jl. of Math. and Phys. Sci. Vol. 23,3, 221-223 (1989).
- 13) S.N.MAJHI AND L.USHA  
"Rheology of Blood in Micro-Vessels",MIT Technical Review, 3-9 (1989).
- 14) M.SHARAFALI AND P.R.PARTHASARATHY  
"On the Distribution of a Busy Period for the Many Server Poisson Queue", Opsearch 26, 125-132 (1989).
- 15) P.R.PARTHASARATHY AND M.SHARAFALI  
"Transient solution to many sever Poisson Queue", J.Appl. Prob. 26, 58-59 (1989)
- 16) P.R.PARTHASARATHY AND M.SHARAFALI  
"The Total Sojourn Time Distribution in a Stochastic Compartmental Model", Math. Comp. Mod. 12, 1167-1173 (1989).

- 17) C.V.RAGHAVARAO AND K.PRAMADAVALLI  
"Numerical Studies of Slow Viscous Rotating Flow Past a Sphere-II", Intl.Jl.for Num.Methods in Fluids, Vol.9,1301-1319(1989)
- 18) C.V. RAGHAVA RAO and K. PRAMADAVALLI  
"Numerical Studies of Slow Viscous Rotating Flow Past a Sphere-III", Intl.Jl.for Num. Methods in Fluids, Vol.9, 1321- 1329 (1989).
- 19) A. RANGAN AND ESTHER GRACE  
"Optimum Periodic Preventive Maintainance of Systems Under Uncertainty", OPSEARCH, Vol.26, 4, 243-252 (1989).
- 20) A. RANGAN and ESTHER GRACE  
"A Stochastic Accumulator Model for Two Choice Reaction Times", Jl. of Psychometry, 3, 1, 27-36 (1990).
- 21) A. RANGAN AND ESTHER GRACE  
"On the Replacement of Systems Subject to Shocks and Wear-Dependent Failure", Adv. Appl. Prob., 21, 238-240 (1989).
- 22) A. RANGAN AND ESTHER GRACE  
"Optimal Replacement in Some Imperfect Maintainance Models", Proc. of the IASTED International Sysmposium, Lugano, Switzerland, 141, 25-27 (1989).
- 23) A. RANGAN and ESTHER GRACE  
"Stochastic Modelling of the Effect of Environmental Disturbances on Population Dynamics", Stoch. Anal. and Appl. 7(3), 325-337 (1989).
- 24) S.G. KAMATH  
"Classical Solution of Maxwell's Equations in 2+1 Dimensional Electro-dynamics with the Chern-Simon Term", Phys. Rev. A40, 6791- 6799 (1989).
- 25) S.H. KULKARNI  
"Topological Condition for Commutating of a Real Banach Algebra", Houston J. Math., Vol 14, 235-245 (1989).
- 26) W.B. VASANTHA  
"Semi-group Rings Which are Zero Square Rings", NEWS BULL C.M.S. 12(4), 8-10 (1989).
- 27) W.B. VASANTHA  
"On Group Rings Which are P-rings", Ganita (1989).

- 28) W.B. VASANTHA  
"Semi-idempotents in Semi-group Rings", Journal of Guizou Institute of Technology, Vol.18(4), 73-74 (1989).
- 29) V.B. JOHRI and R. SUDHARSAN  
"BD-FRW Cosmology with Bulk Viscosity", Australian J. of Physics, 42,(2), 215(1989).
- 30) V.B. JOHRI and R. SUDHARSAN  
"Energy Creation and Entropy Production Due to Bulk Viscosity During an Instantaneous Phase Transition", Phys. Lett.A, 141, 257- 263, (1989).
- 31) V.B. JOHRI and R. SUDHARSAN  
"Transition to a New Radiation Era in the Cosmic Evolution", Astrophysical Letters and Communications (1990).
- 32) S.K. SRINIVASAN  
"Population Point Process Model of Antibunched Light and its Spectrum", J. Phys. A, Math. Gen. 22, 259 (1989).
- 33) S.K. SRINIVASAN and V. SRIDHARAN  
"A population Model of Thermal Radiation", JI. of Mod. Optics, 36(6), 711(1989).
- 34) S.K. SRINIVASAN and V. SRIDHARAN  
"Multiphase evolution of population and its application to optics and colliding-beam experiments", J.Phys. A, Math. Gen., 23, 491 (1990).

[4] PAPERS PRESENTED AT NATIONAL/INTERNATIONAL CONFERENCES:

1. S.K. SRINIVASAN, R.SUBRAMANIAN and K.P. KISTNER  
"Control of Repair Rates in Standby Systems", U.G.C. National Symposium on Queues, Inventory and Reliability, Cochin University of Science and Technology, Cochin July 19-22, 1989.
2. P. ACHUTHAN  
"Mathematical Modelling and Computing", International Conference on Mathematical and Computer Modelling, Chicago, U.S.A., August 89 (Accepted for presentation).
3. P. ACHUTHAN  
"Why Mathematical Models?", IV Ramanujan Mathl. Soc. Conf., Karaikudi (Alagappa Univ.) May '89.

4. P. ACHUTHAN  
"Mathematical Modelling, Theories and Applications", National Symposium on Non-linear Differential Equations, Bharathidasan University, Trichy, September '89.
5. K.S. DERSANAMBIKA, P.GOVINDARAJULU and V. SUBBA RAO  
"Continuous selections for set-valued mappings in almost Normed Spaces", International conference on Approximation Theory and Finite elements, Rani Durgavathi University, Jabalpur, 16th-18th December, '89.
6. V. SUBBA RAO  
"Computational Fluid Dynamics", Seminar on Mathematical Modelling, Department of Mathematics, JNTU College of Engineering, Kakinada, December '89.
7. R. NARASIMHAN, R. RANGARAJAN and P. ACHUTHAN  
"Solitions and Pade Approximants", National Symposium on Non-linear Differential Equations, Bharathidasan University, Trichy, September '89.
8. V. SUBBA RAO, YOUSEF H. ZAHRAN and G. LATHA  
"An efficient method for initial value problems for Hyperbolic Equations", ISTAM, PSG College of Technology, Coimbatore, Dec '89.
9. V. SUBBA RAO and YOUSEF H. ZAHRAN  
"A Finite Difference Method for Hyperbolic Equations", ISTAM, PSG College of Technology, Coimbatore, December '89.
10. S. KALPAKAM and SHAHUL HAMEED  
"Stochastic Analysis of a one-unit System with Excessive Available Period", UGC National Symposium on Queues, Inventory and Reliability, Cochin, 1989.
11. S.N. VENKATARANGAN and T.R. SIVAKUMAR  
"Applications of Shooting type Adomian's Decomposition method to a Class of Poisson's Equations", International Conference on Mathematical and Computer Modelling, Chicago, USA, August, 1989 (Accepted for presentation)
12. S.N. VENKATARANGAN and T.R. SIVAKUMAR  
"Solution of a Class of Nonlinear, Singular Differential Equations by Shooting Type Adomian Method", 34th ISTAM Congress, PSG College of Technology, Coimbatore, December, '89.
13. S.N. VENKATARANGAN and T.R. SIVAKUMAR  
"Steady State Finite Cable: Approximate Analytic Solution by Shooting Type Adomian Method", 34th ISTAM Congress, PSG College of Technology, Coimbatore, December '89.

14. A. RANGAN and ESTHER GRACE  
"Optimal Replacement in Some Imperfect Maintenance Models", International Symposium, Logano, Switzerland. 1989.
15. P. VEERAMANI  
"On Fixed Point Theorems and Their Applications", Fourth Annual Conference of the Ramanujan Mathematical Society, Alagappa University, Karaikudi, 1989.
16. P. ACHUTHAN  
"Mathematical Modelling in the Indian Context", 77th Indian Science Congress, Cochin, January, '90.

[5] LECTURES/SEMINARS GIVEN AT OTHER INSTITUTIONS/  
UNIVERSITIES IN INDIA AND ABROAD:

- i. Dr. A. Rangan gave an invited lecture at UGC sponsored National Symposium at Cochin University of Science and Technology, Cochin, July 1989.
- ii. Dr. S.H. Kulkarni delivered 4 lectures at a refresher course for college teachers organized by the Madras University, Madras (1989).
- iii. Prof. V.B. Johri gave invited talks and seminars at the following universities during 1989-90.

Australian National University, Canberra,  
University of Sydney, Sydney,  
University of New Southwales, Kensington and  
National University of Singapore.

- iv. Prof. V.B. Johri participated in the International Conference on the Philosophy and Foundations of Mathematical and Physical Sciences held at Chittagong, Bangladesh (January 1990) and delivered a keynote lecture.

[6] VISITORS TO THE DEPARTMENT UNDER SPECIAL  
PROGRAMME :

- i. Professor R.P. Srivastav, Stony Brook, New York (U.S.A.) spent about 2 months (June-August, 1989) in the Department under the Tokten project of the CSIR, New Delhi. He delivered extensive lectures on several topics: Integral Equations, Transforms, Mathematical modelling and applications, Analytical computing, Inverse problems etc.
- ii. Professor H.J.W. Muller-Kirsten, University of Kaiserslautern (FRG) spent 2 weeks in the Department under a special invitation.

[7] SPONSORED PROJECTS :

- i. A project under ISTE for preparing a Module on Mathematical Modelling and Simulation is sanctioned (Rs.15,000) (Dr.P. Achuthan and Dr.S.N. Majhi)
- ii. One P and T project for the evaluation and improvement of their Mail Transfers is taken up (Dr.Y.Nagendra, Dr.P.Achuthan and Dr. S.N. Majhi).
- iii. "Modelling and Analysis of Population Dynamics in Changing Environments"-2 years duration, value about 2 lakhs (revised) A revised version was submitted to ICMR (Dr. A. Rangan and Dr. S. Kalpakam)
- iv. An Inter-departmental project on "Mathematical Modelling of the Flow in Transportation Network Systems" is sanctioned (Dr. S.N. Majhi, Dr. S.B. Patnaik and Dr. T. Panda)-(Rs. 30,000)
- v. A project on "Sphere in a rotating viscous fluid at moderate and high Reynolds numbers - A numerical study" submitted to CSIR (Dr. C.V. Raghavarao and Dr. P. Achuthan)
- vi. A project: Multi-co-ordinates Measuring Machine from G.M.T., Metrology Pvt. Ltd., Madras-44, is taken up (Dr.P.Achuthan, Dr. Y. Nagendra and Dr. S.N. Venkatarangan)

[8] COLLABORATION WITH FOREIGN INSTITUTIONS:  
INDO-USSR PROGRAMME OF CO-OPERATION :

The Department has received acceptance of one of its proposals for the mutual Indo-USSR collaborative research programmes in mathematical modelling and applications. Steps are being taken to initiate contacts with the Russian counterparts.

[9] JOURNAL OF MATHEMATICAL AND PHYSICAL SCIENCES  
(JMPS) :

This international journal is now in its 24th year of useful publication. The issues with original quality research papers, reviews and book reviews come out in February, April, June, August, October and December every year.

Patron : N.V.C. Swamy (Director)  
Editor-in-chief : Prof. P. Achuthan  
Associate Editors : 1. Prof. S.N. Majhi  
2. Prof. U.N. Srivastava  
3. Prof. P.R. Parthasarathy  
4. Dr. S.H. Kulkarni

## [10] IMPORTANT PROGRAMMES CONDUCTED :

A ZOPP: Goal-Oriented Project Planning workshop was conducted in the Department for the benefit of the faculty members. The subject was also focussed onto the IIT Madras teaching as well as research community through a programme in a Faculty Association meet.

A TAP: Technology Appreciation Programme on "Mathematics in Industries" in collaboration with IC and SR and Industries was organized.

The Department arranged the Srinivasa Ramanujan Day (SRD) celebrations with exhibitions and lecture series.

## [11] SEMINAR LECTURES:

S.No.	Speaker	Topic	Date
1.	Dr.R.Y. Denis	On Partition Generating Functions	20.07.89
2.	Dr.E.Sharathchandra Texas, USA	Asset Pricing and Production: Theory and Emperical Tests	10.08.89
3.	Dr.M.V.Sathyanarayana	Non-Classical Light	24.08.89
4.	Dr.Usha Sampath	Switching Effect in Predator- Prey Systems	31.08.89
5.	Prof.P.Kalyana Krishnan	Mathematics in Computer Science	08.09.89
6.	Dr.P.K Seghal (C.L.R.I)	Mathematicl Modelling and Bio molecular Interactons	14.09.89
7.	Prof.Dr.H.J.W Muller Kirsten University of Kaiserslautern(FRG)	Construction of Some New Model Theories With Stable or Metastable Pseudoparticle Solutions	20.09.89
8.	Prof.Dr.H.J.W.Muller Kirsten	Quantum Tunnelling, Metastability and Large Order Behaviour of Perturbation Theory	22.09.89



9.	Prof.Dr.H.J.W.Muller Kirsten	Dirac Quantisation of a Supersymmetric Field Theory	25.09.89
10.	Prof.Dr.Joachim Kupsch(FRG)	Anticommutative Interactions for the Euclidean Quantum Field Theory of Fermions	21.09.89
11.	Dr.R.Narasimhan	Solitons:Studies in Non-linear Mathematical Modelling	28.09.89
12.	Dr.P.Veeramani	Fixed Points of Multi-valued Maps and Game Theory	05.10.89
13.	Dr.Parameswaran Sankaran(SPIC)	The Borsuk-Ulam Theorem	12.10.89
14.	Prof.H.Raman	The Complementary role of Mathematical and Physical models in Engg. Design	19.10.89
15.	Prof.M.J.Lighthill London, U.K.	Recent Developments in Fluid Mechanics	05.12.89
16.	Prof. Nakamura, Japan	Advances in Non-Linear Dynamics	06.12.89
17.	Dr. P.Anandan Yale,New Heaven U.S.A	A Computational Framework and Algorithm for the mea- surement of Visual Motion	08.01.90
18.	Dr.(Mrs)W.B.Vasantha	Topological Groups and the global structure of Lie groups	25.01.90
19.	Prof. P.K.Misra Bhuvaneswar	Cultural Value of Mathema- tical Sciences	25.01.90
20.	Prof. R.N.Sen Israel	Ordered Topological Structures	05.02.90
21.	Prof.M.J Beckmann Munich, FRG	Certain Problems in O.R.	08.02.90
22.	Prof.R.Narayanan Florida, U.S.A	Fluid mechanics Instabilities	08.03.90

23. Prof.K.P.Rajappan Bhaskaracharya's Lilavathi 15.03.90  
and Modern mathematics

[12] OTHER ACTIVITIES:

The department has now 3 Personal Computers (1-XT and 2-AT) and many of the required accompaniments in its computer laboratory. Members use them effectively for their research. It is expected that the much-needed computing facilities in the Department will further be enhanced in due course.

A forum for research scholars to enable regular meeting atleast once in a fortnight and discuss relevant problems has been started.

## DEPARTMENT OF MECHANICAL ENGINEERING

### [1] RESEARCH PUBLICATIONS

1. P. Srinivasa Rao and K. V. Gopalakrishnan "Use of non-edible vegetable oils as diesel engine fuels", Journal of Institution of Engineers (India), Vol.70, ptMC4, November 1989, pp. 46-51.
2. M. Arunachalam, P. Srinivasa Rao, K. V. Gopalakrishnan "The performance of a diesel engine with thermally insulated combustion chamber", Journal of the Institution of Engineers (India), Vol.70, ptMC4, November 1989, pp. 52-55.
3. P. Srinivasa Rao and K. V. Gopalakrishnan "Performance of vegetable oils as fuels in diesel engines", Sixth Annual Convention of Bio-Energy Society of India, Madurai, 29-31, January 1990.
4. V. V. Lakshminarayana, D. Mohankrishna, K. Rajagopal, V. Ganesan "Simulation of reed valve induction systems used in two-stroke S.I. engines", Proceedings of the XI National Conference on I.C. Engines and Combustion, 11-15 December 1989, I.I.T., Madras, pp.114-124.
5. A. Ramesh, B. Nagalingam, K. V. Gopalakrishnan "Performance of glow plug surface ignition engine with methyl ester of ricebran oil as fuel", Proceedings of the XI National Conference on I.C. Engines and Combustion, 11-15 December 1989, I.I.T., Madras, pp.162-170.
6. P. Srinivasa Rao and K. V. Gopalakrishnan "Esterified vegetable oils as fuels in diesel engines", Proceedings of the XI National Conference on I.C. Engines and Combustion, 11-15 December 1989, I.I.T., Madras, pp.171-179.
7. A. Ramesh, B. Nagalingam and K. V. Gopalakrishnan "A comparative study of the heat release rates of a ceramic hot surface ignition engine and a glow plug hot surface ignition engine", Proceedings of the XI National Conference on I.C. Engines and Combustion, 11-15 December 1989, I.I.T., Madras, pp.207-214.
8. S. Jabez Dhinagar, B. Nagalingam and K. V. Gopalakrishnan "Use of alcohol as the sole fuel in an adiabatic diesel engine", Proceedings of the XI National Conference on I.C. Engines and Combustion, 11-15 December 1989, I.I.T., Madras, pp.277-287.
9. S. Jabez Dhinagar, N. Sivaramaprasada Rao, B. Nagalingam and K. V. Gopalakrishnan "Compensating the volumetric efficiency drop on an adiabatic diesel engine for improved performance", Proceedings of the XI National Conference on I.C. Engines and Combustion, 11-15 December 1989, I.I.T., Madras, pp. 288-229.

10. G.P. Prabhukumar, B. Nagalingam and K. V. Gopalakrishnan "Hydrogen diesel Vs LPG - diesel fuel engines - An experimental study", Proceedings of the XI National Conference on I.C. Engines and Combustion, 11-15 December 1989, I.I.T., Madras, pp.356-365.
11. K. R. Govinda Mallan and B. S. Samaga "Simulation of a dual-fuel engine on an digital computer", Proceedings of the XI National Conference on I.C. Engines and Combustion, 11-15 December 1989, I.I.T., Madras, pp.375-384.
12. S. Dhandapani, B. Nagalingam and K. V. Gopalakrishnan "In cylinder air motion prediction in a lean burn S.I. engine", Proceedings of the XI National Conference on I.C. Engines and Combustion, 11-15 December 1989, I.I.T., Madras, pp.385-394.
13. S. Subramaniam, V. Ganesan and P. Srinivasa Rao "A comparison of different methods of calculation of flow parameters inside the combustion chamber of an I.C. engine", Proceedings of the XI National Conference on I.C. Engines and Combustion, 11-15 December 1989, I.I.T., Madras, pp.395-402.
14. S. Subramaniam, V. Ganesan and P. Srinivasa Rao "An experimental investigation on the flow characteristics inside a swirl chamber of a diesel engine", Proceedings of the XI National Conference on I.C. Engines and Combustion, 11-15 December 1989, I.I.T., Madras, pp.403-412.
15. Vince Joseph, V. Ganesan, U.S.P. Shet and S. Sampath "Numerical computation of two dimensional reacting flows through swirl burners", Proceedings of the XI National Conference on I.C. Engines and Combustion, 11-15 December 1989, I.I.T., Madras, pp.446-455.
16. P. Ramesh Babu, K. G. Pawan Kumar, A. Ramesh, B. Nagalingam and K. V. Gopalakrishnan "Effect of compressed air aided scavenging on the performance of a two-stroke SI engine fitted with reed valves in transfer ducts", Proceedings of the XI National Conference on I.C. Engines and Combustion, 11-15 December 1989, I.I.T., Madras, pp.579-585.
17. K. V. Reddy, K. R. Babu and V. Ganesan "Utilisation of LPG in diesel engine", Proceedings of the XI National Conference on I.C. Engines and Combustion, 11-15 December 1989, I.I.T., Madras, pp.621-625.
18. R. Muralidharan, S. Govindarajan, K. V. Gopalakrishnan and K.R. Govinda Mallan "Effort of carburettor design factors on performance and emission characteristics of a two stroke, air cooled spark ignition engine", Proceedings of the XI National Conference on I.C. Engines and Combustion, 11-15 December 1989, I.I.T., Madras, pp.652-662.

19. S. Dhandapani, B. Nagalingam and K. V. Gopalakrishnan "Experimental investigation on the performance of catalytically activated combustion in a spark ignited lean burn engine", Proceedings of the XI National Conference on I.C. Engines and Combustion, 11-15 December 1989, I.I.T., Madras, pp.663-669.
20. S. Dhandapani, B. Nagalingam and K. V. Gopalakrishnan "A comparative study of different types of lean burn SI engines", Proceedings of the XI National Conference on I.C. Engines and Combustion, 11-15 December 1989, I.I.T., Madras, pp.670-679.
21. M. S. Nagesh, K. R. Govinda Mallan and K. V. Gopalakrishnan "Extended expansion engine concept for better thermal efficiency", Proceedings of the XI National Conference on I.C. Engines and Combustion, 11-15 December 1989, I.I.T., Madras, pp.691-698.
22. K. N. Gopalan "Computer aided dynamic analysis of the reciprocating engine", Proceedings of the XI National Conference on I.C. Engines and Combustion, 11-15 December 1989, I.I.T., Madras, pp.729-737.
23. G. Devapaul, T. L. Sitharama Rao and V. Ganesan, "A modified eddy break up model for confined auxiliary flow stabilised premixed flames", Proceedings of the XI National Conference on I.C. Engines and Combustion, 11-15 December 1989, I.I.T., Madras, pp.851-859.
24. Vince Joseph, U.S.P. Shet and V. Ganesan "Flow and flame characteristics in a new swirl burner", Journal of Aeronautical Society of India, Vol.141., August 1989, p.295.
25. V. Ganesan "Reed valve analysis and application in two-stroke engines", Proceedings of the Workshop on Emission and its Control for Small Two-stroke Engines, Indian Oil Corporation Limited, Faridabad, November 1989.
26. V. Ganesan "Automotive gas turbine - a review of alternative solutions", Journal of Institution of Engineers (India), Vol.70, January 1990, pp.88-92.
27. S. Subramaniam, S. Sampath, P. Srinivasa Rao and V. Ganesan "Turbulent flow inside the cylinder of a diesel engine - an experimental investigation using hot-wire anemometer", Journal of Experimental Methods in Fluids, Vol.9, No.3, 1990, pp.167- 174.
28. S. Dhandapani, B. Nagalingam and K. V. Gopalakrishnan "Effect of swirl due to squish height on the performance of lean burn SI engine", Journal of Institution of Engineers (India), Vol.70, March 1990, pp.108-110.

29. V. Balabaskaran, R. I. Lewis and H. C. Radhakrishna "Application of two dimensional turbo machinery technique for the analysis of marine ducted propeller", Proceedings of the IV Asian Congress of Fluid Mechanics, August 21-25, 1989, Hong Kong, pp.C55-C58.
30. T. Nagarajan, K. V. Sivarama Rao and B. V. A. Rao "Modeling of R-C-P-R-C spatial mechanism for its kinematic analysis using Denavit-Hartenberg transformation matrix", ASME periodical on Modeling Simulation and Control, B.Vol.26, No.3, Autumn '89, pp.35-43.
31. T. Nagarajan, N. Sivaprasad and S. Ramachandran "A survey of finite element method application for the dynamic analysis of robot manipulators, ASME periodical on Modeling Simulation and Control, B.Vol.27, No.1, Winter 1989-90, pp.23-34.
32. T. Nagarajan, N. Sivaprasad and S. Ramachandran "A generalised approach for finding the minimum deflection path for assembly robots using finite element method", ASME periodical on Modeling Simulation and Control, B. Vol.27, No.1., Winter 1989-90, pp.35- 50.
33. T. Nagarajan, N. Sivaprasad and S. Ramachandran "Estimation of resonant frequencies of platform type robotic manipulators using finite element method", V International Symposium of Linkages and Computer Methods (Theory and Practice of Mechanism), Bucharest, Romania, July 6-11, 1989, pp.513-524.
34. T. Nagarajan, N. Sivaprasad and S. Ramachandran "Determination of minimum deflection path for assembly robots using finite element method", V International Symposium of Linkages and Computer Methods (Theory and Practice of Mechanism), Bucharest, Romania, July 6-11, 1989, pp.525-533.
35. T. Nagarajan, K. V. Sivarama Rao and B. V. A. Rao "Kinematic analysis of R-C-P-R-C spatial mechanism", V International Symposium of Linkages and Computer Methods (Theory and Practice of Mechanism), Bucharest, Romania, July 6-11, 1989, pp.567-577.
36. T. Nagarajan, N. Sivaprasad and S. Ramachandran "An FEM approach for estimating joint control parameters of an industrial robot with elastic links", International Conference on CIM and Robotics, IIT, Delhi, Dec.1989.
37. T. Nagarajan, K. V. Sivarama Rao and B. V. A. Rao "Kinematic analysis of R-C-P-R-C spatial mechanism, Journal of Aeronautical Society of India, Dec.1989.
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39. R. Lakshminarayanan, M. Singaperumal, B. K. Garudachar and M.K. Ramamurthy "Development of a digital computer model for aircraft gas turbine engine fuel control", Proceedings of VI All India Fluid Power Conference, Jan.1990.
40. C. B. Sobhan, S. P. Venkateshan and K. N. Seetharamu "Experimental analysis of unsteady free convection heat transfer from horizontal fin arrays", *Warme und Stoffubertragung*, Vol.24, 1989, pp.155-160,
41. S. P. Venkateshan, P. Shahkottai, E. Y. Kwach and L. H. Back "Acoustic temperature profile measurement technique for large combustion chambers", *ASME-C, J. Heat Transfer*, Vol.III, 1989, pp.461-466.
42. S. P. Venkateshan and P. Shahkottai "Acoustic probes withstand severe conditions but give spatially resolved temperature readings", *NASA Tech. Brief NPO-17007/TN*, Tech. Notes, 1989, pp.700-701.
43. D. Lawson, P. Shahkottai and S. P. Venkateshan "Polymeric electrolytic hygrometer for harsh environments", *NASA Tech. Brief*, Vol.13, No.9, Item#100, Sept.1989.
44. S. S. Sablani, S. P. Venkateshan and V. M. K. Sastri "Numerical study of the problem of freezing in an annulus", Proceedings of X National Heat and Mass Transfer Conference, Srinagar, August 1989.
45. N. Devasahayam, G. Palaniswamy and S. P. Venkateshan "A general purpose microprocessor based board for instrumentation", National Seminar on Instrumentation, Cochin University of Science and Technology, Nov. 1989.
46. K. N. Krishnan and V. M. K. Sastri "Heat transfer in laminar pulsating flows of fluids with temperature dependent viscosities", *Warme-und stoffubertragung*, Vol.24, 1989, pp.37- 42.
47. K. V. C. Rao and V. M. K. Sastri "Heat transfer in an annulus with rotating inner cylinder", *Chemical Engineering and Processing*, Vo.26, 1989, pp.173-177.
48. A. Sankar and V. M. K. Sastri "Finite element solutions of steady two dimensional natural convection equations", Proceedings of the 6th International Conference on Numerical Methods in Thermal Problems, Swansea, UK, vol.6, Part II, 1989.
49. Vijay R. Raghavan "Parametric studies of wall heat transfer in a fluidized bed circulating through a packed bed", *Warme und stoffubertragung*, Vol.24, 1989, pp.139-144.

50. P. Raghavan and R. Natarajan "Determination of work ratio and exhaust dryness fraction for reheat rankine cycles", IX Miami Beach, Florida, USA, Dec. 11-13, 1989.
51. R. Suryanarayanan and R. Natarajan "Thermodynamic analysis of stirling cycles", IX Miami Beach, Florida, USA, Dec. 11-13, 1989.
52. Venkataramana Rao and R. Natarajan "Experiments and computations of two-dimensional flow over a sudden enlargement section", XII Canadian Congress of Applied Mechanics, Ottawa, Canada, May 28 - June 02, 1989.
53. P. Raghavan and R. Natarajan "First and second law analysis of the reheat steam power cycle", XII Canadian Congress of Applied Mechanics, Ottawa, Canada, May 28-June 02, 1989.
54. S.K.A.Somaraj, K. S. Padiyar and R. Natarajan "Visible length, stability and structure of burning gaseous fuel jets", IV Asian Congress of Fluid Mechanics, Hong Kong, August 21 - 25, 1989.
55. B.H.L.Gowda, S. Srinivasan and R. Natarajan "Experimental study of static pressure and mean velocity profiles inside a two- dimensional dump type combustor model, IX International Symposium on Air Breathing Engines, Athens, Greece, Sept.04-09, 1989.
56. J. Venkataramana Rao, B. S. Subhash Chandran and R. Natarajan "Investigations of mixing of axisymmetric hot and cold jets in a dump combustor", Proceedings of the XI National Conference on I.C. Engines and Combustion, 11-15 December 1989, I.I.T., Madras, pp.456-468.
57. S. K. A. Somaraj, K. S. Padiyar and R. Natarajan "Experimental investigation of single and multiple enclosed jet diffusion flames", Proceedings of the XI National Conference on I.C. Engines and Combustion, 11-15 December 1989, I.I.T., Madras.
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61. R. Natarajan "On the concept of excellence", Invited Paper, XIX Annual convention of the Indian Society for Technical Education, Tirupati, Dec.19-21, 1989, pp.1-8.
62. R. Natarajan "Some important considerations in the formulation of energy policy", All India Technical Convention on Non- Conventional Energy Sources - Perspectives for the year 2000 A.D., Institution of Engineers (India), Manipal, Sept. 1989.
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64. R. Natarajan "Organisation, method of assessment and follow-up for accreditation", UGC Workshop on Accreditation, Anna University, Madras, March 24-25, 1989.
65. R. Natarajan, H.Eickhoff and A. Winady "Azimuthal instability in jet diffusion flames", Experiments in Fluids, 7, 420-1, 1989.
66. R. Natarajan and P. Raghavan "First and second law analysis of the reheat steam power cycle", Int. J. of App. Engg. Education 5, 607-19, 1989.
67. A. Venkatesh "Experimental investigations on a two stage solar refrigerator", ISES Solar World Congress 1989, Kobe, Japan, Sept. 1989.
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69. V. B. Gandhe, A. Venkatesh and V. Sriramulu "Thermal analysis of an FMDF solar concentrator", Journal of Solar and Wind Technology, Vol.6, No.3, 1989, pp.197-202.
70. V. Sriramulu and K. Annamalai "High frequency instability problem encountered in CPR engines with radial injectors", 17th Int. Symposium on Space Technology and Sciences, Tokyo, Japan, May 20-25, 1990.
71. K. Thyagarajan and K. A. Bhaskaran "High temperature gas phase oxidation kinetics of benzene", 17th International Symposium on Shock Waves and Shock Tubes, Pennsylvania, USA, July 17-21, 1989.

72. R. Natarajan and G. Kuppuswamy "Lecture method - Strategy for improvement", J. Higher Education, Vol.14, 1989, pp.87-99.
73. R. Natarajan "An investigation of the stability characteristics of jet diffusion flames", J. Aero Soc. of India.
74. R. Natarajan "A range of energy related challenges for the next decade", Urja, 27(3), 1990, pp.55-60.
75. R. Natarajan "The Academic industrial interface", Training Journal of the Board of Apprenticeship Training, 1989.
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77. R. Natarajan "Some essential considerations in energy policy and planning for the future", Urja, 27(1), 1990, pp.39-50.
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79. A. Venkatesh and A. Mani "Experimental investigations on a two stage intermittent solar refrigeration system", Jr. of the Solar Energy Society of India, Vol.3, No.1, 1989, p.23.
80. A. Venkatesh "Experimental observations on a portable solar still", Jr. of the Solar Energy Society of India, Vol.3, No.1, 1989, p.9.
81. Sanjay Deodhar, K. A. Bhaskaran and K. Thyagarajan "Detonation wave parameters for Aromatic hydrocarbons", Indian Journal of Technology, Vol.27, 1989, pp.261-266.
82. K. Thyagarajan and K. A. Bhaskaran "Identification of major pathways in pre-mixed constant volume benzene combustion", Proceedings of the XI National Conference on I.C. Engines and Combustion, 11-15 December 1989, I.I.T., Madras.
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85. P. Chennapan and V. Radhakrishnan "Computer aided design and manufacturing of sculptured surfaces", Proceedings of the IV Int. Conf. on CAD, CAM, Robotics and Factories of the Future, New Delhi, Tata McGraw Hill, 1989, pp.17-27.
86. R. Ramesh and V. Radhakrishnan "An algorithm for optimisation of strip layout and press tool design", Proceedings of the IV Int. Conf. on CAD, CAM, Robotics and Factories of the Future, New Delhi, Tata McGraw Hill, 1989, pp.228-238.
87. B. Ramamoorthy and V. Radhakrishnan "Improving the load carrying capacity of interference fits", Proceedings of Instn. Mech. Engrs. Part-B 203, 1989, pp.83-90.
88. N. Ramesh Babu, V. Radhakrishnan and Y. V. G. S. Murti "Investigations on laser dressing of grinding wheels - Part I : Preliminary study, Trans. ASME J. of Eng. for Industry 111,1989, pp.244-252.
89. N. Ramesh Babu and V. Radhakrishnan "Investigations on laser dressing of grinding wheels - Part II: Grinding performance of a laser dressed aluminium oxide wheel", Trans. ASME J. of Eng. for Industry 111, 1989, pp.253-261.
90. B. D. Bhatt and V. Radhakrishnan "Evaluation of some machining processes as adherent surface treatments in bonding aluminum", J. of Adhesion Science and Technology, V.3, No.5, 1989, pp.383- 396.
91. V. Soundara Rajan and V. Radhakrishnan "An investigation on the roundness and side-wall errors in ultrasonic drilling", Surface Topography, V.2, No.3, 1989, pp.233-245.
92. P. R. Nakkeeran and V. Radhakrishnan "A study on the effect of regulating wheel error on the roundness of the work piece in centreless grinding by computer simulation", Int. J. Mach. Tools Manufact. V.30, No.2, 1990, pp.190-201.
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97. R. Krishnamurthy "Lubricant analysis - its reliability for condition monitoring", Diagnostic Conference, Union College, USA, Sept.11-14, 1989.
98. D. S. Roosevelet, R. Krishnamurthy and S. K. Malhotra "Role of drying on the surface quality of leather", ILTCS Congress, Philadelphia, USA, Oct.15-19, 1989.
99. G. Santhanakrishnan, R. Krishnamurthy and S. K. Malhotra "HSS tool wear studies on machine glass fibre reinforced plastics", WEAR, 132, 1989, pp.327-336.
100. G. Santhanakrishnan, R. Krishnamurthy and S. K. Malhotra "Studies on machined GFRP surfaces", Int. Conf. on Advances in Composite Materials, Jan. 15-18, 1990.
101. B. L. Anantharamu and R. Krishnamurthy "Machining performance of toughened zirconia ceramic and cold compact alumina ceramic in ultrasonic drilling", Int. Journal of Mechanical Working Technology, Netherlands, 1989, pp.365-375.
102. G. Velayutham, O. V. Krishnaiah Chetty and R. Narayan "Electrochemical dissolution of nickel in concentrated electrolyte solutions - an impedance study", First Intl, Symposium on Electrochemical Impedance Spectroscopy, Bombannes, France, May 1989.
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104. M. D. Sreekumar and O. V. Krishnaiah Chetty "An improved lot sizing policy for variable demand", Accepted for I, USA, Dec.9. 1989.
105. Kurapati Venkatesh, K. Ravi Raju and O. V. Krishnaiah Chetty "Simulating flexible automated forming and assembly systems", Accepted for publication and presentaion at Int. Conf. on Developments in Forming Technology, Lisbon, Portugal, Sept.12- 14, 1990.
106. Kurapati Venkatesh, K. Ravi Raju and O. V. Krishnaiah Chetty "Augmenting the perofrmance of flexible multi robot assembly systems through petri nets", Accepted for publication and presentaion at Int. Conf. on Automation, Robotics and Computer Vision, Singapore, Sept.18-21, 1990.

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108. M. Lakshmanan and O. V. Krishnaiah Chetty "Evaluation of dust hazard index in ferrous foundries", Indian Foundry Journal, Jan, 1990, pp. 41-45.
109. P. Venkateswara Rao, O. V. Krishnaiah Chetty, G. Velayutham and R. Narayan "Parametric influence on polarisation in ECM-Part II Effect of probe projection", Proceedings of ISME Conference, Delhi, Feb. 1990.
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111. K. Ravi Raju, K. Venkatesh and O. V. Krishnaiah Chetty "Petri nets for design automation", Accepted for publication and presentaion at the Convention of Computer Engineers, Trichy, India, Sept. 1990.
112. K. Ravi Raju, K. Venkatesh and O. V. Krishnaiah Chetty "Application of petri nets for unmanned flexible manufacturing systems", Accepted for publication and presentaion at All India Conference on Machine Tool Design and Research, IIT, Bombay, India, Dec. 1990.
113. K. Ravi Raju, K. Venkatesh and O. V. Krishnaiah Chetty "Facilites scheduling in flexible manufacturing systems using petri nets", National Seminar on Advances in Metal Cutting and Metal Forming, MIT, Madras, India, May 24-25, 1990.
114. G. Prabhakara Rao, O. V. Krishnaiah Chetty and R. Narayan "Investigations on electrochemical anodic shaping", Accepted for the presentation in 14th AIMTDR Conference, Bombay, Dec. 1990.
115. S. D. Kalandar Saheb and K. Gopinath "Powder metallurgy gears - a brief review", 15th National P/M Conference, Srinagr, May 12- 13, 1989.
116. Phuong Dung Dan and S. Srinivasa Murthy "Comparative thermodynamic study of fluorocarbon refrigerant based vapour absorption heat pumps", Int. J. of Energy Research, Vol.13, 1989, pp.1-22.
117. John. M. George and S. Srinivasa Murthy "Influence of heat exchanger effectiveness on performance of vapour absorption heat transformers", Int. J. of Energy Research, Vol.13, 1989, pp.455- 476.

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120. John. M. George, Winfried Marx and S. Srinivasa Murthy "Thermodynamic analysis of R22 - DMP compression - absorption heat pump", Heat Recovery Systems and CHP, Vol.9, No.5, 1989, pp.433-446.
121. John. M. George, Winfried Marx and S. Srinivasa Murthy "A comparative thermodynamic study of R22 - DMETEG and R22 - DMF compression absorption heat pumps", Heat Recovery Systems and CHP, Vol.10, No.1, 1989, pp.31-36.
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123. S. Srinivasa Murthy "Solar cooling technology : an overview" (Invited Paper), Advances in airconditioning and refrigeration, National Productivity Council, New Delhi, Oct.19-20, 1989.
124. S. Srinivasa Murthy "Utilisation of solar energy for heating and cooling", National Workshop on Strategies for Commercialisation for Renewable Energy Technologies, TEDA, Madras, Dec.15-16, 1989.
125. N. Sitaram, M. Govardhan and N. Venkatarayulu "Wake behaviour of a large deflection turbine rotor linear cascade", J. of Aero. Soc. of India, Vol.41, 1989, pp.269-275.
126. M. Govardhan, N. Sitaram, R. S. N. Prasad and N. Venkatarayulu "Effect of aspect ratio on secondary flows and losses in a high deflection liner turbine rotor cascade", Ind. J. Tech., Vol.27, 1989, pp.63-70.
127. M. Govardhan "Secondary losses behind an annular turbine cascade", Proceedings of IV ACFM, August 1989.
128. M. Govardhan, N. Venkatarayulu and A. Nayak "Quasi three- dimensional computational flow analysis through or annular turbine cascade", 40 years of Turbo Institute, Sept. 1989.
129. K. Radhakrishnan and K. Gopinath "Failure analysis of large sintered bronze clutch plates", Intl. Journal of Powder Metallurgy Science & Technology, Vol.1, 1989, pp.26-35.

130. G. Narasimhan and N. Sivaprasad "FEM analysis of tank turret", Def. Sci. J. Vol.39, No.3, 1989. pp.257-268.
131. N. Sivaprasad and Radha Sarma "A finite element analysis for the design of a conveyor pulley", Comp. & Str. Vol.35, No.3, pp.267- 277.
132. M. Narsi Reddy and N. Sivaprasad "Computer aided selection of rolling bearings", Int. Conf. on CAD, CAM, Robotics & Factories of the Future", New Delhi, Sec.19-22, 1989.
133. S. Krishnamurthy, A. Ramamohana Rao and B. K. Sridhara "Performance studies on positively corrected sursulf treated low carbon steel spur gears", ASMI Conference on Power Transmission and Bearing, April 1989, pp.221-228.
134. S. Krishnamurthy and A. Ramamohana Rao "Effect if sursulf treatment on fatigue life of medium carbon steel spur gears", Mech Theory, Vol.60, No.(1), pp.1080-1089.
135. S. K. Malhotra, N. Ganesan and M. A. Veluswami "Vibrations of orthotropic triangular plates", Journal of Computers and Structures, Vol.12, 1989, pp.17-25.
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137. S. K. Malhotra, N. Ganesan and M. A. Veluswami "Vibration in dumping analysis of orthotropic triangular plates", Journal of Sound and Vibration, 1989, 130(3), pp.379-386.
138. S. K. Malhotra, N. Ganesan and M. A. Veluswami "Vibration of composite plates without oats", Vol.41, n-1, pp.61-64.
139. Paul Joseph, G. Muthuveerppan and N. Ganesan "Vibrations of generally orthotropic plates in fluids", Composite Structures, Vol.15, 1990.
140. A. Ramachandriah, N. Ganesan, G. Muthuveerappan and B. V. A. Rao "Study of plate radiation in an enclosure using FEM", International Congress on Recent Development in Air and Structure Born Sound, USA, March 06-08, 1990.

## [2] HONOURS AND AWARDS

NAME	DESIGNATION	HONOURS/AWARDS
P. Srinivasa Rao K. V. Gopalakrishnan	Assistant Professor Professor	Best paper award - XI National Conference on I.C.Engines & Combustion, Dec. 11-15, 1989, Madras
V. Ganesan	Professor	Vice-chairman Combustion Institute (IS)
S. P. Venkateshan	Professor	NASA Tech Brief Award by NASA Inventions and Contributions Board, Washington, D.C., USA
S. P. Venkateshan	Professor	Acoustic Humidity Sensor, Dec. 1989, Each award carries a \$150 cash prize and a certificate of recognition
S. P. Venkateshan	Professor	United States Patent 4,876,889 granted on Oct.31,1989 for
S. Sivakumar K. Ramakoteswara Rao M. A. Parameswaran	Student Assistant Professor Professor	ISTE - GSFC Award for II Best M.Tech Thesis Rs.6,000/- - awarded
R. Natarajan	Professor	Best paper award - XI National Conference on I.C.Engines & Combustion, Dec. 11-15, 1989, Madras
R. Natarajan	Professor	Best paper Presentation - XI National Conference on I.C.Engines & Combustion, Dec. 11-15, 1989, Madras
K. A. Bhaskaran	Professor	Appeared in ReferenceAsia, Vol.IV Asia's Who's who of Men and Women of Achievement



R. Krishnamurthy	Professor	Elected Fellow of Institution of Production Engineers, London, UK
K. Gopinath	Professor	Editor, International Journal of Powder Metallurgy Science and Technology
K. Gopinath	Professor	Principal Member, Threads & Conventions, Bureau of Indian Standards
K. Gopinath	Professor	Executive Committee Member, FPSI, Madras Chapter
K. Gopinath	Professor	Member, National Council, AMM
A. Veluswami	Professor	Member, National Council, Association of Machines and Mechanisms

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### [3] VISIT OF FACULTY MEMBERS TO OTHER INSTITUTIONS

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NAME	INSTITUTIONS VISITED/PURPOSE OF VISIT/DURATION
1. T. Nagarajan	BHEL, Trichy, Inplant lectures, 29-30 Dec.1989
2. T. Nagarajan	BHEL, Hyderabad, Inplant lectures, 19-21 Feb.1990
3. K. N. Seetharamu	Virginia Polytechnic Institute and State University, Blacksburg, Virginia, USA, NSF Project, 3 weeks.
4. K. N. Seetharamu	University College of Swansea, Swansea, UK, Indo-British Collaboration, 5 weeks.
5. Ajit Kumar Kolar	New York University, New York, Technical discussion with Prof.Zakkay reg. NSF PFBC Project, 4/7/89 to 4/8/89.

6. V. M. K. Sastri                      New York University, USA, NSF Project
7. R. Natarajan                        Benha University of Technology, Egypt, Technical Discussions, Cairo University and Mansoura University, Egypt for delivering lectures, Sept. 1989.
8. R. Natarajan                        BHEL, Trichy for Lectures, Nov. 1989
9. R. Natarajan                        BHEL, Trichy for Lectures, Feb. 1990
10. V. Radhakrishnan                Symposium on Metrology for Quality Control in Production, China, Paper Presentation
11. V. Radhakrishnan                National Institute of Metrology, Beijing and Institute of Machine Building Industry, Beijing, China, Visit
12. V. Radhakrishnan                City Polytechnic, Hongkong, Seminar
13. V. Radhakrishnan                Joint Meeting of the Instn. of Engineers (Singapore) and SME (Singapore), Singapore
14. B. Ramamoorthy                  Bochum University, West Germany, Study visit, 01 Oct 1989 to 31 May 1990
15. L. Vijayaraghavan                Bochum University, West Germany, Study visit, 01 Oct 1989 to 31 May 1990
16. N. Ramesh Babu                  Bochum University, West Germany, Study visit, 01 Oct 1989 to 31 May 1990

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**[4] PARTICIPATION OF FACULTY IN CONFERENCE/SYMPOSIA, ETC.**

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NAME OF STAFF MEMBER	PARTICULARS OF PARTICIPATION IN CONFERENCE/SEMINARS/SYMPOSIA/ SHORT-TERM COURSES	NATURE OF PARTICIPATION
NAME/DATE/VENUE		
1. K.V.Gopalakrishnan	XI National Conference on I.C. Engines and Combustion, Dec.11-15, 1989, IIT., Madras	Paper Presentation

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2. K.V.Gopalakrishnan	Bio-energy Society, Jan.29-31, 1990, Madurai	Paper Presentation
3. V. Ganesan	XI National Conference on I.C. Engines and Combustion, Dec.11-15, 1989, IIT., Madras	Paper Presentation
4. P. Srinivasa Rao	XI National Conference on I.C. Engines and Combustion, Dec.11-15, 1989, IIT., Madras	Paper Presentation
5. B. Nagalingam	XI National Conference on I.C. Engines and Combustion, Dec.11-15, 1989, IIT., Madras	Paper Presentation
6. B. Nagalingam	National Symposium on Natural Gas Utilisation, April 19-21, 1990	Paper Presentation
7. K. N. Gopalan	XI National Conference on I.C. Engines and Combustion, Dec.11-15, 1989, IIT., Madras	Paper Presentation
8. K.R.Govinda Mallan	XI National Conference on I.C. Engines and Combustion, Dec.11-15, 1989, IIT., Madras	Paper Presentation
9. V. Balabhaskaran	IV Asian Congress of Fluid Mechanics, Aug.21-25, 1989, Hong Kong	Delegate
10. S. Kumaraswamy	IV Indian Engineering Congress, 30 Dec. 1989 - 02 Jan. 1990, Bhuvaneshwar	Delegate
11. T. Nagarajan	National Conference on CAD/CAM Sept.01-08, 1989, Coimbatore	Delegate
12. N. Sivaprasad	National Conference on CAD/CAM Sept.01-08, 1989, Coimbatore	Delegate
13. Y. G. Srinivasa	National Seminar on Instrumentation, Cochin, Nov.1989	Delegate
14. Y. G. Srinivasa	13th National Systems Conference Kharagpur, Dec. 1989	Delegate

15. Ajit Kumar Kolar	Workshop on FBC Technology, BHEL, Trichy, June 1989	Invited Lecture
16. Ajit Kumar Kolar	International Conference on MHD Power Generation, BHEL, Trichy, Dec. 4-8, 1989	Guest participation
17. Ajit Kumar Kolar	XI National Conference on I.C. Engines and Combustion, Dec.11-15, 1989, IIT., Madras	Organising Committee Member
18. V. M. K. Sastri	The Asian School on Energy "Industrial and Rural Power Production", AIT, Bangkok Jan. 17-26, 1990	Organising Committee Member
19. Vijay R. Raghavan	XI National Conference on I.C. Engines and Combustion, Dec.11-15, 1989, IIT., Madras	Organising Committee Member
20. R. Natarajan	XI National Conference on I.C. Engines and Combustion, Dec.11-15, 1989, IIT., Madras	Paper Presentation
21. R. Natarajan	IX International Symposium on Air-breathing Engines, Athens, Greece, Sept.04-09, 1989	Paper Presentation
22. R. Natarajan	XIX Annual Convention of the Indian Society for Technical Education, Tirupati, Dec. 19 -21, 1989	Invited Lecture
23. R. Natarajan	Regional Workshop on AICTE Act, S.J. College of Engineering, Mysore, March 11-12, 1989	Paper Presentation
24. R. Natarajan	UGC Workshop on Accreditation Anna University, Madras March 24-25, 1989	Paper Presentation

25. K. S. Padiyar	XI National Conference on I.C. Engines and Combustion, Dec.11-15, 1989, IIT., Madras	Paper Presentation
26. V. Radhakrishnan	Computer Aided Design & Computer Aided Manufacture National Conference, PSG College of Tech. Sept.22-24, 1989	Inaugurated the Conf. & delivered Inaugural address
27. V. Radhakrishnan	IV Int. Conf. on CAD/CAM, Robotics & Factories of the Future, IIT, New Delhi, Dec.19-22, 1989	Paper Presentation
28. P. K. Philip	CAD/CAM National Conference PSG College of Technology Coimbatore, Sept.22-24, 1989	Paper Presentation
29. R. Krishnamurthy	Int. Conf. on Advances in Composite Materials, ASM International - IIT, Bombay Jan.15-18, 1990	Paper Presentation
30. R. Krishnamurthy	XI National Conference on I.C. Engines and Combustion, Dec.11-15, 1989, IIT., Madras	Paper Presentation
31. R. Krishnamurthy	National Seminar METCUTFORM '90 MIT, Madras, Feb. 1990	Paper Presentation
32. S. Srinivasa Murthy	VII Asian School on Energy Asian Institute of Technology Bangkok, Thailand, Nov. 1989	Delivered Lecture
33. S. Srinivasa Murthy	Symposium on Advances in Air-conditioning and refrigeration National Productivity Council, New Delhi, Oct. 19, 1989.	Delivered Lecture
34. M. Govardhan	Fourth Asian Congress of Fluid Mechanics, Hong Kong Aug.19-23, 1989	Paper Presentation

**[5] DISTINGUISHED VISITORS TO THE DEPARTMENT.**

NAME	AFFILIATION	PURPOSE
<b>From Abroad</b>		
1. Dr. R. C. Rosenberg	Professor Dept. of Mechanical Engg. Michingan State University	Lectures on Power Bond Graph
2. Dr. H. R. Thomas	School of Engineering University College of Cardiff, Cardiff, UK	Indo British Collaboration
3. Dr. Victor Zakkay	Director Antonio Fierri Laboratory New York University Westburg, New York	Technical discussion and proposal preparation for NSF PFBC Project
4. Dr. Ing H. Martin	Professor, Institute for Thermal Processing, University of Karlsruhe, Germany	Invited expert under the Ministry of HRD-GTZ Scheme
5. Dr. G. Bechtloff	Director Laboratorium for forder technik and machine elements Hochschule der Bundeswer Hamburg	Visiting Professor
6. Prof. T. Truslove	Professor, Mech. Engg. University of Edinburgh, UK	Discussions
7. Dr. Ing. P. Roth	Professor Institute of Gasdynamics and Combustion, University of Duisburg, West Germany	Discussions

8. Dr. Ing. P. Frank	DFVLR, Institute for Physical Chemistry of Combustion, Stuttgart, West Germany	Discussions
9. Dr. Ing. Massberg	Ruhr University	Indo-German Programme
10. Dr. Ing. M. Mohrle	Ruhr University	Indo-German Programme
11. Dr. Ing. Seifert H.J.	Ruhr University	Indo-German Programme
12. Dr. Ing. F. Jonsen	Ruhr University	Indo-German Programme
13. Dr. Ing. Hans Kurt Toenshoff	Director Inst. of Prodn. Engg & Machine Tools, Hannover	Project discussion and Seminar Talk
14. Dr. Malkin	Professor Univ. of Massachusetts, USA.	Visit to the Lab. and Seminar Talk

#### From India

1. Dr. Durga Pal	Professor Indian Institute of Armament Technology, Pune.	Discussions
2. Mr. A. Ritzmuller	Consul, FRG	Visit to the Lab.
3. Mr. V. Ranganathan	Dy. Project Director ADA, Bangalore	Project Discussion and Seminar Talk
4. Dr. V. T. V. S. Ramachandra Rao	Director of Research Brakes (India) Ltd., Madras.	Invited Lectures

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[6] SEMINARS/SYMPOSIA/SHORT-TERM COURSES ORGANISED

	NAME OF THE PROGRAMME	DURATION
1.	XI National Conference on I.C. Engines and Combustion	Dec.11-16,1989
2.	Short-term Course on Air Pollution from Automobile Engines and its Control	June 5-16,1989
3.	Short-term course on Ceramic in Heat Engines	May 15-26,1989
4.	ZOPP Workshop for Maths Department	
5.	QIP Winter School on Servo and Proportional Hydraulic Controls.	
6.	Scientific Instruments-Summer School sponsored by DST	May 01-05,1989
7.	Recent Developments in Heat Exchangers-Summer School sponsored by ISTE	June 1989
8.	Refresher course on Energy Conservation through Plant Engineering, Indian Institute of Plant Engineers, Madras.	April 17-22, 1989
9.	ISTE short term course on CAD in Mechanical Engineering	July 3-14, 1989



# METALLURGICAL ENGINEERING

## [1] Academic Programmes - Introduction:

The Department of Metallurgical Engg is one of the first departments to be set up and has been in existence right from the inception of the Institute. Apart from the I.I.Sc., Bangalore no major institution in South India was imparting the much needed training at the UG and PG level in Metallurgical Engineering. This department filled that gap and has since then remained in the forefront in the training of Metallurgical Engineers.

This department has well established Laboratories in most industrially significant branches of metallurgical engineering. Particular mention may be made of the thrust achieved in the areas of Metal Joining, Metal Forming and Metal Casting.

## [2] Staff position:

During the year 20 Faculty, 4 Scientists Officer were in position. 2 fresh appointments were made. The details are:

### List of Teachers/Officers appointed during the year

Name	Designation	Date of appointment
Dr.P.Kesavan Nair	Asst.Prof.	19.5.89
Dr.Paramanand Singh	Lecturer	24.10.89
Dr.K.Swaminathan	Lecturer	8.2.90
Dr.V.Sampath	Lecturer	26.4.90
Shri G.Jothinathan	S.S.O.II	8.8.89
Dr.B.Guha	S.S.O.II	8.8.89
Mr.T.Raghavaiah	Tech.Asst.	1.3.90

## [3] Honours & Awards:

A number of Faculty members have won awards and honours at national and international level. The details are:

Name	Honour/award
Prof.R.Vasudevan	Invited by the University of Twente and Science Foundation, the Netherlands for a 3 month visit (Sept-Nov.1989) for interaction with their research group and delivering a few special lectures.
Prof.K.Srinivasa Raghavan	Chairman, Indian Institute of Metals, Madras Chapter Member, Board of Governors, IIT Madras.

Category Editor, Cobalt Ternary System (International Programme - Phase Diagram)

Prof.K.A.Padmanabhan Alexander von Humboldt Fellow - May-July, 1989, University of Erlangen-Nuimberg.  
Alaxander von Humboldt Fellow May-June 1990 Technical Univ. of Aachen

Materials Research Society of India Medal, 1990 (the year of inception)

Member, Scientific Advisory Committee, International Symposium on Manufacturing and Materials Processing since Sept.1989.

Vice Chairman, Indo-US Advanced Study Institute on 'Energy Optimisation in Manufacturing and Materials Processing, Madras, Jan.1989

Prof.H.Md.Roshan Member, Foundry Panel of DGTD Govt. of India.

Dr.S.D.Pathak Advisor, Sports, IIT Madras (nominated by the Director) Faculty Adviser (M.Tech)

Dr.K.Swaminathan Sudharshan Bhat Memorial Prize for the best Ph.D.thesis in 1989.

Dr.D.R.G.Achar National Metallurgist award, Indian Institute of Metals, Calcutta - Sponsored by the Govt.of India.

Dr.K.Prasad Rao Secretary, Indian Institute of Metals, Madras Chapter

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#### [4] Visits by Staff members to other institutions:

Many staff members have visited institutions and organisations in India and abroad. The faculty also actively participated in national and international Seminars/Symposia/ Workshops. The details are:

Name	Institutions visited/Purpose/duration of visit
Dr.S.Raghavan	Visiting Associate Profesor, Dept. of Materials Science and Engineering, McMaster University, Hamilton, Ontario, Canada. During the period research was carried out on Thermodynamics and Development of Chemical sensors in steels using solid state galvanic cells.
Dr.D.G.R.Sharma	Visited Instiut fur Eisenluttentuste on 3 month short term DAAD invitation programme. Worked on the rate of dissolution of carbon in iron

#### [5] Participation of Faculty in Seminars/Symposia etc.

Name	Particulars of Participation in Seminars/Symposia/Short term courses
Dr.K.Srinivasa Raghavan	Presented a paper on Laser Melting at the Symposium on Surface Modification Technologies at Neuchetel, Switzerland, Aug.31,Sept.5, 1989.
Dr.S.D.Pathak	Co-ordinated a 2-week ISTE Winter School on Mech. Behaviour of Materials (27.II- 8.12.89)
Prof.H.Md.Roshan	Presented a paper on Expert System for casting defect analysis at the World Foundry Congress held in Dusseldorf, West Germany, during May 1989  Presented four papers on Foundry Technology in the 37th Annual Convention of the Institute of Indian Foundrymen, at New Delhi,during Feb.1989.  Was one of the organising Secretary for the Advanced Study Institute on Energy Optimisation in manufacturing and materials processing held in Madras during Jan.2-13,1989

Visited International Foundry Exhibition GIFA, 1989 held in Dusseldorf during May 1989.

Prof.K.A. Padmanabhan

Has been invited to deliver the key-note lecture to the session on Metal Forming and also Chair a session at the International symposium on Manufacturing and Materials processing, Aug. 1990, Yugoslavia.

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**[6] Industrial consultancy / testing, etc. undertaken:**

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Name of the Department	No.of assignments (Major)	Total amount (in lakhs)
Dept.of Met.Engg.	11	2 lakhs

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**[7] Invited Lecture Programme:**

The institute has the practice of inviting eminent persons in various walks of life to come and address the students/staff community. The details are annexed.

**[8] Seminars\Symposia organised by the Department:**

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Sl.No.	Seminars/Symposia
1.	Seminar on Metallurgical Education in India, Dr.T.Ramachandran, K.R.E.C. Surathkal 11.4.1989.
2.	Workshop on Codes, Standards and Specification Dr.K.Prasad Rao, 15.4.1990
3.	Seminar on Advanced Ceramic Coatings Dr.Seshu B.Desu, Virginia Polytechnic,USA 7.7.89
4.	Seminar on Research and Industry Atmosphere in USA Dr.Srinivas T.Rao - 27.7.1989
5.	2-Day Workshop on Design of Weldments Prof.V.M.Radhakrishnan and Dr.K.Prasad Rao 25.8.89 and 26.8.1989

6. One day workshop on Failure Prediction and Safety Assessment of Industrial Components  
Prof.Dr.Ing.Lother Issler, F.R.G.- 20.9.89
7. 4-Day workshop on Modern Technique in Electron Microscopy,  
Prof.K.S.Raghavan  
4.12.89 to 7.12.89
8. Seminar on Recent Advances in Superplasticity  
Dr.Terrace G.Langdon, 4.12.89
9. Seminar on Recent Developments in Strip Mills processing and products - Dr.C.Dasarathy, U.K. 22.1.1990
10. Seminar on Advanced in Welding and Cutting Technology in the 90's Mr.Bertil Pekkari, ESCAB Ltd.U.K. 13.2.1990
11. Seminar on Strain Localisation and Transient behaviours due to Dynamic strain ageing - Prof. PG. McCornick, Univ. of Western Australia-20.3.90
12. Seminar on Texture analysis of Metals, Recent Advances  
Prof.R.K.Basu, Dy.Director, DMRL., Hyderabad 20.3.90 to 28.3.90

**[9] List of short term refresher special and sponsored courses conducted during the year 1.4.89 to 31.3.90**

Name of course	Period	Dates
Mechanical Behaviour of Materials	Two weeks	27.11.89 to 8.12.89

**[10] Research Publications:**

**A.List of Conference Publications:**

1. Expert System for casting defect analysis  
H.Md.ROSHAN, K.SUDESH  
Proc-56th World Foundry Congress - Dusseldorf, 1989, pap.No.15.
2. Wear studies on centrifugally cast Al<sub>2</sub>O<sub>3</sub>-ZrO<sub>2</sub>-SiO<sub>2</sub>  
M.VISWANATHAN, K. GOPINATH, H.Md.ROSHAN  
Proc.-National Conf.on Industrial Tribology,Trivandrum,1989.

3. Wear behaviour of LM6 aluminium alloy  
L.KRISHNA REDDY, K.GOPINATH, H.Md.ROSHAN  
Proc.-National Conf.on Industrial Tribology, Trivandrum, 1989, pp.1-6
4. Life Assessment and Prediction Based on an Analysis of Creep Deformation  
H.WOLF, K.A.PADMANABHAN, W.BLUM  
Proc.Int.Conf.on Residual Life of Power Plant Equipment-Prediction and Extension. Ed.R.Somasundaram, Hyderabad, India, 1989, pp.5.
5. Computerised methoding of steel castings  
H.Md.ROSHAN, K. SUDESH  
Proceedings of the 37th Annual Convention of the Institute of Indian Foundrymen held at New Delhi, 1989, Vo.,2, pp.45.55.
6. Knowledge based computer system for casting analysis  
H.Md.ROSHAN, K.SUDESH  
Proceedings of the 37th Annual Convention Institute of Indian Foundrymen held at New Delhi, 1989, Vol.2, pp.95-104.
7. Computer Simulation of foundry related activities  
H.Md.ROSHAN, K.SUDESH  
Proceedings of the 37th Annual Convention of the Institute of Indian Foundrymen held at New Delhi, 1989, Vol.2, pp.145-154.
8. Simulation of metal casting processes  
H.Md.ROSHAN  
Proceedings of the Advanced Study Institute on Energy optimisation in manufacturing and materials processing, 1989, pp.314-317.
9. Energy Conservation in Forming Machines and Forming Processes  
P.VENUGOPAL, K.A. PADMANABHAN  
Indo-US Advanced Study Institute on 'Energy Optimisation in Manufacturing and Materials Processing, Eds.R.K.Shah, H.Md.Roshan, V.M.K.Sastry and K.A.Padmanabhan, Madras, India, 1989, pp. 289-298.
10. Influence of ultrasonic vibrations on the age hardening behaviour of 17-4 PH steel  
MANOJ KUMAR, R. VASUDEVAN - Seminar on Materials for Advanced Technology organised by IIM, Trivandrum, 24-25 Jan 1989.
11. Effect of forging temperature on the microstructure, mechanical properties and weldability of Ti-6Al-4V alloy  
G.THOMAS, B.PANT, R.GANESAN, V.RAMACHANDRA, R.VASUDEVAN  
Seminar on Materials for Advanced Technologies, Trivandrum, 24-25 Jan 1989.

12. Electro codeposition of lead-graphite composite by sediment codeposition  
M.B.LELE, S.K.SESHADRI -  
International Symposium "Industrial Metal Finishing" Karaikudi, 1-3 Feb 1989.
13. Effect of Chemical composition and ferrite content on the mechanical properties of austenitic weldmetals  
K.PRASAD RAO, S.SUNDARESAN, P.RODRIGUEZ  
International Seminar on STAINLESS STEELS, Indian Institute of Metals, Bombay, India, 2-4 Feb 1989.
14. Stress Corrosion Cracking of austenitic clads  
K.PRASAD RAO, K.N.KRISHNAN  
International Seminar on STAINLESS STEELS, Indian Institute of Metals, Bombay, India, 2-4 Feb 1989.
15. Electrochemical studies on some austenitic weld metals  
K.PRASAD RAO, B.RAGHUNATHA RAO, K.J.L.IYER  
International Seminar on STAINLESS STEELS, Indian Institute of Metals, Bombay, India, In Press, 2-4 Feb 1989.
16. Fracture Studies through emission of electromagnetic radiation  
V.JAGASIVAMANI, K.J.L.IYER  
International Conference on Fracture, Houston, ICF7, Mar 1989.
17. On the Formability of an Indigenous LPG Grade Steel  
P.P. DATE, P.G.PRADEEP AND K.A. PADMANABHAN  
43rd Annual Technical Meeting of the Indian Institute of Metals, Calcutta, 14-17 Nov.1989.
18. Ambient and Near-ambient Temperature Characterisation of a Ti-Al-Mn Alloy  
S.S. BHATTACHARYA AND K.A. PADMANABHAN  
43rd Annual Technical Meeting of the Indian Institute of Metals, Calcutta, 14-17 Nov.1989.
19. X-ray line broadening studies during ageing of 17-4 PH & 18 Nickel Maraging steel  
MANOJ KUMAR, R.VASUDEVAN  
47th Annual Convention of Metallurgists and Materials Scientists, Institution of Engineers (India), Roorkee, Mar 1989.
20. Welding of Aluminium-Lithium Alloys  
D.R.G.ACHAR - Proceedings of the Seminar on Science & Technology of Aluminium-Lithium Alloys, IIMB-AAA, Bangalore, Mar 1989.

21. Solid Lubricants - metal composites  
M.B.LELE, S.K.SESHADRI  
13th National Powder Metallurgy Conference, Bhopal, 2-3 Mar 1989.
22. Fatigue strength in cruciform welded joints  
BIMALENDU GUHA, S.D.PATHAK, V.M.RADHAKRISHNAN  
International Conference on Offshore Mechanics and Arctic Engineering (OMAE) Europe '89 The Hague, Netherlands, Material Tech. Symposium, 19-23 Mar 1989  
pap.No.89/969.
23. Underwater Welding and Cutting for Offshore Applications - a state of art Report  
D.R.G. ACHAR -Proceedings of the Seminar on Welding in the Energy Sector, IIT Madras Branch, Madras Apr 1989, pp.35-46.
24. Lead-MoS<sub>2</sub> composite by sediment codeposition for tribological applications  
M.B.LELE, C.S.RAMESH, S.K.SESHADRI  
43rd ATM-IIM, Calcutta, Nov 1989.
25. Amplitude Distribution Analysis of AE signal obtained during High Temperature Oxidation of Zircaloy  
B.B.Jha, BALDEV RAJ, D.K.BHATTACHARYA, KJL IYER  
ATMIIM, 14 Nov. 1989.
26. Studies on the compatibility of SS AISI 316 with eutectic Pb-Li alloy  
A.JOSEPH, K.V.KASIVISWANADHAN, BALDEV RAJ  
43rd Annual Technical Meeting of IIM and International Symposium on Non-ferrous Metals in the 21st Century, Calcutta 14-17 Nov 1989.
27. Activated Carbon production from coconut shells using fluidised bed reactor  
C.J.KIRUPAKARAN, K.KRISHNAIAH, S.K.SESHADRI  
Proc.Chemcon-89, Indian Chemical Engg. Congress, Trivandrum, Dec 1989, pp.26-30, Pap.No.A1 - 172.
28. Boronising of Low Alloy steel  
K.J.L.IYER, B.RAGHUNATHA RAO, S.GOWRISHANKAR  
Workshop on Wear Erosion in Electric Power Plant, CPRI, Bangalore, 7-8 Dec 1989, pap.No.4B.
29. Effect of weld cooling rate on ferrite content of Austenitic weld metals  
K.PRASAD RAO  
National Welding Seminar-89, New Delhi, 27-29 Dec 1989, pp.1-4.
30. A study of Ferrite Transformation in Austenitic Weld Metals  
A.R.SUNDRANI, P.RODRIGUEZ, K.PRASAD RAO  
Proc.of National Welding Seminar-89, New Delhi, 27-29 Dec 1989, pp.1-5



31. On the Scientific Basis of Metals Processing  
K.A.PADMANABHAN  
MRSI Medal 1990 Acceptance Lecture, Pune, Feb.10, 1990
32. Interfaces: Structure and Properties - A report  
K.A.PADMANABHAN  
Current Science, 59 (1990) 299 Metals, Materials and Processes (in press).
33. Macro-Micro-and Re-entrant shape forming of steels of Alloy Ti-6Al-2N  
D.VISWANATHAN, S.VENKATASAMY AND K.A.PADMANABHAN  
Proc.Int.Conf.Developments in Forming Technology, Portugal, Sep. 1990 (in press).
34. Influence of the Heat of Deformation on the Axi-symmetric Compressive Flow stress of Solid Cylinders under Conditions of Rapid Leading  
KA PADMANABHAN, AP SINGH AND KSK CHOCKALINGAM-  
Proc.Int.Symp.on Manufacturing & Materials Processing, Yugoslavia Aug1990(in press).
35. Flow and Thermal Characteristics of Superplastic Macro-, Micro-and Re-entrant shape Forming  
D.VISWANATHAN & KA PADMANABHAN-Key-note lecture,Proc.Int.Symp.on Manufacturing & Materials Processing, Yugoslavia,Aug1990(in press).
36. Role of Interfaces in Superplastic flow  
K.A.PADMANABHAN - Proc.Indo-US Workshop on Interfaces: Structure and Properties, Oaxford-IBH (in press).
37. Creep Cracking in stainless steel and in weldments  
V.M. RADHAKRISHNAN AND M. KAMARAJ  
Int.Conf. on Stainless steel, INCOSS, Feb.1989, IIT Bombay
38. Creep Cracking in austenitic weldments  
M.KAMARAJ AND V.M.RADHAKRISHNAN  
Proc. Inter.Conf. on Fracture, ICF7, Vol.2, 1989 p.1869
39. Sand Reclamation - A waste management concept  
A. JANAGAN AND H.Md. ROSHAN  
Proc. of the 37th Annual Convention of the Institute of Indian Foundrymen held at New Delhi, 1989, Vol.2, p.75-88
40. Characterisation of creep rupture properties of 304 SS by parametric approach  
V.SURYANARAYANA, K.J.L.IYER AND V.M.RADHAKRISHNAN  
47th Annual Convention of Metallurgists and Material Scientists, The Inst. of Engineers (India) Roorkee Mar 1989.

41. Energy flow to the crack tip during fast fracture in a viscoplastic material  
O. PRABHAKAR  
12th Canadian Congress of Applied Mechanics, Ottawa, Canada 28th May 1989.

## B. LIST OF PAPERS PUBLISHED

1. Creep and fracture of a cast Ni-base superalloy  
V.M.RADHAKRISHNAN, BEBASHIS DEB  
Trans. Indian Inst. Metals, 1989 Vol.42 No.2, p.173.
2. Cumulative fatigue in a Nimonic alloy  
M.S. BHASKARA, DEEPAK KUMAR, V.M. RADHAKRISHNAN  
Trans. Indian Inst. Metals, 1989, Vol.42, No.2, p.201.
3. Creep Cracking in type 308 stainless steel and its weldment  
M. KAMARAJ, V.M. RADHAKRISHNAN  
Trans. Indian Inst. Metals, 1989, Vol.42, No.2, p. 181.
4. Interaction of low temperature hot corrosion and creep  
V. SURIANARAYANAN, K.J.L. IYER, V.M. RADHAKRISHNAN  
Materials Sci. Eng., A 112 (1989) p.107.
5. Studies on Mould Filling ability characteristics of Mg-Al alloys  
S.SUNDARRAJAN, H.Md.ROSHAN-  
AFS Transactions, Vol.97, p.607-616(1989)
6. EPR method versus ASTM A 262 practice E for measuring DOS in austenitic stainless steels.  
P. MURALIDHARAN, J.B. GNANAMURTHY, K. PRASAD RAO  
Corrosion, 1989, Vol.45, pp.142-149.
7. An examination of the Relative Merits of the Compression Test and the Torsion Test for the prediction of peak pressures during the extrusion of commercial purity titanium.  
P. VENUGOPAL, G. SRINIVASAN, S. VENKATESAN, S. VENUGOPAL.  
Mechanical Working Tech., 1989, Vol19, pp.151-163.
8. The Influence of Hydrogen on the Mechanical Properties and Structure of a stable 304 Stainless steel  
K.J.L. IYER  
Can. Met. Quart., 1989, Vol.28, pp. 153

9. Evaluation of the Stress Corrosion Resistance of Cold Rolled  
AISI Type 316 Stainless Steel Using constant load and slow strain rate tests.  
H.S. KHATAK, P. MURALIDHARAN, J.B. GNANAMURTHY,  
P. RODRIGUEZ, & KA PADMANABHAN-  
J.Nuclear Materials,1989,Vol.168, pp. 157-161.
10. A Design method for fatigue of materials with initial defects  
V.M. RADHAKRISHNAN AND V.V. BALASUBRAMANIAM  
Trans I.I.M. Vol.42, (1989) p. 473.
11. The influence of Ultrasonic Vibrations on the retained Austenite content of a 1%C  
- 2.3% Mn steel  
K.J.L.IYER -  
Ultrasonics, 1989, pp.245
12. On the correlation between annealing textures and formability in an Extra-deep  
drawing low carbon steel.  
K. SWAMINATHAN, K.A. PADMANABHAN, R.K. BASU  
J. Materials Sci. Letters, 1989, Vol.8, pp. 595-598.
13. Enhanced activity of Austenite resulting from Ultrasonic vibrations in a low alloy  
case - hardened steel  
K.J.L. IYER -  
J. Materials Sci. 1989, Vol.24, pp. 2147
14. Effect of hot salt corrosion on creep rupture properties of AISI 304 Stainless steel  
at 600 - 700 Degree Centigrade  
V. SURIANARAYANNA, K.J.L. IYER, V.M. RADHAKRISHNAN  
High Temp. Technol., Jan 1989, Vol.7(1), pp. 33-40.
15. On the correlation between the stress state of deformation and fracture behaviour  
in an extra-deep drawing Low Carbon steel  
K. SWAMINATHAN, K.A. PADMANABHAN  
Metals Mater. Processes, Jan 1989, Vol.1(1), pp. 49-56.
16. Electro co-deposition of lead-graphite composite  
M.B. LELE, S.K. SESHADRI  
Trans. SAEST, Jan 1989, Vol24(1), pp 51 - 54.
17. Oxygen Enrichment of Ba<sub>2</sub>Cu<sub>3</sub>O<sub>7</sub> Using the Fluidization Technique  
U.V. VARADARAJU, P. VENUGOPAL, K.A. PADMANABHAN  
Bull. Materials Sci., Jan 1989, Vol.12(1), pp 63-80.

18. A model of creep rupture life under hot corrosion  
V. SURIANARAYANAN, M. KAMARAJ, K.J.L. IYER,  
V.M. RADHAKRISHNAN-  
High Temp. Technol., Feb 1989, Vol7(2), pp. 91-96.
19. Pulse electrodeposition of copper from copper sulphate bath  
G. DEVARAJ, K.I. VASU, S.K. SESHADRI  
Bull. Electrochemistry, May 1989, Vol.5(5), pp. 333 - 336.
20. Electron beam welding studies of 25mm thick Ti-6Al-4V sections  
G.THOMAS,V.RAMACHANDRA,K.V.NAGARAJAN,B.PANT,R.VASUDEVAN  
Welding J., Aug 1989, pp. 336-341.
21. Structural Deformation of manganese substituted mullites - X ray line broadening  
and lattice parameter studies  
H. SCHNEIDER AND R. VASUDEVAN  
Neues Jahrbuch Mineral, 1989, 4, 165 - 173.
22. Untersuchungen des ultraschallschwingungseinflusses auf das vergütungsverhaltens  
MANOJKUMAR AND R. VASUDEVAN,  
Haerterei Technische Mitteilungen (HTM) 1989, 44, 2, 95-98.
23. Expert system for analysis of casting defects - case module  
H.Md. ROSHAN AND K. SUDESH  
AFS Transactions, Vol97, p 601 - 606, 1989
24. Two methods to determine thermal properties of moulding sand compacts  
P. KANNAIAH, K.L. NARAYANA AND H.Md. ROSHAN  
Indian Foundry Journal, Vol.35, No.12, p 11-19 (Dec.1989)
25. Crack propagation in Creep  
VM.RADHAKRISHNAN & M.KAMARAJ  
Trans IIM Supp.42 (1989)p. s 107.
26. High temperature crack growth in austenitic weld metal.  
M. KAMARAJ AND VM. RADHAKRISHNAN  
Engg Fracture Mechanics 33, 1989, p. 801.
27. Similarities and Differences in the Approaches to structural superplasticity and  
High Temperature creep  
S.S. BHATTACHARYA AND K.A. PADMANABHAN  
Trans. Ind. Inst. Metals, 42, (supplement) 1989, S123-S137.

28. Room temperature formability and fracture behaviour of a high strength Al-Zn-Hg alloy  
K. SWAMINATHAH, P.P. DATE AND K.A. PADMANABHAN  
ASME J. Eng. Materi. Technol. (in press)
29. Tensile Flow and Fracture Behaviour of a superplastic Al-Ca- Zn alloy  
K. SWAMINATHAN AND K.A. PADMANABHAN  
J. Materi. Sci. (in press)
30. Numerical Optimisation of superplastic Deformation  
N.D. THEODERE AND K.A.PADMANABHAN  
J. Materi. Sci.25 (1990) 2133
31. On Microstructure - Property correlation of type 316L stainless steel weld metal  
T.P.S. GILL, M. VIJAYALAKSHMI, P. RODRIGUEZ AND  
K.A.PADMANABHAN  
Metall. Trans - (a) (in press).
32. Computer modeling of solidification process in metal/casting/joining  
O.PRABHAKAR,R.KRISHNAKUMAR,K.MADHUSUDANA,AND  
P.NAGENDRA  
Principles of solidification and materials processing. Vol.1, Proceedings of Indo-US  
Workshop, pp 405-436, 1989.
33. Laser surface remelt hardening of grey iron for improving the wear life of pattern  
equipments.  
S. CHITHAMBARAM, O. PRABHAKAR  
Transactions of the American Foundrymen's society, Vol.97,1989.

**[11] Details of supporting staff:**

There were 41 supporting staff (technical and administrative) during the period under report. The details are:

Technical	Administrative	Others	Total
31	7	3	41

## DEPARTMENT OF PHYSICS

### [1] New Courses Introduced

Sl.No.	Course No.	Title	Structure	Faculty
1.	PH 755	Coherent and Quantum Optics	3 0 0 3	Dr.R.S.Sirohi Dr.B.M.Sivaram Dr. V.Balakrishnan
2.	PH 756	Quantum Electronics	3 0 0 3	Dr. V.Sivaramakrishnan Dr.B.M.Sivaram Dr.S.B.S.Sastry
3.	PH 757	Laser Theory	3 0 0 3	Dr.B.M.Sivaram Dr.R.S.Sirohi Dr.T.A.Prasada Rao
4.	PH 758	Laser Devices	3 0 0 3	Dr.B.M.Sivaram Dr.R.S.Sirohi Dr.M.P.Kothiyal
5.	PH 759	Laser Applications	3 0 0 3	Dr.M.P.Kothiyal Dr.D.K.Sharma Dr.T.A.Prasada Rao
6.	PH 760	Fibre Optic Sensors and Application	3 0 0 3	Dr.R.S.Sirohi Dr.V.V.Rao Dr.J.P.Raina

### [2] Research and Development activities during the year:

Nonlinear optical response of some organic materials has been investigated using high power Nd : Yag and Ruby Lasers. The third order susceptibility of the materials was deduced for optical phase conjugation. The effect of doping on optical response was also investigated. Mass transport studies in polycrystalline silicon and the role of grain boundaries on transport properties were investigated.

Thermal expansion in solids were carried out using Fizeau's optical interference technique. A high Tc superconductor YBCO was studied and a shift in the anomaly was observed around 240 K. Using ultrasonic Pulse Echo Interferometer, velocity measurements were made down to liquid nitrogen temperature in YBCO material.

The optical absorption, fluorescence and thermo luminescence characteristics of alkali sulphates with four different types of impurities namely Lithium, Copper, Europium and Dysprosium have been studied with a view to establish the nature and mechanism of emission from these materials. A group of dosimetry materials namely the alkaline earth fluorides were investigated in order to develop a cheap and efficient dosimetry material for use in civilian areas near nuclear reactors.

Transport properties of copper ion conducting glasses are studied. Effect of dispersion on the transport properties of  $\text{Ag}_2\text{HgI}_4$ . Application of these fast ion conducting glasses, composites and polymer materials for solid state batteries were investigated.

The thermopower of the electron superconductors  $\text{Nd}_{1-x}\text{Ce}_x\text{CuO}_{4-y}$  has been measured from 4.2 K upwards. Fluctuation effects in the electrical conductivity of single phase 2122  $\text{Tl,Ca La Ba Cu}_3\text{O}_{7-y}$  and  $\text{Ca Sm Ba Cu}_3\text{O}_{7-y}$  have been measured and the results are explained. Tunneling studies on zinc doped YBCO showed energy gap decrease as  $T_c$  is reduced. The specific heat of  $\text{Pr}_{2-x}\text{Ce}_x\text{CuO}_{4-y}$  has been measured in the temperature range 4.2 to 60 K and the Debye temperature and the electronic specific heat coefficient were determined.

The AC magnetic susceptibility measurements were done on various high  $T_c$  superconductors. The magnetic susceptibility measurements were done on Pr doped YBCO using SQID magnetometer. The effective magnetic moment, Curie constant and paramagnetic Curie temperature were calculated. With the SQID magnetometer magnetisation measurements were done upto 5.5 T at various temperatures.

Electronic and structural characterisation of the thin films of the thermopile materials  $\text{Pb}_{1-x}\text{Se}_x\text{Te}$  and  $\text{Pb Se}_{1-y}\text{Te}_y$  were prepared by flash evaporation. Structural phase transition, ageing electrical and optical properties of II-VI semiconductor thin films and the ageing behaviour of metal films in the presence of magnetic field were studied. The possible application of Cd-Se-Cd Te pseudobinary and Cd S films as solar control coating was investigated.

Electrical and optical properties of hydrogenated amorphous silicon films were studied. Surface and Interface states in semiconductor films were studied. Indium tin oxide-silicon heterostructure solar cells were prepared and their performance was evaluated. Indium tin oxide films were prepared by spray pyrolysis method and the effect of substrate temperature was studied. Self diffusion and electromigration was studied in tin thin films by neutron activation tracer scanning method.

Dielectric dispersion in liquid mixtures were studied using cavity perturbation techniques in the microwave region. Lithium-zinc ferrites, Strontium titanate ferroelectric materials were prepared and studied. Strontium and potassium substituted YBCO superconducting materials were prepared and studied. Microwave dielectric constant and loss studies were made at X, Q, J, E and B band frequencies down to liquid nitrogen temperature.

Highly magnetostrictive materials using HO, Tb, Dy and Fe were prepared and characterized using X-ray diffraction, magnetization, Curie temperature measurements.  $\text{Dy}_{0.73}\text{Tb}_{0.27}\text{Fe}_2$  and  $\text{HO}_{0.85}\text{Tb}_{0.15}\text{Fe}_2$  systems were prepared and magnetostriction was measured for possible application as transducer elements. The effect of hydrogen absorption on the magnetization, curie temperature, Mossbauer spectra, Ferromagnetic resonance and electrical resistivity of these materials were also investigated.

Nuclear Magnetic Resonance studies were carried out on the  $\text{ErNi}_2\text{H}_x$  systems with a view to find out the possible location of hydrogens in the Cubic Leves phase compounds. New  $\text{Zr}_{1-x}\text{Ho}_x\text{Co}_2$  alloy systems were prepared and characterized using X-ray diffraction. Hydrogen absorption was studied in the temperature range 300 to 600 K and the pressure range 0.005 bar to 0.95 bar.

In organic liquids and polymers kerr effect and phase conjugation were studied using high power lasers and electrostatic fields. Nonlinear susceptibility <sup>(3)</sup> values for these materials were determined. Photoacoustic investigations were carried out in transparent and absorbing media for several organic liquids.

Temporal and spectral characteristics of the Distributed Feedback Dye Lasers are studied theoretically and experimentally. Development of suitable short pulse UV lasers for pumping the Distributed Feedback Lasers is in progress. A mode locked picosecond Nd-YAG laser capable of delivering 25 ps wide pulses at  $1.06\ \mu\text{m}$  and its second, third and fourth harmonics has been installed to study various ultrafast phenomena occurring in liquids and solids.

Ion exchange process was used to develop graded index glass. Radii of curvature and focal length were measured using Talbot interferometer. Nondestructive testing of components were carried out using Holography and Speckle techniques.

The crystal molecular structures of over ten interesting inorganic complexes of nickel, cobalt, selenium and tellurium were successfully studied by single crystal X-ray diffractometry. Structures of about ten compounds of small organic molecules of interest to polymer industry, solar energy technology and bio technology were also studied successfully by X-ray diffraction. Structural characterization of the superionic conducting glasses of the  $\text{AgI-AgO}_2$  systems doped with vanadate and molybdate groups was achieved by EXAF studies and X-ray RDF analysis on amorphous samples. Based on the structural and optical characterization of some novel luminescent dyes, a liquid solar energy collector has been designed and characterized.

Relativistic Multichannel Quantum Defect theory was used in the analysis of excited states in atoms. Some work on the molecular orbital theory has been initiated.

In computational Physics some software was developed to aid physics teaching at the undergraduate and postgraduate levels.



Sufficiency conditions for certainty of first passage across any given point was studied in respect of first passage time problems in general diffusion processes. Brownian motion was studied in a magnetic field. Diffusivity, phase space distribution and orbital diamagnetism were studied in the presence of dissipation. Effect of thermal noise on a coherent optical field; sensitivity of the photon distribution and the atomic population inversion to the presence of superposed thermal photons were studied. Perturbative calculations of cross sections in electroweak theory and factorisation properties of differential cross-sections in electroweak processes were carried out. Effective second-order elastic constants and second pressure derivatives of hexagonal crystals were calculated. Fourth order elastic constants of Beta Brass and some non-ideal hcp crystals like Mg and Er were calculated. Thermoelastic coefficient and pressure derivatives were derived from a Mil-Gruneisen interatomic potential.

### [3] Instruments/Equipment Designed and Developed:

1. High pressure oxidation set up for silicon.
2. Facility to measure hydrogen absorption at high pressure (50 atm) - Fabricated : Now being tested and calibrated.
3. Facility to study wide line  $^1\text{H}$  NMR - Fabricated : Tested and being used.
4. Ball mill.
5. Electrical conductivity.
6. Polarization Vs Electric field method.
7. A new cryostat for specific heat measurement is set up.
8. A set-up for measuring thermal conductivity is working successfully down to 25 K.
9. A circuit for automatic recording of  $dI/dV$  for tunnelling studies has been made.
10. High vacuum system for preparing intercalation compounds.
11. Contactless technique for conductivity measurement.

### [4] Collaboration with Foreign Institutions:

Dr.P.C.Deshmukh is having collaborative research work at the Georgia State University, Atlanta, U.S.A. for the Sixth Consecutive year.

### [5] Research Publications:

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**[6] Honours and awards:**

Name of the Awardee	Designation	Dept.	Honour
Dr.K.Hariharan	Assistant Professor	Physics	The paper entitled, 'Fast Ion Conducting Glasses, Polymers and Composites as materials for Solid State Batteries' presented at the Second National Convention of Electrochemists held at the Central Electrochemical Research Institute, Karaikudi on 28th February 1990 was adjudged as the best presentation.

**[7] Papers presented at Conferences attended: INDIA**

Name of Faculty	Particulars of Participation in Conference/Seminars/Symposia/Short Term Courses	
	Date	Venue
Dr.V.Sivaramakrishnan	DAE Solid State Physics Symposium Dec. 1989	I.I.T., Madras.
Dr.K.V.S.Rama Rao	-do-	
Dr.G.Rangarajan	-do-	
Dr.R.Srinivasaan	-do-	

Dr. Y. V. G. S. Murti	-do-
Dr. K. V. Reddy	-do-
Dr. V. R. K. Murthy	-do-
Dr. T. A. Prasada Rao	-do-
Dr. T. S. Natarajan	-do-
Dr. Y. S. Rao	-do-
Dr. R. S. Sirohi	National Symposium on Instrumentation Oct. 1989      Bangalore.
Dr. M. P. Kothiyal	-do-
Dr. D. K. Sharma	-do-
Dr. V. V. Rao	-do-
Dr. B. M. Sivaram	National Symposium on Lasers and Applications March 1989      Rohtak.
Dr. B. M. Sivaram	IEEE National Seminar on Lasers and Engineering and Medicine Nov. 1989      Trivandrum.
Dr. M. P. Kothiyal	17th OSI Symposium on Optics and Opto-electronics April 1989      Chandigarh.
Dr. D. K. Sharma	-do-
Dr. B. S. V. Gopalam	National Minorological Institute Feb. 1989      Mysore.
Dr. B. S. V. Gopalam	IWPSD, 1989,      Delhi.
Dr. (Mrs) Mahasheshasayee	National Conference on Crystallography Dec. 1989      Bombay.



Dr.B.Subramanyam	National Symposium Acoustics Dec. 1989      Calcutta.
Dr.V.Subramanyamurthy	IV National Convention of Indian Association of Physics Teachers Oct. 1989      Raipur.
Dr.V.Damodara Das	National Seminar on Infra-Red Devices and their Defence Applications, SSPL March 1989      Delhi.
Dr.P.C.Deshmukh	Bulletin Ind.Assoc. Physics Dec.1989      India.
Dr.K.Srinivasan	XXI National Seminar on Crystallography Dec.1989      Bombay.
Dr.S.Srinivasan	-do-
Dr.G.Rangarajan	International Conference on Modern Aspects of Superconductivity Nov.1989      Paris.
Dr.G.Rangarajan	International Conference on superconductivity Jan.1990      Bangalore.
Dr.R.S.Sirohi	International Workshop on Teaching Aids in Physics Education, Sri Krishna Devraya Univ. Jan.1989      Anantapur.
Dr.R.S.Sirohi	International Workshop on Laser Applications in Spectroscopy and Optics, LASO Nov.1989      Madras.
Dr.R.S.Sirohi	II International Conference on Holographic Systems, Components and Applications, Univ. of Bath Sept.1989      U.K.
Dr.V.Ramachandran	MRS Fall Meeting, Boston Nov.1989      USA.
Dr.B.S.V.Gopalam	-do-

Dr.B.M.Sivaram	International Laser Science Conference Aug.1989          Stanford.
Dr.B.M.Sivaram	International Symposium on Surface Modification Technologies Aug.1989          Neuchatel.
Dr.K.V.Reddy	V International Workshop on Physics of Semiconductor Devices Dec.1989          New Delhi.
Dr.V.Damodara Das	-do-
Dr.J.Majhi	17 Yugoslav Conference on Microelectronics May 1989          NIS, Yugoslavia.
Dr.V.Damodara Das	11th International Vacuum Congress and 7th International Conference on Solid Surfaces Sept.1989          Koln, FRG.
Dr.V.R.K.Murthy	V International Conference on Ferrites Jan.1989          Bombay.
Dr.P.C.Deshmukh	I International Conference on Physics of Electron Atomic Coelisions July 1989          New York.
Dr.V.Ramachandran	International Conference on Material and Mechanisms of superconductivity, Stanford Aug.1989          USA.
Dr.K.Hariharan	VII International Conference on Solid State Ionics Nov.1989          Japan.
Dr.T.S.Natarajan	New Tools and Devices Ngee Ann Polytechnic Nov.1989          Singapore.
Dr.A.Subrahmanyam	7th International Conference on Ion and Plasma assisted techniques 1989                  USA.

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## [8] Distinguished Visitors to Departments:

Name	Affiliation
i) From Abroad:	
1. Dr. Alfons Weber	NBS, Washington, U.S.A.
2. Dr. Narayan Sahoo	State Univ. of New York, Albany, U.S.A.
3. Dr. Stefan BENACKA	Electrotechnical Institute, Czechoslovakia.
4. Dr. Vladimir Nekvasil	Instt. of Physics Czechoslovak Academy of Sciences, Czechoslovakia.
5. Dr. S. Lakshmanaswamy	The Univ. of Texas at Dallas, PB No. 830 688, MP 32 Richardson, Texas 75083 - 0688.
6. Mr. Balint Podor	Jasz U. 90-94 Budapest, H-1131, Hungary.
7. Prof. V. Vitek	Dept. of Material Sc., Univ. of Pennsylvania.
8. Dr. R. Jayaraman	Bell Labs., U.S.A.
9. Prof. B. Ravean	Univ. of Caen, Caen, France.
10. Prof. B. Kitazawa	Univ. of Tokyo, Tokyo, Japan.
11. Prof. K. N. R. Taylor	Univ. of New South Wales, Australia.
12. Dr. R. Suryanaryanan	Lab. De. Physiques des Solides CNRS, 92915 Meudon, France.
ii) From India:	
13. Dr. K. S. Chandrasekaran	U.G.C. Emeritus Fellow Dept. of Physics, Madurai Kamaraj Univ., Palkalai Nagar.
14. Dr. B. Lal	Bhabha Atomic Research Centre, Bombay.

**[9] Seminar/Symposia organised by Dept.:**

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Sl.No.	Seminar/Symposia/Short Term Courses organised
1.	Workshop on 'Laser Applications in Engineering from 2-12 Jan.1990
2.	A Modern course in Quantum Mechanics' from 10-31 May 1989
3.	Department of Atomic Energy Symposium on Solid State Physics from 18.12.89 to 22.12.1989.

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# CENTRAL LIBRARY

## [1] Library Mordernization:

A programme for the modernization of the Central Library was taken up during the year, pursuant to a resolution of the Senate passed at its 158th meeting held on 24th October 1989.

In order to advise and monitor the implementation of this programme, a Sub-Committee of the Library Advisory Committee has been constituted.

The modernization programme covers broadly the following areas:

### (a) Library Computerization :

A project estimated to cost Rs.80,000 was approved for computerizing the routine activities and services of the Library. Two full-time Project Associates are being recruited to work on this project.

To begin with, a computer-based Membership Directory has been created and the loan transactions in the Library Counter have been automated.

This will be followed by computerizing the book-ordering processes and accounting procedures of the library budget.

Two M.Tech. students from the Industrial Management Section in the Humanities and Social Sciences Department are being assigned with a project work for developing a Journals Management Information System.

The data base of current journals subscribed by the Library along with details of back volumes held which was created earlier is being updated.

A data base of all new books added to the Library from 1st January 1990 onwards has been created and will be maintained on a regular and continuous basis. This data base will form the basis for the Open Public Access Catalogue (OPAC) to be developed eventually under a phased programme.

A new computer-based accession-list "New Additions to the Library" is being brought out by the Library as a fortnightly publication. The data base of theses submitted to the Institute for M.S. and Ph.D. degrees from 1964 onwards which was created during the earlier years is being updated.

### **(b) Online Access to International Databases:**

It is proposed to set up a high-speed telecommunication link in the Central Library permitting online access to international data bases offered by such information retrieval systems like DIALOG, Palo Alto, California, U.S.A., and the European Space agency, Frascati, Italy. Madras Telecom have been requested to set up this link at an annual recurring cost of Rs.30,000/=. The facility is expected to be operational by October 1990.

### **(c) Improvement to Physical facilities:**

The construction of a new book stack (Stack V) for the Library was completed during the year and it is being commissioned for use.

Civil works for the extension of the book-lift to reach this new stack from the 3rd floor were also completed.

The main-reading halls and all the book-stacks (Stack I to IV) are being renovated to improve access and reading facilities.

The document collections have also been reorganized taking advantage of the additional floor and shelf-space available in the V stack.

### **(d) New Library Building:**

Since the existing library building has reached its saturation limits without any further scope for expansion, a proposal for the planning, design and construction of a new and modern building for the Central Library has been approved.

The work is likely to start sometime towards the end of 1990 and a token provision of Rs.37.00 lakhs has been made in the Institute's budget for 1990-91 for this purpose.

### **(e) New Library Services:**

The library has introduced several new services, such as, "Reprint Supply Service", "Literature Search Service" and "Translation Service", besides the usual Circulation, Reference, Document Procurement and Reprographic Services.

The resources and services of the Library are being extended to more than 150 Industrial Associate Members, Corporate Members, Alumni & Retired Staff Members of the Institute.

In addition to these regular users, a large number of Graduate and Post-Graduate scholars, faculty and others from Universities and R&D institutions in Andhra Pradesh, Tamil Nadu and Kerala are allowed to make use of the library resources on request.

## **(f) Reprographic Facilities:**

The Reprographic facilities have been augmented with addition of a fullfledged D.T.P. system. The computerized catalogue of the Institute Ph.D. theses was printed through the D.T.P. system. The system is also being used for the computerized production and laser-printing of catalogue card sets, book spine-labels etc., for all new books added to the Library.

A new Xerox Copier was added to the Reprographic Section during the year under review to cope up with the increasing demands from the users.

A CD-ROM system has been acquired and installed and it is proposed to buy a few CD-ROM data bases like "Engineering Index" for in-house literature searches.

## **[2] Staff Matters:**

Shri M.N.Seetharaman took over charge of the Central Library as a Special Officer on contract basis with effect from 25th September 1989, consequent on the retirement of Shri V.S.Nazir Ahmed, Librarian, on 31st October 1989.

Shri C.Deenadayalu, Deputy Librarian and Smt.J.Durairaj, Assistant Librarian (SG), retired from service during the year under review.

Shri M.N.Seetharaman visited the Jawaharlal Nehru Aluminium Design and Development Centre, Nagpur, from 14th March 1990 to 16th March 1990 on invitation from the Director of the Centre to advise him on the planning and establishment of a Technical Information Centre for Aluminium under a UNDP project.

Shri M.N.Seetharaman, Special Officer, attended the IX World Book Fair held at New Delhi from 14.2.90 to 19.2.90 to select books for the Central Library.

Shri P.Venkatesan, Assistant Librarian (SG) and Shri P.N.Swamy, Senior Professional Assistant, attended the Seminar on "Micro-Publishing and Micro-Filming for Libraries" held at Madras during June 1989. Shri N.Gnanasekaran, Senior Professional Assistant, attended a Seminar on "Management of Government Libraries and Information Centres" held in Goa University during November 1989 and presented a paper authored by him and Shri M.N.Seetharaman on "Collection Development in Libraries and Information Centres".

Shri C.C.Tom, Shri C.R.Sekar and Shri P.N.Swamy attended a Workshop on CD/ISIS Software organised by NISSAT, in C.M.T.I., D.S.I.R., Government of India, New Delhi, Bangalore during Jan.1990.

Shri B.Vasudevan, Superintendent attended a three day Programme of "Man Power Management" for administrative staff held at the Institute from 09.02.1990 to 11.02.1990.

### [3] Library Statistics:

The following statistics reflects the overall performance of the Library during the year under review:-

#### I MEMBERSHIP

( i) Institute Members (Staff & Students) ..	4,660
(ii) Outside Members:	
(a) Individual ..	79
(b) Corporate ..	3
(c) Industrial Associateship ..	174
(d) Consultation Permits ..	328

#### II COLLECTION DEVELOPMENT

##### Acquisition of Publications

(a) Books ..	4,519
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#### II COLLECTION DEVELOPMENT

##### Acquisition of Publications (Contd.)

(b) Pamphlets and Reports ..	293
(c) Microfilms/Fische ..	3
(d) Institute Ph.D. Theses ..	83
(e) Book-Bank General ..	1,669
(f) Book-Bank (Weaker Section) ..	4,672
(g) Current Periodicals by Subscriptions	1,510
(h) Current Periodicals by Exchange/Gift	111
(i) Back Volumes of Periodicals ..	3,210
(j) Total intake during the year ..	8,108
(All publications)	
(k) Total Accessions as at the end of March 1990 ..	2,54,353

#### III LIBRARY AND INFORMATION SERVICES

##### (a) Circulation

( i) Number of Readers visited ..	1,01,750
( ii) Number of Volumes issued ..	1,40,602
(iii) Number of Volumes issued through Book Bank (General) ..	1,900
( iv) Number of Volumes issued through Book Bank (Weaker Section) ..	930
( v) Overdue and other charges collected Rs. ..	1,62,577



<b>(b) <u>Reservation for Books</u></b>		
(i) Registered	..	6,397
(ii) Fulfilled	..	4,877
<b>(c) <u>Inter-Library Loans</u></b>		
(i) Borrowed from other Libraries	..	165
(ii) Loaned to other Libraries	..	130
<b>(d) <u>Literature Search</u></b>		
(i) Computer-based literature searches through Dialogue International online Information Retrieval System	..	2
<b>(e) <u>Reprint Service</u></b>		
(i) From International sources i.e. British Library, Canadian Institute of Scientific Information, INSDOC etc.	..	
<b>(f) <u>Translation Services</u></b>	..	3

#### IV AUDIO-VISUAL SERVICE

(i) Number of Audio-Visual Cassettes	..	53
(ii) Number of Video Cassettes	..	117
(iii) Number of Audio-Visual programme conducted	..	26
(iv) Number of persons attended	..	450

#### V REPROGRAPHIC SERVICE

(i) Number of Xerox Copies supplied	..	2,22,717 (Pages)
(ii) DTP output	..	450 (Pages)
(iii) Number of Rotamaster prepared and printed	..	978
(iv) Number of stencils duplicated	..	553

#### VI BINDING

(i) Number of Books and Journals bound	..	1,578
(ii) Number of Departmental Publications bound	..	1,216
(iii) Number of Books and Journals bound through external binders	..	4,591

#### VII VISITORS TO THE LIBRARY

(i) Students from Library Schools (About 30 students per Group)	..	6 Groups
(ii) Other Visitors	..	3

## PLACEMENT 1989-90

The following figures indicate the number of students in each branch who have secured placement in private and public sector establishments. A few students received second job also. These are indicated as (+..).

Department	M.TECH	M.S.
1.Aero.Engg	0 out of 5	-
2.App.Mech.	8 " 12	-
3.Chem. Engg	5 (+2) " 16	1
4.Civil Engg	3 " 29	4
5.Com.Sci&Engg	12 (+4) " 15	7
6.Elec.Engg	28 (+7) " 33	2
7.Indus.Mgmt.	6 " 16	-
8.Indus.Metlgy	7 " 18	-
9.Mech.Engg	31 (+8) " 52	6
10.Ocean Engg	2 " 5	-
11.Solid State Technology	3 (+1) " 6	-
	105 (+22)	207 20

Department	B.Tech.
1.Aero.Engg	12 out of 15
2.Chem.Engg	18 (+3) " 33
3.Civil Engg	22 (+2) " 31
4.Com.Sci&Engg	20 (+3) " 31
5.Elec&Electronics Engg	23 (+2) " 35
6.Electronics & Comm.Engg	30 (+5) " 41
7.Mech.Engg	53 (+8) " 68
8.Met.Engg	17 (+1) " 22
9.Naval Arch.	9 " 13
	204 (+24) " 289
11.M.Sc. Mathematics	5
12.Ph.D. Electrical	1

Though the figures given above would indicate that there were still a number of students left unplaced by us, in reality it was not so. The students who were not placed were those who did not use the Placement Office for getting a job, as they had other options. The Placement Office did place almost all the students who wanted job through us.

## **HOSTEL MANAGEMENT**

Being a residential institution, all the students admitted to IIT Madras, are required to reside in the campus. There are about 2378 single room accommodation, distributed in 11 men's hostels and 1 ladies' hostel.

Each hostel is administered by a Warden and an Assistant Warden. The Warden is assisted by a Hostel Council (constituting Student Secretaries and Assistant Warden) in day-to-day functioning of the hostel. The Hostel Management is a centrally administered body and is overall in-charge of functioning of all the Hostels and Central Supplies Unit. There are 236 hostel staff and they are responsible to the Management through the respective Wardens of the Hostels. The Chairman Council of Wardens is the Chairman of the Hostel Management. He is assisted by an Assistant Registrar and other supporting staff.

## **CENTRAL SUPPLIES UNIT**

The Central Supplies Unit is administered by a Warden. It procures under the Milk Supply Scheme, the milk from the nearby villages and from TCMPL Ltd., distributes to the student hostels, to the residents of the campus and to the staff of the Institute residing around the campus. Under the Provision Supply Scheme, the Unit procures the items of major consumption to hostels from the wholesale suppliers and distributes them, thus reducing the overall mess rates of hostel inmates.

## CENTRAL WORKSHOP

The various units of the Central Workshop are Carpentry and pattern making, Fitters and Tool Maker's shop, Machine shop, Gear shop and Gear Testing, Instrument shop, Machine shop, Foundry, smithy and Heat treatment, welding shop, Automobile repair, Electroplating shop, Design cell and stores. The Central Workshop gives practical training for B.Tech and M.Sc., (Physics) students, the Employees of I.I.T., Madras through Apprentice training programme and personnel from private industries. Besides this, they undertake fabrication of components, gadgets, apparatus etc. required by the various departments for research and development projects. The central workshop also undertakes design and manufacture of components, machine tools etc. for industries.

### Facilities

Gear cutting, Gear grinding and testing (spur and bevel gears) Jig boring, grinding, copy milling, manufacture of precision scales, precision instrument repairing calibration of pressure gauges and dynamic balancing of rotors etc.

The transport system of the Institute is also controlled and maintained by the Central Workshop.

In the year 1989-90 Workshop received 665 Work Orders from various departments in connection with projects, Research and Development and maintenance work in addition to the regular programme for the students of B.Tech.

Advanced Workshop course was conducted during the Summer (April-May 1990) to the B.Tech students and 35 students were trained.

## WEAKER SECTION & FOREIGN STUDENTS

### [1] B.Tech:

22.5% of the seats are reserved for the students belonging to SC/ST Community. At present they are admitted through the Joint Entrance Examination with a relaxation. These students have to get only  $\frac{2}{3}$  of the marks obtained by the last student of the general category to get qualified for admission. 25 SC/ST students joined the B.Tech. degree course during the academic year 1989-90. Students admitted against the SC/ST reservation quota are given the following benefits:

1. Travelling allowance (IInd Class train fare/ordinary bus fare) from the place of residence to Madras to join the B.Tech degree course.
2. Free tuition.
3. Free messing (basic menu) and pocket allowance of Rs.70/-p.m.irrespective of their parent's/gaurdian's income.
4. Free lodging
5. Exclusive use of Weaker Section (SC/ST) Book Bank.
6. Drawing instrument (Mini-drafter) free of cost.
7. Help in getting placements.
8. Financial help for needy students through part-time job through Guidance and Counselling Unit, if available.

### [2] M.Tech:

22.5% of the seats are reserved for the students of SC/ST community. At present these students are admitted through GATE examination. 27 SC/ST students joined M.Tech. degree course during the academic year 1989-90. Students admitted against the SC/ST reservation quota are given the following benefits:

1. Exclusive use of Weaker Section (SC/ST) BOOK BANK.
2. Help in getting placements.
3. Financial help for needy students through part-time jobs through Guidance and Counselling Unit, if available.

4. Scholarship of Rs.1,000/- p.m. as given to all students.

### **[3] Preparatory Course:**

The Preparatory course for one academic year duration was started during the year 1983-84. The course is meant exclusively for SC/ST students. Selection for this course is made from the SC/ST students who did not get admission through the Joint Entrance Examination. After successfully completing the Preparatory Course at IIT, they will be eligible to join B.Tech. degree course and they are not required to write JEE again. 19 students (SC/ST) joined the Preparatory Course during the academic year 1989-90. Students admitted to the Preparatory Course are given the following benefits:

1. Travelling allowance (IInd class Train fare/ordinary bus fare) from the place of residence to Madras to join the Preparatory Course.
2. Free tuition.
3. Free messing (basic menu) and pocket allowance of Rs.70/-p.m.irrespective of their parent's/gaurdians's income.
4. Free loding.
5. Exclusive use of Weaker Section (SC/ST) Book Bank.

### **[4] Adviser:**

A faculty member is appointed as Adviser to look after the needs of Weaker Section (SC/ST) and Foreign students.

## **GUIDANCE & COUNSELLING UNIT**

### **ACTIVITIES:**

1. Student and Faculty Counsellors helped the I year B.Tech students to overcome the usual initial problems of adjustment to the new system.
2. This Unit provides the much needed emotitonal support to the I year students, when most of them stay away from the parents for the first year.
3. The Unit also attended to those, who needed professional counselling.
4. It arranged for instruction by senior students to the I year students, who needed guidance in subjects like Mathematics, Physics & Chemistry.
5. It helped the Medical Officers and the I year students to get the blood grouping of the latter done.

## CONSTRUCTION UNIT

### Major works completed during the year:

Sl No.	Name of work	Value-Rs.in lakhs
1.	Building for Telecommunication Centre	1.45
2.	Extension to the Operation Theatre of the Institute Hospital	1.40
3.	Extension & Modification to 'F' type qrs. (Block I - 12 Quarters)	4.48
4.	Raising the compound wall in Hostel Zone	2.68
5.	Construction of a building for PFBC pilot plant (INDO-US-NSF Project)	3.55
6.	Construction of underground sumps in Institute and Hostel Zones.	3.20
7.	Extension of Random wave Flume&side structures	12.22
8.	Construction of Stack IV&V at Central Lib.	18.84
9.	Relaying with Asphalt concrete for road from Gajendra Circle to (i) Ganga Hostel and (ii) N.C.C. Building	9.43
10.	Construction of a Multipurpose Hall for Staff/Ladies Club.	7.30
11.	Construction of screen wall and 'Back stage' structure at Open Air Theatre	4.60
12.	Construction of 'B' type Qrs. (2 Blocks-4 Qrs)	17.80
13.	Construction of 'C' type Qrs. (2 Blocks-4 Qrs)	16.00
14.	Production Engineering Laboratory for Mech. Engg Deptt (Out of Donation received from Industries and CAD/CAM Project funds).	26.00

Besides the above listed major works, many other minor works had been taken up and completed during the year 1989-90.

# INSTITUTE GYMKHANA

## SPORTS EVENTS:

### 1. SPORTS FEST 1989-90:

The Sports fest 1989-90 Inter-Collegiate level Tournament was organised and conducted by the Institute Gymkhana with the help of student leaders very successfully. The tournaments were conducted in almost all disciplines. Our Institute teams performed well and gained rich experience in building up teams for the Inter IIT tournaments. We are happy to mention that nearly 30 (thirty) Colleges in the city had participated and made the sportsfest a grand success. There was not even a single protest in any of the tournaments.

### 2. THE INTER IIT SPORTS MEET

We had the pleasure of participating in the 26th All India Inter IIT Sportsmeet of the 1989-90 at Kanpur from 11-16 December 1989. Our students practised hard in all Sports and Games from the beginning of the year. We are proud to state that our women students had knocked off the coveted general championship and thus brought laurel to our Institute. They won gold in Basketball, Table Tennis and Athletics.

Our men students won gold in Tennis, Table Tennis and Silver in Athletics, Basketball and Weight Lifting. They could not do well as expected because of the fact that there were several sudden drop-outs in the last minute, due to their personal and academic reasons.

### 3. ALL INDIA GERHARD FISCHER AND KOKILA RAJAIAH INTER-COLLEGIATE FLOODLIT BASKET BALL TOURNAMENT 1989-90

The Gerhard Fischer and Kokila Rajaiah Basketball Tournaments for men and women attracted 15 and 5 teams respectively. P.S.G. Arts College, Coimbatore retained the trophy and the Loyala College, Madras was the RUNNER-UP in the men section. The ETHIRAJ COLLEGE, MADRAS was the WINNER and the STELLA ARTS COLLEGE, MADRAS was the RUNNER-UP in the women section. The matches were keenly contested. Our students and staff conducted the tournaments most successfully where there was not even a single protest throughout the tournaments. Teams returned with the sense of satisfaction, as their participation in the Open Air Theatre under flood lights fetched memorable memories.



#### **4. ALL INDIA PHILIPS AND TRINITY INTER-COLLEGIATE FLOODLIT VOLLEY BALL TOURNAMENTS 1989-90.**

Our students also had the pleasure of conducting the Philips and Trinity Volleyball Tournaments in the last week of January 1990. All the matches were held at the Student Activities Centre under floodlights. It gave the spectators a panoramic view of the game. 11 Men teams and 10 women teams comprising both outstation and local teams were invited to participate. ADITHANAR COLLEGE, TIRUCHENDUR won the trophy and the ST. JOSEPH'S COLLEGE, TIRUCHI was the RUNNER-UP in the men's section. SARADA COLLEGE, SALEM annexed the trophy and the ETHIRAJ COLLEGE, MADRAS claimed the RUNNER-UP position in the women's section. There was not even a single protest in the tournaments. All teams enjoyed their participation and SAC proved to be an excellent venue from the participant's and spectators' point of view. SAC provided a feeling to all players as though they had participated in an international fixture.

#### **5. THE STUDENT ACTIVITIES CENTRE**

The Student Activities Centre an ultra modern complex and a multipurpose floodlit auditorium is being put to use to the maximum. Our students and staff are profiting a lot through this facility. Some of the important events that were held are:

- a) All India Philips and Trinity Inter-Collegiate Floodlit Volleyball Tournament.
- b) Inter-Collegiate Table Tennis Tournament.
- c) Sportsfest Inter-Collegiate Volleyball Tournament
- d) Inter-Hostel Volleyball Tournament
- e) Institute Volleyball and Basketball teams' practice
- f) SAC is also used regularly for the functioning of weight Lifting and Table Tennis Clubs.
- g) Erection of Multi-gym.

#### **6. INSTALLATION OF MULTI-GYM IN THE SAC BUILDING PURPOSE**

- a) to promote health, Physical Fitness and body building to our students, Staff and their wards.
- b) The Sportsmen in different disciplines can strengthen the specific muscles and increase the performance in the respective sport. The club is being run in the mornings and evenings on all the days in a week on the membership basis. This has attracted more than 400 members. This has evoked interest among the members of our campus.
- c) We are contemplating to add two more meaningful stations alongwith the present 12 (Twelve) stations to enrich the multi-gym.
- d) This has convinced everyone in the campus that it forms the base for HEALTH CLUB.

## **7. OPEN BRIDGE TOURNAMENT 1989-90**

In the OPEN BRIDGE TOURNAMENT conducted by the Institute Gymkhana during 21-23 March 1990, nearly 20 teams in team events and 30 teams in pair events participated. Ex IITians were the winners in both events. Mahalakshmi Club of Madras was the Runner-up in the above tournaments.

## **8. SPORTS STAR IIT INTER COLLEGIATE CRICKET TOURNAMENT 1989-90**

The above cricket tournament was sponsored by the "SPORTS STAR" in which 16 colleges participated. The GURUNANAK COLLEGE annexed the trophy and the LOYALA COLLEGE became the RUNNER-UP in the tournament. Prof. N.V.C. SWAMY Director of our Institute was kind enough to preside over the final function and distribute the prizes and certificates.

## **9. LAWN TENNIS CLASSIC**

Institute Gymkhana also organised and conducted Lawn Tennis Tournaments in the style of "A TENNIS CLASSIC" 1990 for the campus school Tennis Players in the age group of 11 to 15 years.

N.Vijay won Mr. NIKOLAUS MERTEN CUP for singles defeating Samphel Nordon.

N.Vijay and Naveen won the LATE SHRI RAMASWAMI IYENGAR SHEILD for doubles defeating Samphel Nordon and Johnson Godson.

## **10. TOURNAMENTS AMONG STUDENTS AND CAMPUS MEMBERS**

In order to obtain maximum participation from the student community, staff and their wards and to improve individual techniques, the following competitions were also conducted by the Institute Gymkhana:

- (a) Annual Road Race.
- (b) Open cycle Race.
- (c) 3-a-side Basketball (48 teams)
- (d) 3-a-side Volleyball (54 teams)
- (e) 6-a-side Hockey (36 teams)
- (f) 6-a-side Football (75 teams)
- (g) Ball Badminton (open)
- (h) Institute Chess Competition (Open)

## **11. INTER-HOSTEL TOURNAMENTS**

The Inter-Hostel tournaments which form the heart of the competitions ensures larger participation from the student body in sports and games. Competitions were held in all the disciplines. We really appreciate the sportive spirit of our students on and off the courts. Matches were keenly contested following the principle of "Give and take" and "THE SCHROETER TROPHY" for the INTER-HOSTEL CHAMPIONSHIP was annexed by the SARASWATHI HOSTEL.

## **12. SWIMMING POOL**

Our model Swimming Pool where an international swimming meet could be held is lying unused from the past three years due to acute water shortage and failure of monsoon. We are only waiting for the fruitful season which is going to reward the city of Madras with adequate rains so that the enviable facility of our swimming pool could be put into use.

## **13. N.S.O. AND HAL PROGRAMMES**

THE NATIONAL SPORTS ORGANISATION PROGRAMME for the I year B.Tech students and the Physical Training and the games programme for the HAL Management and Design trainees were effectively organised by the PTIs of the Gymkhana.

## **CULTURAL ACTIVITIES**

The Cultural Calendar for the year 1989-90 started off on a bright note with the LIT SOC RALLY. This is basically for the freshers to get a feel of things to come. This is also instrumental in locating talent among the freshers. This year it evoked enthusiastic response from the senior students also.

## **1. INSTITUTE OPEN EVENTS**

These events were spread out during the odd semester. The events held were Dumb Charades, Crossword, Treasure Hunt, Elocution, Light music, Western Music, Quiz, Debate, Pot porri, Jam, and Sketching. These unfolded new talents and were very well attended. The Quiz finals, Debate Finals and Light and Western Music events attracted an unprecedented audience.

## **2. INTER HOSTEL EVENTS:**

The Inter-Hostel events this year included Jam, Quiz Elocution, Debate Crossword, Pot Pouri and Dumb Charades and were conducted in the even semester. In view of the organisation of Mardi Gras events were restricted to fewer in number that what had been planned earlier.

### **3. SPECIAL EVENINGS AND OTHER CULTURAL EVENTS:**

Apart from the above regular cultural activities, we had a Staff-Students Debate and Quiz meant for increasing informal interaction between Staff and Students.

We also had the opportunity to watch a play by Salim Ghouse called "GHOSTS". At the fag end of both the semesters we had a fine performance by the IIT music group "The Haze".

### **4. SPIC MACAY CONCERTS AND LECTURE DEMONSTRATIONS**

This year our Association with SPIC-MACAY proved to be a fruitful one and we could arrange a variety of high level lecture demonstrations and concerts. We had important personalities like Pandit Shiv Kumar Sharma, Sudharani Raghupathi and S.Balachander giving recitls and demonstrations.

### **5. OUTSTATION PARTICIPATION OF CULTURAL EVENTS:**

This year the participation of our students in Outstation and Local cultural festivals were very rewarding. Distinctions were achieved in almost all events in which our students took part in, like Western Music, Quiz, Debate, Dumb-Charades, JAM, elocution etc.

### **6.MARDI GRAS 90:**

The festival over the years has gained a reputation of being the trendsetter. The Mardi Gras this year was conducted from 10th to 14th January 1990. This year Mardi Gras was a resounding success. The level of competition was far better than any other cultural festival.

Competition were held in Western Music, JAM , Creative Writing, Painting and Carving, Elocution, Classical Music, Debate, Triplex, paper collage, Pot painting, Light Music, Dumb Charades, Quiz, Treasure Hunt, Sketching, Rangoli and Elocution.

The following Professional shows were arranged for MardiGras '90.

1. L.SHANKAR, VIKKU VINAYAKAM AND CAROLINE-CLASICAL MUSIC
2. DR. M. BALAMURALI KRISHNA AND PT.JASRAJ - JUGALBANDI
3. PT. HARIPRASAD CHAURASIA - FLUTE RECITAL.

## INSTITUTE HOSPITAL

The Institute Hospital consisting of 30 beds, rendering medical aid to students and Staff of our Institute. On an average 300 patients are treated daily in the Out-patient department. Hospital offers Out-patient and in-patient services for Medical, surgical Obstetrics, Gynaecological, Paediatric, Psychiatric. ENT and Ophthalmic treatment.

Dr. A.Ganesan, M.D. is the Chief Medical Officer.

The following Medical Officers are rendering their services in their respective specialities:

- |   |                               |
|---|-------------------------------|
| 1. Dr.N.A.JAYAVELAN, M.B.B.S  | Resident Medical Officer      |
| 2. Dr.SUMATI KHANGAONKAR, M.B.B.S.,D.A  | Medical Officer               |
| 3. Dr. LALITHAKUMARI, M.B.B.S.,D.G.O  | Medical Officer               |
| 4. Dr.S.ARUNA, B.Sc., M.B.B.S   | Medical Officer               |
| 5. Dr.C.SRIDEVI, M.D.,D.Ch.   | Medical Officer               |
| 6. Dr.S.KAMESWARAN, M.S.Ph.D<br>F.R.C.S.(ED),F.R.C.S.(Glax),<br>R.R.C.S.(D.L.O) | ENT Consultant (Part-time)    |
| 7. Dr.S.DEVAJI RAO M.S.,MNAMS., FICS  | Consultant Surgeon(Part time) |
| 8. Dr.S.RATHNAMALA M.B.B.S., D.O.   | Eye Specialist (Part-time)    |
| 9. Dr.VIJAY NAGASWAMI, M.B.B.S.,D.P.M.  | Consultant Psychiatrist       |
| 10.Dr.T.K.NARASIMHA REDDY, M.B.B.S.,  | Junior Medical Officer        |
| 11.Dr.R.SHYAMALA, M.B.B.S.,   | Junior Medical Officer        |

Sri L.Palaniappan is the Lay Secretary and is assiting the Chief Medical Officer in administrative work of the Hospital to which Medical Reimbursement Unit is also attached.

Two ambulances are available at Hospital and are being used round the clock. One medical Officer is posted for call duty and is available for all the 24 hours of a day to attend the emergency cases in the Hospital.

Laboratory tests are undertaken for clinical pathology and a few Bio-chemical investigations. ECG service is available at the Hospital. Some major surgical operations are also undertaken in our modernised Operation Theatre.

Immunisation like polio, Triple Antigen etc. for children are given at appropriate intervals.

Regarding incentive Scheme for promotion of small family norms introduced by Government of India, Family planning operations are conducted at this Hospital, besides counselling.

## 4 (TN) AIR SQN (TECH) NCC

### [1] Introduction:

The Air Wing Ncc unit is functioning at IIT Madras from 16 Sep 1965, to provide NCC Training, exclusively to the student population of the Institute. Regular IAF Officers and Airmen are posted to this unit and the strength is augmented by part time officers and other supporting staff drawn from the Institute. NCC syllabus includes drill, weapon training, civil defence, health/hygiene, leadership training, history of airpower, principles of flight air armaments, Radio/Radar aids, Avionics and instrumentation. The training is imparted by a team comprising of the Air Force elements and the Institute part time officers.

### [2] Unit Organisation:

- a) Commanding Officer : Wing Commander M Murugesan
- b) Administrative Officer : Squadron Leader S Veera Raghavan
- c) Part time NCC Officers : Flight Lieutenant (NCC)  
KV Chalapathi Rao (on supernumery list)  
Dr A Mani.. under Pre-Commissioning Training

### [3] Activities during the year:

152 Cadets from the first year B.Tech were enrolled as cadets during the year. In addition to the regular NCC training, the following activities were taken up:

- a) Range firing practice on rifle and revolver.
- b) One blood donation camp at Red Cross Society, Madras for the eligible cadets.
- c) Pledging for donation of eyes by volunteer cadets.
- d) participation by NCC in the Institute celebration of the Republic day.

### [4] Conclusion:

The NCC activities during the year were broad based and made more interesting. In addition NCC offered ample opportunities to interested cadets in several adventure activities. Thus 4(TN) Air Sqn (Tech) NCC located within the IIT campus helped to instill a sense of discipline, comradeship, a spirit of adventure and leadership capability in the life of IIT students.

## N.S.C. ACTIVITIES

### Activities during the year 1.4.89 to 31.3.90

1. On 8.4.89 certificates were issued to 10 girls and women after successful completion of 6 months tailoring classes in Velacheri, Madras. 13 new girls and women joined for the next 6 months tailoring classes and completed the courses in the month of October, 1989. For the next batch there were not learners and hence the sewing machines (seven in November) were given to the Ladies Club, IIT Madras on 22.2.90 as per the decision of the Dean's Committee.
2. During April 1989 about 10 volunteers went to Thakkar Baba Vidyalaya for reading to the blind. Various lessons were recorded in about 30 cassettes so that the blind students can listen to the lessons at their leisure time. About 20 volunteers went regularly to St.Louis School for the Blind in Adyar for teaching and for reading the lessons to them. On 13.9.89, 5 volunteers wrote the quarterly examination for the blind in the above school. 14 NSS volunteers took part in "World Vision Day" by helping the blind in organising a cultural programme in Guindy on 22.10.89. Again on 24.2.90 about 8 volunteers helped the blind in organising an exhibition at Avvai Home, Adyar.
3. Under literacy programme 10 literacy kits were distributed to about 13 illiterates in Velacheri on 12.7.89 and classes were conducted in Velacheri. After the dropout, 2 of them became literate in the month of November, 1989. IIT girl students went to Kasturba Nagar and taught 15 illiterate ladies since August and all of them learnt to sign, read simple words, and do simple arithmetic at the end of Feb. 1990.
4. Since 12.8.89 coaching classes for X Std Students in Vana Vani School were conducted. Classes were conducted during Saturdays and Sundays. About 55 school students attended the above classes in Mathematics, Physics and Chemistry. Coaching classes were conducted upto Middle of Feb.1990.
5. In association with Voluntary Blood Donors' Club, IIT Madras, blood donation camps were arranged on 30.9.89 and 24.2.90. In the above two camps about 70 students and staff donated blood and grouping was done for about 30 people.
6. International Literacy Day was celebrated on 15.9.89. About 20 faculty and students took part in the brain storming session "How to remove illiteracy in India".
7. Mr.S.Vdyakar, a renowned social worker in Madras spoke to NSS volunteers on the topic "My experiences in serving the needy" on 22.9.89. About 45 students and staff listened to the above talk.

8. About 20 IIT students were given coaching in spoken Tamil during Feb.-March 1990.
9. National Youth Day as part of National Youth Week, was celebrated on 1.2.90 at the CLT. Swami Pitambaranandaji Maharaj (Ramakrishna Mission, Students Home, Mylapore, Madras spoke to students and staff (about 80 in number) on the topic "Swami Vivekananda-The Awakener of Modern India". In this connection a book exhibition was also arranged by the Sri Ramakrishna Math during the period 31.1.90 to 2.2.90 in HSB 132.
10. Dr.C.N.Deivanayagam, Dean, Tamil Nadu Arasu Medical Science and Research Institute, Porur, Madras 600 116, spoke to students and staff (about 50 in number) on 1.3.90 at CLT on the topic "Evils of smoking". In this connection "Lung Function Test" was done on about 30 people on that day in HSB 132.
11. An Art Workshop was held for school children in Vana Vani Matriculation Higher Secondary School from 9.00 AM to 1.00 PM on 27.1.90 as part of National Youth Week (Skill Development Day). About 500 students from nearby schools took part in the above workshop. The students displayed their art work in the form of spot painting, gayance art and craft. Rs.500/- was spent on the above arts workshop.
12. First Aid Classes were conducted by Shri K.J.Suriyanarayanan, Hony.Secretary, St.John Ambulance Association, Mylapore, Madras-4. 32 students took part in the above programme from 1.1.90 to 9.1.90 in HSB 132 daily from 6.00 PM to 7.00 PM.
13. Again as part of National Youth Week (Physical Fitness Day) various sports events were organised for school children in Government High School in Velachery on 16.2.90. Prizes worth Rs.850/- were distributed to students.



## **STUDENT WELFARE FUND**

During the past year (1989-90) no student made use of this facility. As a result of a vigorous effort to collect the repayments from the alumni, 11 of them have refunded the loan in full and two in part. A sum of Rs. 12,411.55 has been recovered.

## ADMINISTRATION

### Director

Prof. N.V.C. Swamy

### Deans

Prof. V.G.K.Murti, Dean Academic Research

Prof. Surjit Singh, Dean Academic Courses

Prof. D.Prithvi Raj, Dean Staff Affairs

Prof. R.Natarajan, Dean Students

Prof. V.Radhakrishnan, Dean, Indu. Consul. & Spons. Res.

Prof. G.Aravamudan, Dean Administration

(from 24.4.90)

Prof. V.M.Krishna Sastri, Dean Academic Research

(from 26.4.90)

Prof. A.Kuppurajulu, Dean Academic Course

(from 23.4.90)

Prof. V.S.Raju, Dean, Indu.Con.& Spon.Res.

(from 20.4.90)

Prof. N.Venkatrayulu, Dean Students

(from 26.4.90)

## HEADS OF DEPARTMENTS

Prof. G.Subramanian

... Aerospace Engineering

Prof. B.V.Asathanarayana Rao

... Applied Mechanics

Prof. C.A.Sastry

... Chemical Engineering

Prof. V.Ramakrishnan

... Chemistry

Prof. T.P.Ganesan

... Civil Engineering

Prof. R.Nagarajan

... Computer Science & Engineering

Prof. B.Ramaswami

... Electrical Engineering

Prof. A.V.Krishna Rao

... Humanities and Social Sciences

Prof. P.Achuthan

... Mathematics

Prof. V.M.Krishna Sastri

... Mechanical Engg. (upto 24.4.90)

Prof. V.Radhakrishnan

... Mechanical Engg. (from 25.4.90)

Prof. O.Prabhakar

... Metallurgical Engineering

Prof. M.Ravindran

... Ocean Engineering Centre

Prof. V.Sivaramakrishnan

... Physics

## CENTRAL ADMINISTRATION

### Registrar

Sri V. Shanmugam

### Deputy Registrar

Sri M.Gopalan (Retired on 30.6.89)

Dr. Paul P. Panenghat

**Assistant Registrar (SG)**  
Sri G.R. Raghunatha Rao

**Finance & Accounts Officer (SG)**  
Sri A.V.Karunakaran Nambiar (Retired on 30.4.89)

**Finance & Accounts Officer**  
Sri R. Kannan (from 8.8.89)

**Stores & Purchase Officer**  
Sri A. Thirunavukkarasu

**Internal Audit Officer**  
Sri R. Srinivasan

**Security Officer**  
Sri G. Selvamani

**Assistant Registrars**  
Kum. G.Saroja  
Sri B.Nagaraja Rao  
Sri K.Sekar  
Sri K.R.Raghavan  
Sri K.Ramaswamy  
Sri K.Rangarajan  
Sri R.N.Sankaran

**Assistant Finance & Accounts Officer (SG)**  
Sri R. Kannan (upto 7.8.89)

**Assistant Finance & Accounts Officers**

Sri V.Ramamurthy  
Sri S.Ramakrishnan  
Sri G.Sreenivasulu

**Assistant Stores & Purchase Officer (SG)**  
Sri M.C. James

**Assistant Stores & Purchase Officer**  
Sri M. Manickam

**Secretary (SG) to Director**  
Sri V.V.Natarajan

**Secretary to Director**  
Sri G.Natarajan

## **CENTRAL LIBRARY**

**Librarian**  
Sri V.S. Nazeer Ahmed (Retired on 31.10.89)

**Special Officer**  
Sri M.N. Seetharaman

**Assistant Librarian (SG)**  
Smt. J. Durairaj (Retired on 30.11.89)  
Sri P.Venkatesan  
Sri N.Sathyamurthy

## **ENGINEERING UNIT**

**Institute Engineer**  
Sri N. Malayalam

**Executive Engineer**  
Sri C. Ganesan

**Assistant Engineers (SG)**  
Sri D.Ramanathan  
Sri Abraham Varghese  
Sri M.Doorvasulu Reddy

**Horticultural Superintendent (SG)**  
Sri P. Manickavasagam

## NAMES OF FACULTY MEMBERS, DEPARTMENT-WISE

### AEROSPACE ENGINEERING

#### Professors

Prof. K.Balaraman (Rtd.14.11.89)  
Dr. A.K.Sreekanth  
Dr. T.K.Bose  
Dr. K.A.Damodaran  
Dr. G.Subramanian (Head)  
Dr. S.Krishnan  
Dr. T.K.Varadan

#### Associate Professor

Dr. E.G.Tulapurkara

#### Assistant Professors

Dr. R.M.Siddevera Gowda  
Dr. S.S.Gokhale  
Dr. A.Krishnan  
Dr. S.Santhakumar  
Dr. Job Kurian

Lecturer : Sri S.C. Rajan  
Technical Officer (SG) : G.A.Venceslas

### APPLIED MECHANICS

#### Professors

Dr. N.V.Chandrasekaraswamy  
Dr. BV Aswathanarayana Rao (Head)  
Dr. R.S.Alwar  
Dr. V.Ramamurthi  
Dr. P.S.Srinivasan  
Dr. R.S.Srinivasan  
Dr. K.M.Patil  
Dr. Megha Singh  
Dr. N.Ganesan  
Dr. B.Srinivasa Prabhu  
Dr. V.Ramjee  
Dr. B.H.Lakshmana Gowda  
Dr. P.A.Aswathanarayana  
Dr. S.Narayanan  
Dr. T.M.Srinivasan  
(Resigned on 20.11.89)

#### Associate Professor

Dr. J.Ramachandran

#### Assistant Professors

Dr. M.Balakrishnan  
Dr. S.Radhakrishnan  
Dr. P.Krishna Iyer  
Dr. J.Lakshminarasimhan

#### Lecturer

Dr. S.Swarnamani

#### Sr.Scientific Officer Gr.II

Smt. Sujatha Chandramohan  
Sri G.Thomas

## CHEMICAL ENGINEERING

### Professors

Dr. T.Gopichand  
Dr. M.Satyanarayana  
Dr. Y.B.G.Varma  
Dr. M.Ramanujam  
Dr. N.Subramanian  
Dr. C.A.Sastry (Head)  
Dr. M.S.Ananth  
Dr. Ch.Durga Prasada Rao  
Dr. G.S.Davies \*  
Dr. T.Venkatram  
Dr. A.Baradarajan  
Dr. C.Chandra Prasad

\* Rtd on 5.9.89 as Assoc.  
Prof. & re-employed as  
Professor

### Assistant Professors

Dr. K.Remananda Rao  
Dr. R.Subramaniam  
Dr. S.Subba Rao  
Dr. N.R.Neelakantan  
Dr. R.Vedaraman  
Dr. D.V.Seetharamamurthy  
Dr. T.K.Ramanujam  
Dr. K.Krishnaiah  
Dr. Tapobrata Panda  
Dr. V.Sriramachandra Rao  
Dr. A.R.Balakrishnan  
Dr. S.Sankaranarayanan  
(from 7.5.90)

### Lecturer

Dr. S.K.Rakshit

## CHEMISTRY

### Professors

Dr. S.R.Ramadas (Rtd. 13.6.89)  
Dr. V.Srinivasan (Rtd. 30.1.90)  
Dr. J.C.Kuriacose (Rtd. 15.2.90)  
Dr. G.Aravamudan  
Dr. C.Narayana Pillai  
Dr. P.T.Manoharan  
Dr. C.Kalidas  
Dr. V.Ramakrishnan (Head)  
Dr. T.V.Ramakrishna  
Dr. M.Ramakrishna Udupa

### Assistant Professors

Dr. (Mrs.) Chandra Sainathan  
Dr. R.Ramasamy  
Dr. C.S.Venkatachalam  
Dr. S.Vancheesan  
Dr. T.K.Varadarajan

Dr. C.S.Swamy  
Dr. J.Rajaram  
Dr. V.Mahadevan  
Dr. R.Narayan  
Dr. M.S.Gopinathan  
Dr. M.Srinivasan  
Dr. D.V.Ramana  
Dr. K.K.Balasubramanian  
Dr. V.R.Satyanarayana Rao  
Dr. B.Viswanathan

Dr. N.Balasubramanian  
Dr. M.N.Sudheendra Rao  
Dr. (Mrs.) K. Lalitha  
Dr. N.Sundaram  
Dr. R.P.Viswanath

**Lecturer**  
Sri G.Sundararajan  
(from 30.4.90)

**Sr. Scientific Officer Gr.II**  
Dr. M.S.Subramanian  
Dr. T.Subramanian

## **CIVIL ENGINEERING**

### **Professors**

Dr. L.N.Ramamurthy (Rtd.25.7.89)  
Dr. P.Srinivasa Rao  
Dr. D.Johnson Victor  
Dr. H.Raman  
Dr. T.P.Ganesan (Head)  
Dr. C.S.Krishnamurthy  
Dr. R.Radhakrishnan  
Dr. N.Rajagopalan

Dr. K.Elango  
Dr. Nainan P. Kurian  
Dr. V.Paramasivam  
Dr. H.Suresh Rao  
Dr. P.Kalyanasundaram  
Dr. P.K.Aravindan  
Dr. V.Kalyanaraman  
Dr. H.Achyutha

### **Associate Professor**

Dr. N.R.Krishnaswamy

### **Assistant Professors**

Dr. V.R.Rengaraju  
Dr. B.S.Thandaveswara  
Dr. M.S.Mathews

Sri K.Gopalakrishna  
Dr. S.B.Patnaik  
Dr. S.R.Gandhi

### **Chief Techno Economic Officer**

Sri D. Hariharan

### **Lecturers**

Sri S.Rajeev  
Dr. K.Srinivasan  
Sri V.Thamizharasan

Sri S.Mohan  
Dr. A.Bhoominathan  
Sri A.Ramachandraiah  
(from 4.4.90)

### **Senior Scientific Officers Gr.II**

Sri M.Subbi Reddy  
Sri R.Ambalavanan

Sri A.Ramachandraiah  
Sri K.Ananthanarayanan

**Technical Officers (SG)**  
**Senior Scientific Officer Gr.I**

Sri P.R.Kothandaraman  
Dr. N.Indrasenan

# COMPUTER SCIENCE AND ENGINEERING

## Professors

Dr. H.N.Mahabala  
Dr. C.R.Muthukrishnan  
Dr. R.Kalyana Krishnan

Dr.R.Nagarajan (Head)  
Dr.B.Yegnanarayana  
Dr.(Mrs.)Kamala Krithivasan

## Assistant Professors

Dr. N.Parameswaran  
Dr. S.V.Raghavan  
Dr. S.Raman  
Dr. C.Pandurangan

Dr.Timothy A. Gonsolves  
Dr.C.Siva Ram Murthy  
Sri Deepak Khemani

## Systems Manager

Sri P.Seshasayi

## Lecturers

Sri R.Sundar  
Sri G.V.Ramana Rao  
Smt. Hema Arunachalam Murthy  
Sri Sukendu Das

Sri D.Janakiram  
Sri Ravi Mittal  
Sri G.Ravi Prakash

## Senior Scientific Officers Gr.II

Sri L.V.Satyanarayana(Rtd.25.8.89)  
Sri T.Ramalingom(Rtd.12.6.89)  
Sri S.K.Ramesh  
Sri C.Chandrasekhar

Sri N.Alwar  
Sri B.Prabhakar  
Sri J.T. Sanjeeva Murthy  
(from 2.5.90)

## Senior Systems Programmer (SG)

Dr.M.Kothanda Ramanujam

## Senior Systems Engineer

Sri R.Deenadayalu

## Shift Engineer

Sri K.G.Sundararajan

## Programmer Gr.I

Smt. Vatsala  
Dr.(Smt.) Vijayalaxmi Sirohi



## ELECTRICAL ENGINEERING

### Professors

Dr. M.K.Achuthan (Rtd.12.5.89)  
Dr. V.G.K.Murti  
Dr. D.K.Banerjee  
Dr. B.Ramaswami (Head)  
Dr. V.Seshadri  
Dr. A.Kuppurajulu  
Dr. Y.Narayana Rao  
Dr. J.P.Raina  
Dr. V.V.Sastry  
Dr. K.Radhakrishna Rao  
Dr. P.Sankaran  
Dr. P.Subbarami Reddy

Dr. V.Venkat Rao  
Dr. M.Mukunda Rao  
Dr. K.N.Bhat  
Dr. G.Sridhara Rao  
Dr. S.S.Yegnanarayanan  
Dr. Vedam Subrahmaniam  
Dr. M.S.Narasimhan  
Dr. K.Ramar  
Dr. C.Eswaran  
Dr. A.Jhun Jhunwala  
Dr. P.A.Janakiraman

### Associate Professors

Dr. C.Dattatrayan  
Dr. M.V.Chalapathy Rao

### Principal Scientific Officer

Dr. P.R. Vaya

### Assistant Professors

Dr. T.A.Ramalinga Bhat  
Dr. T.J.Vitto  
Dr. Antony Reddy  
Dr. R.Parimelazhagan

Dr. C.Venkataseshaiah  
Dr. P.Sashidhara Rao  
Sri G.T.Manohar  
Dr. Bhaskar Ramamoorthy

### Lecturers

Sri Varadharajan Subramanian  
Sri M.Krishnamurthi  
Sri P.C.Majhee

Sri G.Govardhanagiri Rao  
Dr.V.Jagadesh Kumar  
Dr.VR Udpikar(Rtd.15.12.89)

### Senior Design Engineer

Sri P. Rama Seshagiri Rao

### Senior Scientific Officer Gr.II

Dr. S.Karmalkar  
Sri K.Ponnuraju (CSD)

### Technical Officers (SG)

Sri A.S.Satheesan  
Sri P.S.Kalyanasundaram

## HUMANITIES & SOCIAL SCIENCES

### Professors

Dr. S.Ambirajan  
Dr. A.V.Krishna Rao (Head)  
Dr. Dipak Chaudhuri

Dr. L.V.L.N.Sarma  
Dr. R.Rajagopalan

### Assistant Professors

Dr. C.Ramachandran  
Sri V.S.Kumar  
Dr. R.N.Anantharaman  
Dr. T.T.Narendran

Dr. L.S.Ganesh  
Dr. (Mrs.)Elizebeth Nainan Kurian

Dr. S.C.Chaudhari

### Lecturers

Sri M.Durgaprasada Rao  
Dr. (Kum)Evangeline Manickam  
Sri S.Mohan  
Dr. B.Subramanian

Dr. (Kum) R. Malathy  
Dr. C.Rajendran  
Dr. V.R.Muraleedharan

### Senior Scientific Officer Gr.II

Sri S.Jayachandran

## MATHEMATICS

### Professors

Dr. S.K.Srinivasan  
Dr. L.V.K.V.Sarma  
Dr. H.S.Paul  
Dr. K.R.Parthasarathy  
Dr. R.Subramanian  
Dr. V.B.Johri

Dr. U.N.Srivastava  
Dr. P.Achuthan (Head)  
Dr. Surendranath Majhi  
Dr. P.Bhattacharya  
Dr. P.R.Parthasarathy

### Associate Professors

Dr. V.Subba Rao  
Dr. C.M.Purushotham

Dr. A.Avudainayagam  
Dr. (Mrs.) S.Kalpagam

### Assistant Professors

Dr. D.S.Subramanyam  
Dr. Y.Nagendra  
Dr. S.N.Venkatrangan  
Dr. C.V.Raghava Rao

Dr. S.H.Kulkarni  
Dr. P.V.Subrahmanyam  
Dr. A.Rangan

**Senior Scientific Officer Gr.I**

**Dr. K.Swaminathan**

**Lecturers**

**Dr. S.G.Kamath**

**Dr. W.B.Vasantha**

**Dr. P.Veeramani**

**MECHANICAL ENGINEERING**

**Professors**

**Dr. H.C.Radhakrishna**

**Dr. D.Prithviraj**

**Dr. M.A.Parameswaran**

**Dr. G.V.N.Rayudu**

**Dr. V.M.Krishna Sastry**

**Dr. V.Radhakrishnan (Head)**

**Dr. R.Natarajan**

**Dr. K.Lakshminarayana**

**Dr. K.A.Bhaskaran**

**Dr. K.V.Gopalakrishnan**

**Dr. K.N.Seetharamu**

**Dr. V.Sriramulu**

**Dr. A.Ramamohana Rao**

**DR. N.Venkatarayulu**

**Dr. P.K.Philip**

**Dr. M.A.Veluswami**

**Dr. S.Srinivasa Murthy**

**Dr. V.Ganesan**

**Dr. R.Raman**

**Dr. R.Krishnamurthy**

**Dr. B.Nagalingam**

**Dr. M.S.Shunmugam**

**Dr. A.Venkatesh**

**Dr. Vijay R. Raghavan**

**Dr. T.Nagarajan**

**Dr. S.P.Venkatesan**

**Dr. K.Gopinath**

**Dr. M.Madhusudhana Rao**

**Chief Design Engineer**

**Sri T.S.Chennabasavan**

**Assistant Professors**

**Dr. P.Srinivasa Rao**

**Dr. U.S.P.Shet**

**Dr. O.V.Krishnaiah Chetty**

**Dr. K.R.Govinda Mallan**

**Dr. K.Narayanaswamy**

**Dr. K.V.Chalapathi Rao**

**Dr. K.N.Gopalan**

**Dr. V.Balabaskaran**

**Dr. A.K.Kolar**

**Dr. K.Ramakoteswara Rao**

**Dr. G.Muthuveerappan**

**Dr. S.Kumaraswamy**

**Dr. Y.G.Srinivasa**

**Dr. N.Sivaprasad**

**Dr. G.Kuppusamy**

**Sri M.Singaperumal**

**Lecturers**

**Sri K.S.Padiyar**

**Sri V.N.Rajan**

**Sri D.V.Ramalingeswara Rao**

**Dr. M.M.Mayuram**

**Dr. L.Vijayaraghavan**

**Dr. B.Ramamurthy**

Sri K.V.Thyagarajan  
Sri V.Jayaprakash  
Dr. S.Krishnamurthy  
Dr. N.Sitaram  
Dr. M.Govardhan

Sri N.Ramesh Babu  
Dr. Prakash Maiya  
Dr. A.Mani  
Sri R.Krishnakumar

**Senior Scientific Officer Gr.II**

Sri S.Boopathy

**Senior Design Engineer**

Sri S.D.Kalender Saheb

**Senior Maintenance Engineer**

Sri A.Arun

**Technical Officers (SG)**

Sri K.S.Veeraraghavan  
Sri G.S.Ramachandran  
Sri A.V.Sundaram

## **METALLURGICAL ENGINEERING**

### **Professors**

Dr. K.Srinivasa Raghavan  
Dr. R.Vasudevan  
Dr. H.Md.Roshan  
Dr. K.Ananthapadmanabhan

Dr. V.M.Radhakrishnan  
Dr. O.Prabhakar (Head)  
Dr. D.R.G.Achar  
Dr. K.J.L.Iyer

### **Assistant Professors**

Dr. C.V.Gokularathnam  
Dr. S.K.Seshadri  
Dr. P.Venugopal  
Dr. S.Ramakrishna Iyer  
DR. S.D.Pathak

Dr. S.Raghavan  
Dr. K.Prasada Rao  
Dr. Ganpath Ram Sharma  
Dr. V.Jagasivamani  
Dr. P.Kesavan Nair

### **Lecturers**

Dr. Paramanad Singh  
Dr. K.Swaminathan  
Dr. V.Sampath (from 26.4.90)

### **Sr.Scientific Officer (Gr.II)**

Sri S.Annamalai  
Sri S.Kumaran

### **Technical Officer (SG)**

Sri B.Raghunatha Rao  
Sri V.K.Vidyasagar

## PHYSICS

### Professors

Dr. R.Srinivasan  
Dr. S.Radhakrishna  
Dr. Y.V.G.S.Murti  
Dr. J.Sobhanadri  
Dr. V.Balakrishnan  
Dr. K.V.S.Rama Rao  
Dr. V.Sivaramakrishnan (Head)  
Dr. G.Rangarajan

Dr. R.Ramji Rao  
Dr. S.B.S.Sastri  
Dr. B.M.Sivaram  
Dr. R.S.Sirohi  
Dr. C.K.Narayanaswamy  
Dr. K.Viswanatha Reddy  
Dr. M.P.Kothiyal  
Dr. (Mrs.)Maha Seshasayee

### Chief Design Engineer

Dr. Dev Kishore Sharma

### Assistant Professors

Dr. A.V.Narasimhan  
Dr. T.A.Prasada Rao  
Dr. B.S.V.S.Ramachandracharyulu  
Dr. V.Damodara Das  
Dr. V.Ramachandran  
Dr. S.Srinivasan  
Dr. K.Srinivasan  
Dr. B.S.V.Gopalam  
Dr. V.Ramakrishnamurthy  
Dr. P.C.Deshmukh

Dr. Sriraman Srinivasan  
Dr. B.Subramanyam  
Dr. Jagabandu Majhi  
Dr. G.Sreenivasamurthy  
Dr. V.Subrahmanya Murthy  
Dr. K.Hariharan  
Dr. A.Subrahmanyam  
Dr. T.S.Natarajan  
Dr V.Venkateswara Rao

### Lecturers

Dr. (Kum) T.M. Vimala  
Dr. K.Muraleedharan

### Senior Scientific Officer Gr.I

Dr. Y.Syamsundar Rao  
Dr. V.Sankaranarayanan

### Senior Scientific Officer Gr.II

Sri K.Sarangapani

### Technical Officer (SG)

Sri U.D.Venkataramaiah

## OCEAN ENGINEERING CENTRE

### Professors

Dr. V.Satyanarayana Raju  
Dr. C.Ganapathy Chettiar  
Dr. M.Ravindran (Head)

Dr. S.Narasimha Rao  
Dr. M.R.Pranesh  
Dr. C.P.Vendhan

### Associate Professor

Dr. K.Muthukrishnaiah

### Assistant Professors

Dr. K.Ganesh Babu  
Dr. S.P.Subramanian  
Sri R.L.Roy Chawdhry  
Sri P.Sambandam

Dr. R.Mahadevan  
Dr. V.Sundar  
Dr. V.G.Idichandy

### Lecturers

Dr. Dababratna Sen  
Dr. S.N.Bhattacharyya  
Dr. J.S.Mani

Dr.R.Sundaravadivelu  
Dr.S.Neelamani(from 2.5.90)

### Senior Scientific Officers Gr.I

Sri S.Meenakshisundaram  
Dr. K.Rajagopalan

Sri R.Natarajan

### Senior Scientific Officers Gr.II

Dr. S.R.Gandhi  
Sri V.Ananthasubramanian

Sri C.K.Vijayan

## **REGIONAL SOPHISTICATED INSTRUMENTATION CENTRE**

### **Professors**

Dr. Surjit Singh  
Dr. P.T.Manoharan

Dr. S.Subramanian (Head)  
Dr. T.K.K.Srinivasan

### **Assistant Professors**

Dr. S.P.Venkateshan

### **Senior Scientific Officers Gr.II**

Sri M.S.Moni  
Sri G.Palaniswami

Dr. Babu Varghese

## **CENTRAL ELECTRONICS CENTRE**

Chief Instrumentation Engineer  
Instrument Engineer

Sri T.N.Ranganathan  
Sri K.R. Venkatachalam

## **MATERIAL SCIENCE AND RESERACH CENTRE**

Professor  
Senior Scientific Officer Gr.II

Dr. G.V.Subba Rao  
Dr. U.V.Varada Raju

## **FIBRE REINFORCED PLASTIC RESEARCH CENTRE**

Chief Design Engineers

Dr.N.Gopalakrishnan Nair (Head)  
Dr. R.Palaninathan  
Dr. S.K.Malhotra

Senior Design Engineer

Sri B.Jagadish Chandra Babu

## **CENTRE FOR INDUSTRIAL CONSULTANCY AND SPONSORED RESEARCH**

Chief Techno Economic Officer  
Senior Techno Economic Officer

Dr. D.Balakrishnan  
Dr. C.Sivaprasada Rao  
Sri Y.G.Narasimha

## **CENTRAL WORKSHOP**

<b>Senior Workshop Superintendent</b>	Sri S.Jambunathan
<b>Assistant Workshop Superintendent</b>	Sri N.L.N.N. Kumar
<b>Technical Officers (SG)</b>	Sri K.S.Veeraraghavan
	Sri G.S.Ramachandran
	Sri A.V.Sundaram

## **CENTRE FOR CONTINUING EDUCATION**

**Professor**

Dr. M.K.Achuthan (Re-employed) from 13.5.89.



## NON-TEACHING EMPLOYEES

Name of the Department	Technical	Admn.	Others
1. Aerospace Engineering	9	5	
2. Applied Mechanics	7	6	
3. Chemistry	6	5	
4. Chemical Engineering	10	5	
5. Civil Engineering	20	8	
6. Central Workshop	67	5	
7. R & AC Unit	6	1	
8. Electrical Engineering	19	10	
9. Humanities & Soc.Sciences	-	3	
10. Mathematics	-	3	
11. Mechanical Engineering	51	13	
12. Metallurgical Engineering	14	5	
13. Physics	13	5	
14. Ocean Engineering Centre	6	3	
15. Computer Sci.& Engineering	-	7	
16. Dean (ICSR)	-	4	
17. Central Elec.Centre	7	2	
18. MSRC	1	2	
19. RSIC	1	3	
20. FRPRC	3	1	
21. Central Gas Supplies Unit	-	1	
22. Central Glass Blowing Sec.	3	-	
23. Dean (Students)	-	2	
24. Adviser, Foreign & Weaker Section Students	-	1	
25. NCC	-	2	
26. Security Section	-	1	
27. Chairman Council of Wardens	-	6	
28. Gymkhana	-	2	
29. Centre for Continuing Edn.	-	4	
30. GATE	-	2	
31. Hospital	-	3	
32. Placement Office	-	4	
33. Taramani House	-	1	
34. Transport Cell	-	1	
35. Admissions Office	-	4	
36. Internal Audit	-	6	
37. Library	-	7	
38. Admn.II.	-	5	

39. Admn.I & Recruitment	-	10
40. Admn.III	-	4
41. Genl.Admn.	-	8
42. Registrar Office	-	4
43. Accounts Section	-	49
44. Academic (Students)	-	22
45. Dean Staff Affairs	-	2
46. Dean Academic Research	-	1
47. Stores Section	-	15
48. SC/ST Cell	-	1
49. Engg. Unit	-	21

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## BUDGET PROPOSALS 1989-90 & 1990-91

Description	BUDGET ESTIMATES FOR 1989-90		Revised Estimates 1989-90 as per Finance Committee	Budget Estimates 1990-91 (as proposed)
	(as proposed)	as allocated By Board of Governors		
	(Rupees in lakhs)			
(1)	(2)	(3)	(4)	(5)
NON-PLAN RECURRING	1,559.00	1,559.00	1,779.00	1,897.01
NON-RECURRING	15.00	15.00	10.00	20.00
TOTAL NON-PLAN	1,574.00	1,574.00 (-)69.25*	1,789.00	1,917.01
PLAN RECURRING	45.40	30.00	30.00	53.34
NON-RECURRING	753.95	370.00	370.00	527.10
TOTAL PLAN	799.35	400.00	400.00	580.44
INCOME	188.78	221.00	218.41	215.43

\* Reduction in the sanctioned amount.

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH 1989

EXPENDITURE		INCOME	
	Rs.	Rs.	
<u>EDUCATIONAL EXPENSES</u>			
<u>Pay of Teaching Staff:</u>			Grant from Govt. of India (on Revenue Account) 13,05,45,000
Department of			<u>LESS</u> 1987-88 Transfer 2,73,52,000
Chemistry	25,06,532		----- 10,31,93,000
Physics	27,47,976		<u>ADD</u> 1988-89 Out-Standing adjustment 56,86,000
Mathematics	15,91,626		----- 10,88,79,000
Humanities & Social Sciences	11,70,159		<u>GENERAL INCOME</u>
Civil Engineering	26,34,684		Tuition Fees 5,41,880
Mechanical Engineering	38,97,985		Hostel Seat Rent 2,96,004
Electrical Engineering	36,62,396		Gymkhana Fee 50,580
Chemical Engineering	17,26,020		Medical Fees 17,363
Metallurgical Engineering	14,76,242		----- 67,943
Applied Mechanics	16,47,085		Student Amenities Fund 84,250
Aerospace Engineering	9,46,457		Fine 6,489
Ocean Engineering	12,11,304		Examination Fees 78,300
Computer Science & Engg.	14,70,674		Degree in Absentia 3,940
	-----		Application fee from students 44,20,399
	2,66,89,140		Application fee for appointments 12,108
	-----		Admission Fees 47,676
			Grade Card 4,775
			----- 55,63,764
C/o	2,66,89,140	C/o	11,44,42,764

EXPENDITURE			INCOME		
	Rs.	Rs.		Rs.	Rs.
<u>B/f.</u>		2,66,89,140	<u>B/f.</u>		11,44,42,764
<u>PAY OF NON-TEACHING STAFF</u>					
Department of			<u>MISCELLANEOUS RECEIPTS</u>		
Chemistry	7,94,479		Institute Bus Collection	7,57,955	
Physics	16,59,620		Hire charges on		
Mathematics	1,46,244		Institute Vehicles	63,863	
Humanities & Social Sciences	2,05,656		Licence Fees	13,31,557	
Civil Engineering	16,83,333		Electricity, Water and		
Mechanical Engineering	27,17,264		Service charges	10,66,477	
Electrical Engineering	19,91,600		Lawns and Gardens		
Chemical Engineering	9,10,742		(Auction sale of trees		
Metallurgical Engineering	11,16,263		usufructs)	41,003	
Applied Mechanics	8,32,631		Income from Computer Centre	85,944	
Aerospace Engineering	6,74,245		Income from VAX-II Computer	41,069	
Ocean Engineering	5,79,047		Other Receipts	1,59,32,638	
Computer Science & Engg.	5,49,898				
	-----	1,38,16,022		-----	1,93,20,506
<u>PAY AND ALLOWANCES</u>					
Centres - Officers	7,83,941				
Centres - Others	12,59,235				
	-----	20,43,176			
Central Electronics Centre		4,15,553			
Air-Conditioning Unit		3,84,522			
Indo-German Projects		28,669			
		-----			
<u>C/o.</u>		4,33,77,082	<u>C/o.</u>		13,37,63,270

EXPENDITURE		INCOME	
B/f.	Rs.	B/f.	Rs.
<u>DEPARTMENT EXPENSES</u>			13,37,63,270
Chemistry	5,44,960		
Physics	5,05,912		
Humanities & Social Sciences	4,756		
Mathematics	21,584		
Civil Engineering	4,48,085		
Mechanical Engineering	10,03,572		
Electrical Engineering	8,07,811		
Chemical Engineering	4,42,920		
Metallurgical Engineering	6,38,953		
Applied Mechanics	4,77,600		
Aerospace Engineering	3,03,118		
Ocean Engineering	2,35,135		
Computer Science & Engg.	29,47,327		
	-----		83,81,733
<u>LIBRARY</u>			
Officers	4,11,321		
Establishment	17,81,051		
Contingencies & Operating Cost (-)	2,76,545		
Binding charges	30,400		
Journal of General Interest	3,534		
NMR charges	46,209		
	-----(-)		1,96,401
	-----		19,95,971
	-----		-----
C/o.	5,37,54,786	C/o.	13,37,63,270

EXPENDITURE		INCOME	
	Rs.		Rs.
B/f.	5,37,54,786	B/f.	13,37,63,270
<b><u>WORKSHOPS</u></b>			
<b><u>Pay and Allowances</u></b>			
Work Shop Superintendents	7,74,072		
Other Staff	35,40,144		
<b><u>Working Expenses</u></b>			
(Instruments tools & other consumables)	1,52,245		
	-----		
	44,66,461		
Stipend to apprentices	1,82,064		
<b><u>CENTRES/CENTRAL SERVICES</u></b>			
<b><u>WORKING EXPENSES</u></b>			
Fibre Reinforced Plastic			
Research Centre	1,45,316		
Material Science Research Centre	2,10,362		
Bio-Science & Bio-Technology	1,28,663		
Engineering Design Centre	5,286		
Central Electronics Centre	1,43,867		
Regional Sophisticated			
Instrumentation Centre	1,21,388		
Central Glass Blowing Section	24,137		
Central Photographic Section	25,024		
Air Conditioning Unit	3,96,438		
Rural Development Research Activities			
other expenses	1,85,378		
Indo-German Project	89,499		
Central Gas Supplied Unit	31,682		
Customs Duty on personal Effects	39,038		
	-----		
C/o.	5,99,49,389	C/o.	13,37,63,270

EXPENDITURE		INCOME	
B/f.	Rs.	B/f.	Rs.
	5,99,49,389		13,37,63,270
<u>INSTITUTE SCHOLARSHIPS</u>			
Post Graduate & Research	1,24,32,593		
Under Graduate	5,14,521		
	-----		
	1,29,47,114		
<u>NCC/NSS</u>			
Pay & Allowances	1,46,551		
Other Expenditure	76,477		
	-----		
	2,23,028		
<u>ATHELETIC &amp; GYMKHANA</u>			
Pay & Allowances	3,00,873		
Contribution to Gymkhana Management	9,26,110		
	-----		
	12,26,983		
<u>OTHER ITEMS</u>			
Part-Time Lectures	6,869		
Visiting Professors	19,584		
Technical Bulleing & Journals	1,53,846		
Symposia & Seminars	22,664		
Implant Training/Courses/Visits	1,21,084		
Continuing Education Programme organised by the Institute	2,13,878		
Guidance & Counselling Unit	3,237		
Special Coaching Programme for SC/ST students	34,337		
Training & Welfare activities including Special Training to SC/ST Staff (EWS)	298		
	-----		
C/o.	7,49,22,311	C/o.	13,37,63,270



EXPENDITURE		INCOME	
B/f.	Rs.	B/a.	Rs.
			13,37,63,270
Quality Improvement Programme	3,730		
Director's Discretionary Fund for Research	26,265		
HAL Trainees	1,00,000		
Membership Fees to Outside Bodies	61,015		
Remuneration to External Examiners	80,599		
Joint Entrance Examinations	11,46,000		
Graduate Aptitude Test in Engineering	9,74,243		
ISRO-IIT-M Cell	97,106		
Convocation	86,822		
Prizes for Academic Distinction	10,726		
Contribution towards Institute participation in programme of National Conference	25,000		
<u>HOSTELS</u>			
Allowances to Wardens	41,821		
Subsidy to Hostels	40,67,942		
Security to Hostels	1,62,160		
<u>CENTRAL ADMINISTRATION</u>			
Pay & Allowances - Officers	26,37,228		
Pay & Allowances - Estt	79,22,307		
	-----		
	1,05,59,535		
	-----		
C/o.	9,23,65,275	C/o.	13,37,63,270

EXPENDITURE		INCOME	
B/f.	Rs.	B/f.	Rs.
	9,23,65,275		13,37,63,270
<u>CONTINGENCIES</u>			
Postage	4,88,286		
Entertainment	1,21,761		
Telephone	12,95,867		
Liveries	2,17,822		
Stationery	6,27,749		
Printing	2,33,339		
Advertisement	6,57,329		
Sundries (Misc.expenses)	3,33,195		
Guest House Provisions	44,516		
	-----	40,19,864	
<u>OTHER ITEMS</u>			
Director's Discretionary Fund		8,100	
<u>STORES</u>			
General Stores	(-)8,036		
Pay & Allowances - Officers	2,65,911		
Pay & Allowances - Estt	6,60,968		
	-----	9,18,843	
<u>SECURITY</u>			
Other Charges		2,97,441	
Fire Fighting Operating Cost		13,394	
<u>LAWNS &amp; GARDENS</u>			
Pay & Allowances of Horticultural Superintendent	50,724		
Pay & Allowances - Others	1,76,007		
	-----	2,26,731	
	-----		
C/o.	9,78,49,648	C/o.	13,37,63,270

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EXPENDITURE INCOME

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	Rs.	Rs.		Rs.
B/f.			B/f.	13,37,63,270
Power		9,78,49,648		
Mosquito Control		50,64,660		
Water		13,208		
Oil and Petrol		14,16,591		
		2,24,987		

REPAIR AND MAINTENANCE

a. Furniture		4,17,537		
b. Typewriter & Duplicators		1,57,024		
c. Motor Vehicles		2,38,945		
	-----	8,13,506		
Duty, Insurance & Road Taxes		90,186		

WORKS AND MAINTENANCE

Pay & Allowances - Officers		4,47,557		
Pay & Allowances - Estt.		83,43,170		
Other Charges		43,01,595		
	-----	1,30,92,322		
Property Tax		2,48,606		

HOSPITAL

Pay & Allowances-				
Medical Officers		3,73,159		
Pay & Allowances -Estt.		7,79,666		
Purchase of Medicines		7,69,780		
	-----	19,22,605		

C/o. 12,07,36,319

C/o. 13,37,63,270

EXPENDITURE		INCOME	
B/f.	Rs.	B/f	Rs.
	12,07,36,319		13,37,63,270
Subsidy to Vanavani School	1,54,152		
Central School	--		
Audit Charges	1,42,430		
Legal Expenses	33,620		
Reimbursement of Stamp Duty	57,590		
<b><u>TRAVELLING EXPENSES</u></b>			
Board of Governors	15,105		
Staff Selection and Other Committees	70,123		
Candidates called for interview	97,714		
External Examiners	1,73,407		
Leave Salary and Pension Contribution on account of Personnel on Foreign Services	14,895		
Campus Amenities	30,896		
C.P.F. Contribution Etc.	1,19,16,059		
Hostel Contingencies	3,786		
Excess of Income over Expenditure	3,17,174		
<b>TOTAL</b>	<b>13,37,63,270</b>	<b>TOTAL</b>	<b>13,37,63,270</b>

Sd/-  
**A.V.K.NAMBIAR**  
 FINANCE & ACCOUNTS OFFICER  
 INDIAN INSTITUTE OF TECHNOLOGY  
 MADRAS 600 036.

Sd/-  
**V. SHANMUGAM**  
 REGISTRAR  
 INDIAN INSTITUTE OF TECHNOLOGY  
 MADRAS 600 036.

Sd/-  
**N.V.C.SWAMY**  
 DIRECTOR  
 INDIAN INSTITUTE OF TECHNOLOGY  
 MADRAS 600 036.

**INDIAN INSTITUTE OF TECHNOLOGY, MADRAS-36**  
**RECEIPTS AND PAYMENTS ACCOUNT FOR THE YEAR 1988 - 89**

RECEIPTS		PAYMENTS	
	Rs.		Rs.
Opening Balance	9,87,75,349	<u>ON CAPITAL ACCOUNT</u>	
		i. Building and Works	1,44,07,699
<u>RECEIPTS ON CAPITAL ACCOUNT</u>		ii. a. <u>Furniture, Equipments</u> <u>and fittings</u>	
Grant from Government of India on Capital Account	5,94,31,000	<u>DEPARTMENTS</u>	
		1. Chemistry	21,29,587
		2. Physics	23,68,048
<u>OTHER CAPITAL RECEIPTS</u>		3. Mathematics	2,44,531
Customs Duty on West German Equipments (Per Contra)	15,68,903	4. Humanities & Social Sciences	83,837
		5. Civil Engineering	18,00,980
		6. Electrical Engineering	22,69,659
		7. Mechanical Engineering	37,22,348
		8. Chemical Engineering	12,55,084
		9. Metallurgy	38,63,098
		10. Applied Mechanics	19,09,316
		11. Aeronautical Engineering	13,90,283
		12. Ocean Engineering	12,67,618
		13. Computer Science & Engg)	
		Furniture, Equipment and)	79,82,245
		Fittings, Indian Contribution)	
		for Siemens Computer )	
			3,02,86,634
		<u>b. RESEARCH CENTRES CENTRAL</u> <u>SERVICES</u>	
		1. Fibre Reinforced Plastic Research Centre	5,10,706
		2. Bio-Science & Bio-Technology	7,58,908
		3. Material Science & Res. Centre	4,85,265
		4. Engineering Design Centre	7,68,863
		5. Central Electronic Centre	1,67,947
			26,91,689
	15,97,75,252	c/o	4,46,94,333

RECEIPTS			PAYMENTS		
B/f.	Rs.	Rs.	B/f.	Rs.	Rs.
		15,97,75,252		26,91,689	4,46,94,333
<u>GRANT FROM GOVERNMENT OF INDIA</u>			6. Regional Sophisticated		
On Revenue Account		13,05,45,000	Instrumentation Centre	14,65,414	
<u>RECEIPTS FROM ACADEMIC SECTION</u>			7. Central Photographic Sec.	6,680	
Tuition Fees	5,47,075		8. Air-Conditioning Unit	1,52,287	
Hostel Seat Rent	2,98,692		9. Central X-Ray Diff.Lab.	43,292	
Gymkhana Fee	50,580		10. Central Glass Blowing Sec.	71,498	
Student Amenities Fund	84,430				44,30,860
Medicals Fees	17,716		c. Central Workshops		2,58,456
Fines	6,489		d. Indo-German Collo.Programme		
Examination Fees	40,700		(Eqpt.)etc.		1,57,138
Degree in Absentia	3,940		e. Replacement of Obsolete		
Admission Fees	47,676		Equipment		2,31,902
Thesis Fees	37,600		<u>LIBRARY</u>		
Grade Card	4,775		a. Books	11,48,171	
		11,39,673	b. Journals & back vol.	57,43,800	
Application Fees from students		44,20,399	c. Equipment	2,77,130	
Recredit of Contribution and } interest due to change over to}		44,09,717	d. Film Media Resources	6,097	
G.P.F.Scheme }					71,75,198
Institute Bus Collection	7,59,685		<u>CUSTOMS DUTY ON WEST-</u>		
Hire Charges on Instt.	64,863		<u>GERMAN EQUIPMENT</u>		
Vehicles		8,24,548	Payments	---	
<u>RECEIPTS FROM BUILDINGS</u>			LESS Refunds (-)	15,68,903	
Licence Fees	12,41,726		per Contra (-)	15,68,903	
Electricity, Water and			Clearance Charges on		
Service Charges	10,20,888		West German Equipment		13,14,273
		22,62,614	<u>FURNITURE AND FITTINGS</u>		
			Office, Library etc.		3,84,899
			Utensils of Hostels		1,708
C/o.		30,33,77,203			
			C/o.		5,86,48,767

RECEIPTS		PAYMENTS	
	Rs.		Rs.
B/f.	30,33,77,203	B/f.	5,86,48,767
Usufructs and Receipts from sewage Farm	41,002	<u>OTHERS</u>	
Receipts from Computer Centre	1,27,262	a. Hospital Equipment	1,49,047
Over Head Charges from		b. Motor Vehicles	548
Consultancy Services	9,60,663	c. Cycles	8,986
		d. Office Equipment	5,10,445
<u>OTHER RECEIPTS</u>		e. Telephones	82,142
Application fees for posts in Institute	12,108	f. NCC Design Models etc.	9,960
Library Overdue Collection	88,589	g. Fire Fighting Eqpt.	20,877
Institute Day & Assn.Fees	5,425		-----
Migration Certificate	236		7,82,005
Industrial Associate Membership	60,812	<u>REVENUE ACCOUNTS</u>	
Short term & Other Courses	1,900	<u>Academic Section pay &amp;</u>	
Hire Charges for Gowns	4,120	<u>Allowance of Teaching</u>	
Subscription of Journal of Mathematical & Physical Sciences	1,56,947	<u>Staff</u>	
Interest on Conv. Advance	53,373	Chemistry	24,83,697
Interest on Call Deposit with SBI	38,34,085	Physics	27,25,297
Interest on P.F. Investments	62,82,198	Mathematics	15,63,526
Maintenance of Fans	60,855	Humanities & Soc.Sci.	11,58,046
VAX II/750 Computer earnings	41,069	Civil Engineering	26,07,983
Dept.Dues/Breakages	25	Mechanical Engineering	38,21,455
Guest House Lodging Charges	31	Electrical Engineering	36,66,590
	-----	Chemical Engineering	17,11,497
	1,06,01,773	Metallurgical Engineering	14,86,872
	-----	Applied Mechanics	16,39,775
		Aeronautical Engg.	9,37,392
		Ocean Engineering	11,97,830
		Computer Sci. & Engg.	14,45,162
			-----
C/o.	31,51,07,903		2,64,45,122
	-----		-----
		C/o.	8,58,75,894





RECEIPTS

PAYMENTS

B/f.	Rs.	Rs.	B/f.	Rs.	Rs.
		32,06,33,971		15,55,929	9,95,50,045
<u>DEPOSITS</u>			Mechanical Engg.	9,60,097	
Contractors Deposit (Works)	17,07,129		Electrical Engg.	8,83,302	
Suppliers Deposit (Inst.)	5,99,078		Chemical Engg.	4,21,245	
External Scholarship	5,04,832		Metallurgical Engg.	5,76,991	
C.S.I.R.	18,41,159		Applied Mechanics	4,49,634	
Student Caution Deposit	33,725		Aeronautical Engg.	2,97,453	
New Plan Schemes etc.Ha/c	5,26,70,198		Ocean Engg.	2,00,368	
Miscellaneous Deposits	69,47,380		Computer Sci.&Engg.	33,82,826	
Q.I.P.&C.S.D.Scheme	50,88,099			-----	87,27,845
I.C.S.R.Projects	5,35,18,674		<u>LIBRARY</u>		
R.S.I.C. Receipts	1,01,814		Pay and Allowances-		
Library Deposits	1,00,960		Officers	4,07,680	
Students aid and welfare			Pay & Allowances -Estt	17,67,424	
fund receipts from students	23,020		Journal of General Int.	3,535	
Interest on Endowments	44,227		Contingencies and		
Alumini Association	53,375		Operating cost	1,19,173	
	-----	12,32,33,670	Binding Charges	30,400	
			N.M.R.Charges	46,210	
				-----	23,74,422
			<u>CENTRAL WORKSHOPS</u>		
			Pay & Allowances-Officers	8,12,734	
			Pay & Allowances-Estt.	33,26,125	
			Working Expenses-Tools		
			and other consumables	2,18,271	
				-----	45,57,130
			Indo-German Projects		
			(Pay & Allowances)		29,868
					-----
C/o.		44,38,67,641	C/o.		11,52,39,310

RECEIPTS		PAYMENTS	
B/f.	Rs.	Rs.	Rs.
	44,38,67,641		11,52,39,310
		<u>RESEARCH CENTRES</u>	
		Pay & Allowances-Officers	7,77,362
		Pay & Allowances-Estt.	12,52,270
		Central Electronics Centre	4,14,280
		Pay & Allowances	
		Air-Conditioning Unit	3,89,914
		-----	28,33,826
		<u>CENTRES,CENTRAL SERVICES</u>	
		<u>WORKING EXPENSES</u>	
		Fibre Reinforced Plastic Res.	
		Centre	1,95,152
		Material Science Res.Centre	2,85,435
		Bio-Science & Bio-Technology	1,29,356
		Central Electronics Centre	1,44,246
		Regional Sophisticated	
		Instrumentation Centre	1,11,869
		Central Glass Blowing Section	23,803
		Central Photographic Section	25,264
		Air Conditioning Unit	3,84,591
		Central Gas Supplies Unit	32,030
		Central X-Ray Diffraction Lab	78,275
		-----	14,10,021
		Customs Duty on Personal Effects	39,038
		<u>RURAL DEVELOPMENT RES.ACTIVITIES</u>	
		Working Expenses	1,77,074
		Indo-German Project	89,499
		<u>INSTITUTE SCHOLARSHIPS</u>	
		Post Graduate & Research	1,23,78,102
		Under Graduate	4,89,158
		-----	1,28,67,260
C/o.	44,38,67,641	C/o.	13,26,56,028

## RECEIPTS

## PAYMENTS

B/f.	Rs.	Rs.	B/f.	Rs.	Rs.
	44,38,67,641				13,26,56,028
			<u>OTHER ITEMS</u>		
			Part-Time Lecturers	6,869	
			Visiting Professors	19,584	
			Technical Bulletins & Journals	1,53,845	
			Symposia and Seminars	22,664	
			Inplant Training/Courses/ Visits	1,21,084	
			Continuing Education Pro- gramme organised by the Inst.	2,13,878	
			Quality Improvement Programme	3,730	
			Contribution towards Institute's participation in National Conferences	25,000	
			Director's Discretionary Fund for Research	33	
			Stipend for Apprentices	1,88,978	
			H.A.L.Trainee	1,00,000	
			Membership to outside bodies	61,015	
			Remuneration to External Examiners	80,599	
			Joint Entrance Examination	11,46,626	
			Graduate Aptitude Test in Engg.	9,74,165	
			Convocation	85,821	
			Prizes for Acd.Distinction	10,826	
			I.S.R.O.-ITT-M Cell	97,106	
				-----	33,11,823
C/o.	----- 44,38,67,641	C/o.			----- 13,59,67,851

RECEIPTS		PAYMENTS	
	Rs.	Rs.	Rs.
B/f.	44,38,67,641	B/f.	13,59,67,851
		<u>N.C.C., N.S.S. &amp; N.S.O.</u>	
		Pay & Allowances	1,44,847
		Other Expenditure	76,477
			-----
			2,21,324
		<u>CENTRAL ADMINISTRATION</u>	
		Pay & Allowances-Officers	26,14,559
		Pay & Allowances-Others	78,71,166
			-----
			1,04,85,725
		<u>HOSTELS</u>	
		Security (Hostels)	1,62,160
		Allowances to Wardens	41,821
		Subsidy to Hostels	40,67,942
			-----
			42,71,923
		<u>STORES</u>	
		Pay & Allowances-Officers	2,63,695
		Pay & Allowances-Others	6,56,082
		General Stores	18,444
		Security-Other Charges	2,84,816
		Fire Fighting Operating Cost	13,394
			-----
			12,36,431
		<u>LAWNS &amp; GARDENS</u>	
		Pay & Allowances of Horti- cultural Superintendent	50,315
		Other Expenses	1,76,006
			-----
			2,26,321
C/o.	----- 44,38,67,641	C/o.	----- 15,24,09,575

## RECEIPTS

## PAYMENTS

B/f.	Rs.	B/f.	Rs.
	44,38,67,641		15,24,09,575
		<u>SERVICE &amp; MAINTENANCE</u>	
		Telephones	12,95,867
		Power	15,19,644
		Water	14,16,591
		Furniture-Repair & Maintenance	4,17,537
		Oil & Petrol	2,26,810
		Duty, Insurance & Taxes	1,03,768
		Repair and Maintenance to Motor Vehicels & Cycles	3,08,975
		Property Tax	2,48,606
		-----	95,37,798
		<u>MEDICAL DISPENSARY</u>	
		Pay & Allowances-Medical Officers	3,74,146
		Pay & Allowances-Estt.	7,73,180
		Purchase of Medicines	8,27,210
		-----	19,74,536
		<u>ATHLETIC &amp; GYMKHANA</u>	
		Pay & Allowances	2,98,469
		Contribution to Gymkhana Management Account	9,26,110
		-----	12,24,579
		Mosquito Control	13,208
		Subsidy to Vanavani School	1,54,152
		Campus Amenities	30,896
		Spl. Coaching to SC/ST students	34,337
		Training & Welfare activities Including Spl. Training to SC/ST staff	298
		Guidance and Counselling	3,237
		Central School	--
		-----	2,36,128
C/o.	44,38,67,641	C/o.	16,53,82,616

RECEIPTS		PAYMENTS	
B/f.	Rs. 44,38,67,641	B/f. Director's Discretionary Fund	Rs. 16,53,82,616 8,100
		<u>WORKS &amp; MAINTENANCE</u>	
		Pay & Allowances - Officers	4,49,924
		Pay & Allowances - Others	83,39,904
		Other Expenditure on Maintenance	50,05,793
			----- 1,37,95,621
		<u>ADMINISTRATION-GENERAL EXPENSES</u>	
		Postage	5,00,279
		Entertainment	1,21,761
		Liveries	2,12,265
		Stationary	7,95,763
		Printing	2,23,879
		Guest House & Taramani House	44,084
		Advertisement	5,53,986
		Repairs to Office Equipment	1,74,062
		Audit Charges	1,69,920
		Legal Expenses	33,619
			----- 28,29,618
C/o.	----- 44,38,67,641	C/o.	----- 18,20,15,955

RECEIPTS

PAYMENTS

RECEIPTS		PAYMENTS	
B/f.	Rs.	B/f.	Rs.
	44,38,67,641		18,20,15,955
		<u>TRAVELLING EXPENSES</u>	
		Board of Governors	15,106
		Staff Committee, Selection Committee	70,123
		Candidates called for Interview	97,714
		External Examiners	1,73,407
		-----	3,56,350
		Leave Salary & Pension	
		Contribution on account of Foreign Services	38,372
		Reimbursement of Stamp Duty	57,590
		Sundries	3,32,187
		Hostel Contingencies	3,786
		<u>PROVIDENT FUND/GRATUITY/PENSION</u>	
		Pension/Commutation of Pension	
		Pension	24,73,665
		Family Pension	5,39,284
		Institute Share of Contribution	74,55,068
		Gratuity	15,74,943
		Deposit linked Insurance	17,590
		-----	1,20,60,550
		<u>ADVANCES</u>	
		Motor Car & Other Conveyance	6,82,572
		Customs Duty-Non Plan	21,25,751
		Festival Advance	4,39,600
		Other Miscellaneous Advance	23,41,721
		House Building Advance	20,09,300
		-----	75,98,944
C/o.	44,38,67,641	C/o.	20,24,63,734

RECEIPTS		PAYMENTS	
B/f.	Rs.	B/f.	Rs.
	44,38,67,641		20,24,63,734
		<u>REFUND OF DEPOSITS</u>	
		Suppliers Deposits (Instt.)	6,34,403
		Contractors Deposit (Works)	8,13,111
		External Scholarships	5,95,585
		C.S.I.R.	18,06,506
		Miscellaneous Deposit	48,86,686
		Students Caution Deposit	16,225
		Library Deposit	55,546
		Micro Processor Lab, Centres etc.	3,60,04,196
		QIP Programme organised by GOI/CSD	28,45,560
		Industrial Consultancy Works & Projects	4,17,98,393
		Endowments totwards prizes etc.	6,679
		Alumini Association	900
		Students Welfare Fund	--
		R.S.I.C. Payments	--
			8,94,63,790
		<u>CLOSING BALANCE</u>	
		Cash in hand	6,62,805
		With State Bank of India	15,12,77,175
		Post Office Savings Bank a/c	137
			15,19,40,117
			-----
		Total	44,38,67,641
		Total	44,38,67,641

Sd/-  
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FINANCE & ACCOUNTS OFFICER  
INDIAN INSTITUTE OF TECHNOLOGY  
MADRAS 600 036.

Sd/-  
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REGISTRAR  
INDIAN INSTITUTE OF TECHNOLOGY  
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Sd/-  
N.V.C.SWAMY  
DIRECTOR  
INDIAN INSTITUTE OF TECHNOLOGY  
MADRAS 600 036.



**INDIAN INSTITUTE OF TECHNOLOGY, MADRAS-36.**  
**BALANCE SHEET AS AT 31-3-1989.**

CAPITAL FUND AND LIABILITIES		PROPERTY AND ASSETS		
<u>CAPITAL</u>	Rs.	Rs.	Rs.	Rs.
Value of Land per contra		1,12,17,262	<u>LAND</u>	
Block Value of German Aid per contra	14,15,88,604		Value of land gifted by the Tamil Nadu government	1,12,17,262
Equipment, Technical Books and Journals per contra	16,56,230		<u>BUILDING</u>	
	-----	14,32,44,834	Cost of completed Buildings as on 31.3.88	13,82,65,503
Value of aid Alexander Van Humboldt foundation	10,83,000		ADD Buildings completed during the year	1,77,34,383
Value of aid from German Volks Wagon Foundation	2,99,860	13,82,860		-----
<u>COMPUTER SYSTEM PER CONTRA</u>		1,54,50,458	Building under construction as on 31.3.88	1,41,17,586
As per last Balance Sheet			ADD Expenditure during the year	1,42,44,305
Value of Siemens Computer per contra [German contribution]		3,09,97,578		-----
construction as Capital Fund & Balance of Income & Expenditure a/c as on 31.3.88	39,94,31,912		LESS transferred to completed buildings a/c.	1,77,34,383
				-----
<u>ADD</u> Capital Grant during 1988-89	5,94,31,000			2,83,61,891
	-----			
	45,88,62,912			
<u>ADD</u> Excess of Income over Expenditure during 88	3,17,174			
	-----			
	45,91,80,086		<u>DIESEL GENERATORS</u>	2,14,231
<u>LESS</u> Value of Equipments Written off	2,28,954			
	-----	45,89,51,132		
C/o		66,12,44,124		C/o 17,80,58,887
				-----

## CAPITAL FUND AND LIABILITIES

## PROPERTY AND ASSETS

	Rs.	Rs. B/f.	Rs. 66,12,44,124		Rs. B/f.	Rs. 17,80,58,887
Cost of Projector etc. (Gymkhana) per contra			49,811	Equipment Furniture and fittings at cost as per Balance Sheet as at 31-3-88	13,10,32,294	
Endowment Fund (Governor's Prize etc.)			4,75,350	ADD Additions during the year	3,48,84,299	
Endowment pertaining to Gymkhana Management a/c per contra			1,000	LESS Cost of Equipments written off during the year	16,59,16,593	
<u>DEPOSITS</u>						
EMD/ICC and other Deposits	8,59,42,138				1,66,296	
Modernisation of labs/New Plan Schemes Emerging Technology approved by Govt. of India	3,55,79,415			Computer acquired thro' German Food Aid Fund under the Indo-German agreement at cost as on 31-3-89		16,57,50,297
ADD Receipts 1988-89	5,04,91,003			Value of Siemens Computer		1,54,50,458
	8,60,70,418					
LESS Payments for the year	3,17,58,462			acquired under IndoGerman agreement cost of German Contribution	3,09,97,578	
	5,43,11,956			Indian contribution (during 1987-88)	78,45,934	3,88,43,512
ADD Adjustment refundable to IRDF (Sale proceeds of Motor Vehicles)	33,369			Block value of Equip ments from Alexander Von Humboldt Foundation as on 31-3-89	10,83,000	
	14,02,87,463			Block value of Regrige- rator and components from German Volks Wagon Founda- tion as on 31-3-89	2,99,860	
						13,82,860
C/o.			80,20,57,748	C/o.		39,94,86,014

CAPITAL FUND AND LIABILITIES		PROPERTY AND ASSETS	
Rs.	Rs.	Rs.	Rs.
	80,20,57,748	B/f	39,94,86,014
<b>SUNDRY CREDITORS</b>		Block value of Equipment from W.G. as on 31-3-88	13,07,89,963
i. On works accounts	14,24,293	ADD Additions during the year	1,15,78,380
ii. Supplies made/Service rendered Department/ Sections	14,17,708		14,23,68,343
	-----	28,42,001	
<b>OUTSTANDING EXPENSES:</b>		LESS Value of equipments written off during the year	7,79,739
<u>Payable</u>			-----
a. Pay and Allowances	51,26,943		14,15,88,604
b. Scholarships	2,28,926	Customs duty and clearance charges on equipment from W.G. as per B/S as on 31-3-88	3,01,46,737
c. Other allowances Medical	54,600	LESS Adjustments projects per contra	-----
d. wages to NMR labourers Departments/Sections	38,336		3,01,46,737
e. Audit fees	1,20,000		
f. Stipend to Apprentices	11,261		
g. Computer Centre remunera- tion to staff	--		
h. L.S and P.C payable	11,000		
	-----	55,91,066	
Computer receipts received in advance		---	
Grant-in-Aid from American Chemical Society per contra		<u>ADD Customs duty etc.</u> <u>paid during the year</u>	
Balance as per last year		Customs Duty	
Balance sheet	1,10,934	Clearing charges & Transport	13,14,273
			-----
			13,14,273
			-----
			3,14,61,010
		LESS Refund of Customs Duty received	15,68,903
			-----
			2,98,92,107
			-----
C/o.	81,06,01,749	C/o.	57,09,66,725

CAPITAL FUND AND LIABILITIES		PROPERTY AND ASSETS	
	Rs.		Rs.
	B/f. 81,06,01,749		B/f. 57,09,66,725
Unpaid items as on 31.3.89 as per undisbursed pay register	43,283	Motor Vehicles at cost as per Balance Sheet as at 31.3.88	24,28,037
New Plan Schemes Engineering Technology approved by Government of India (per contra) 31.3.89	4,71,20,800	ADD Additions during the year	5,092
			-----
		LESS cost of Vehicles written off	24,33,129
			62,658
			-----
		Library Books and Scientific Journals at cost as on 31-3-88	23,70,471
		ADD Additions during the year	3,49,61,634
			68,91,972
			-----
		Block value of Technical books from W.G. as per B/S as at 31-3-88	4,18,53,606
		ADD Additions during the year	15,56,230
			1,00,000
			-----
		Typewriters & Duplicators at cost as per B/S as at 31.3.88	16,56,230
		ADD Additions during the year	17,96,165
			4,85,960
			-----
		Tools & Plants as at 31.3.88	22,82,125
		ADD Additions during the year	5,77,523
			35,294
			-----
		Cycles at cost as per B/S as at 31.3.88	6,12,817
		LESS Cost of Cycles written off during the year	76,978
			---
	-----		-----
C/o.	85,77,65,832		76,978
			61,97,41,974

## CAPITAL FUND AND LIABILITIES

## PROPERTY AND ASSETS

	Rs.	Rs.		Rs.	Rs.
	B/f	85,77,65,832	B/f.	76,978	61,97,41,974
<b><u>INDUSTRIAL RESEARCH AND DEVELOPMENT FUND A/C</u></b>			<b>ADD Additions during the year</b>	8,986	
Balance as on 1-4-88				-----	85,964
[as per separate state- ment of account]	85,83,291		<b><u>INVESTMENT ACCOUNTS</u></b>		
ADD Receipts for the year	21,93,659		Endowment Fund Governor's prize etc. as on 31-3-88		4,75,350
	-----		Endowment pertaining to Gymkhana Management a/c per contra		1,000
LESS Payments during the year	1,07,76,950		<b><u>STOCK AS ON 31-3-88</u></b>		
	4,75,931		Consumable Stores with Departments		72,62,452
	-----	1,03,01,019	Construction materials with Engineering Unit works a/c		3,42,590
<b><u>GYMKHANA MANAGEMENT ACCOUNT</u></b>			Stationary Articles		4,71,709
Opening Balance as on 1-4-88 as per separate statement of account	1,48,105		Stock of Tyres and Tubes, Spare parts		33,864
ADD Receipts of the year	11,78,627		Liveries etc		14,838
	-----		Unesco Coupons		29,998
LESS Payments during the year	13,26,732		Diesel Oil		34,195
	11,58,390		Projector & Tape Recorders [Gymkhana Assets] at cost as per last year B/S		49,811
	-----	1,68,342	Grant receivable from Government		56,86,000
			Furniture hire Charges recoverable		517
			Licence Fees etc. recoverable		1,41,599
			Fees recoverable		45,519
			Leave Salary recoverable from parent Departments		22,387
			Excess provision of P.F. Contribution and Interest recoverable		5,14,420
				-----	
C/o.		86,82,35,193	C/o.		63,49,54,187

## CAPITAL FUND AND LIABILITIES

## PROPERTY AND ASSETS

	Rs.		Rs.		Rs.		Rs.
	B/f		B/f				
<u>GUEST HOUSES ACCOUNT</u>		86,82,35,193			63,49,54,187		
Opening Balance as on 1-4-88				Income receivable by computer Centre			2,46,901
as per separate statement	14,746			Hire charges of Institute Vehicles etc. recoverable			3,884
ADD Receipts	4,13,607			Pre-paid taxes and Insurance			38,509
	-----			Stamps in hand			60,160
	4,28,353			<u>Equipments procured from Grant-in-aid received from the American Chemical Society</u>			
LESS payments	4,09,306			Balance carried over from last year			1,10,934
	-----	19,047		<u>Equipment procured out of Grant-in-Aid received from Government of India</u>			
<u>TARAMANI GUEST HOUSE LIABILITIES</u>				<u>NEW PLAN SCHEMES</u>			
Gratuity payable to erstwhile Taramani House presently serving employees as on the date of take over	6,708			Opening Balance	1,70,48,804		
Advances received for parties	5,043			ADD Adjustment	3,00,71,996		
Bills payable for provisions	42,968				-----		4,71,20,800
Accumalated assets over Liabilities	1,12,405			Deposits with Telephones			10,800
	-----	1,67,124		Deposit with Firms			32,207
				Works Advance			49,49,056
				Central Supplies Unit [permanent Imprest]			5,00,000
				Advances [Recoverable]			1,52,76,662
				Deposit with Tamil Nadu Electricity Board			5,16,777
							-----
C/o		86,84,21,364	C/o				70,38,20,877



CAPITAL FUND AND LIABILITIES		PROPERTY AND ASSETS	
	Rs.		Rs.
B/f	86,84,21,364	B/f	70,57,80,436
		<u>T.H. [G.H. a/c] Assets</u>	
		Equipments on the date of take over	2,176
		Deposits with suppliers as on 31-3-89	1,725
		Stock of provisions	7,259
		Mess dues outstanding	1,55,965
			-----
		Stock at Guest House Provisions	1,67,125
			96
		<u>CLOSING BALANCE</u>	
		<u>Unpaid Balance per contra with state</u>	
		<u>Bank of India</u>	
		Cash on hand UPD	43,283
		Imprest (Instt.)	500
		Imprest (Engg. Unit)	1,400
			-----
		Cash on hand (other than 'C' a/c)	6,62,805
		With S.B.I. (other than IRDF a/c)	15,12,77,175
		With IIT P.O.S.B. a/c	137
			-----
			15,19,40,117
		With S.B.I. IRDF a/c	1,03,01,018
		With S.B.I. Gym. Management a/c	1,68,342
		With S.B.I. Guest House a/c	19,047
		EMD/Caution & other Deposits	8,59,42,138
		New Plan Schemes	5,43,11,956
		IRDF Deposits Adjustments	33,369
			-----
			14,02,87,463
		ADD Drawn from Refundable Deposits	1,16,52,654
			-----
			15,19,40,117
			-----
			86,84,21,364
			-----
			86,84,21,364
			-----
			86,84,21,364

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