

NATIONAL PRODUCTIVITY COUNCIL

PROSPECTUS

for

**One Year Post Graduate Programme In
ENVIRONMENT MANAGEMENT
2009 - 2010**



**Dr. AMBEDKAR INSTITUTE OF PRODUCTIVITY
No. 6, SIDCO INDUSTRIAL ESTATE
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NATIONAL PRODUCTIVITY COUNCIL

The National Productivity Council, established in 1958 is an autonomous organization registered as a society. It is tripartite in its constitution and representatives of Government, employers and workers and various professional bodies participate in its working. Besides its headquarters at New Delhi, NPC operates through twelve Regional Directorates and three Regional Offices. Its activities are further extended by nation-wide network of 48 Local Productivity Councils.

The objective of NPC is to stimulate productivity consciousness in the country and to provide productivity services with a view to maximizing the utilization of available resources of men, machines, materials and power, to wage war against waste, and to help secure for the people of the country a better and higher standard of living. To this end, NPC collects and disseminates information about the concept and techniques of productivity and management through various publications including periodicals and audio-visual media of films, radio and exhibitions. It organizes and conducts seminars and training programmes for various levels of management in the subjects of productivity and management.

With a view to demonstrating the validity and value application of productivity and management techniques, NPC offers consultancy service (Productivity Survey and Implementation Service) for which the demand has been steadily rising. The service is intended to help industry; departments of Government and service organizations adopt techniques of better management and operational efficiency consistent with the economic and social aspirations of the Nation.

NPC has established various other specialized services, such as Fuel Efficiency Services, Plant Engineering and Production Engineering Services, Productivity Services for public sector undertakings, public utilities, public administration, post-harvest operations in agriculture and small industries; Applied Productivity Research for evolving trends and indices of productivity in the core sector of economy; National Scheme of Supervisory Development under which an examination is held and National Certificate in Supervision is awarded to the successful candidates and Productivity Programmes for Trade Union Leaders and Workers. NPC also conducts institutional training programmes for the development of consultants in Productivity and Management in the areas of Industrial Engineering, Fuel Efficiency, Plant Engineering, Behavioural Sciences, Finance Management, Marketing Management and Agricultural Productivity.

NPC's professional staff consists of about 150 highly qualified and experienced specialists representing various disciplines relevant to management and productivity. NPC possesses a well-equipped Library-cum-Documentation Centre.

BACKGROUND

The phenomenal growth of industry and energy sectors coupled with rapid modernization, under the pretext of providing luxury and comfort, is posing a serious threat to our natural resources and environment. While technological progress is vital for our country to improve the living standard, it may spell disaster to human welfare through indiscriminate extraction of natural resources and discharge of wastes.

Realizing this, various Acts have been enacted and enforced to control media-specific pollution. Environmental Pollution Act is meant to integrate resource conservation, pollution prevention and pollution control efforts. Effective waste management with the concept of Centralized wastewater Treatment Facilities for cluster of industrial units is also gaining momentum. However, the achievement of various regulatory bodies in the last 15 years has not been all that impressive in improving environmental quality. Non-availability of trained manpower is a serious limitation for tackling environmental issues in an integrated manner. There are also economic, technological and institutional limitations. Integrated air-water-land approach in training is the need of the hour.

NPC is well aware of the economic and other benefits of anti-pollution measures in the industries, Post-control system is a must for regulatory compliance. NPC launched its pollution prevention and control(PPC) services in 1980. The services and strengthened with Indo-German bilateral technical cooperation project on Industrial Pollution Control from 1985. The Environment Division of NPC has acquired complete design capabilities for PPC projects. It is realized that non-availability of adequate trained man-power is the major limiting factor for diversification and expansion of PPC services.

OBJECTIVE

The objective of this course is to provide trainees with up-to-date knowledge of industrial Air, Wastewater & Solid/Hazardous waste problems; technology and management techniques for pollution prevention, waste minimization techniques; and design expertise of post-control systems. The Institute and PPC cells at Delhi, Bombay, Calcutta and Gandhinagar have modern laboratories, which are used for practicals and on the Job training in Waste minimization and pollution prevention & control. The participants will be fully equipped to take up challenging assignments as Consultants and Pollution Prevention & Control Managers. The programme will develop the skills of specialist, trainer, consultant and manager.

ELIGIBILITY

Candidates should have acquired at least Bachelor's Degree in Engineering/Technology in any of the following branches: Mechanical, Chemical. Civil with specialization in environment engineering with an aggregate of 55% marks. Preference will be given to

candidates with practical experience. Candidates appearing at the final degree examination can also apply, but must produce final mark sheet before appearing for Eligibility Test. They must have excellent analytical and creative bent of mind, aptitude for applied work and good personality.

Candidates should be below the age of 28 years on 1.11.09. Age is relaxable by 5 years for SC/ST candidates.

AWARD OF CERTIFICATE

Candidates who qualify in examinations, project studies and other evaluation will be awarded a Postgraduate Certificate in Environment Management. The PG is widely recognised and accepted by Industry.

The following medals are awarded:

1. NPC Chairman's Gold Medal to the best candidate.
2. NPC Director General's Silver Medal to the second best candidate.

A. Selection

After Screening of applications, candidates will appear at their own cost for written examination at one of the centres specified. Those qualified will be called for group discussions and personal interview and for which second class sleeper train fare/state road transport bus fare will be reimbursed.

VENUE

Dr. Ambedkar Institute of Productivity, National Productivity Council, 6, (Old No.31-B), SIDCO Industrial Estate, Ambattur, Chennai-600 098.

HOSTEL

The Institute has Hostel facilities which have thirty single rooms and eight double rooms to accommodate the participants and the faculty. The hostel is equipped with Kitchen Recreation and other amenities.

CURRICULUM

The selected candidates will undergo intensive, comprehensive and practice oriented classroom training at the Institute lasting about a year. The curriculum prescribed for the course is the outcome of blending experience of training and consultancy work that NPC has accumulated for about forty years. The broad coverage of subjects is given separately.

FACULTY

The Institute has a core faculty group. The Institute also draws the chief/senior consultants of NPC who possess wide practical experience from its various Offices. Experienced guest speakers from industries, business organisations, institutions and professional bodies are also invited to share their experience. A list of core faculty is given at the end.

METHOD OF TRAINING

The training is imparted through class-room lectures, group discussions, case studies, business games, role plays, audiovisual aids, self & group learning methods, etc.

PROJECT WORK & ON THE JOB TRAINING (OJT)

Each candidate will undertake one in-plant project in industrial/commercial organisations at the end of first semester & undergo OJT in any of the NPC offices. This will provide them opportunity to gain confidence by applying techniques learnt to live problems.

PROGRESS

The progress of each candidate will be monitored through examinations, quiz, exercises, project work, and practical training. In case of poor performance, indiscipline, misbehaviour, lack of interest, poor conduct, etc. training may be terminated without assigning any reasons. In cases of excessive absence, the training may also be extended.

LIBRARY

The Institute library holds about 4500 books, journals, in addition to numerous consultancy, project and thesis report and seminar proceedings. The Institute has loan facility with libraries of IIT, British Council, American Library etc.

DATE OF COMMENCEMENT

The programme commences on 16.11.09

APPLICATION

The application form is available on web site www.aipnpc.com . The candidate should take a print out of the same, fill it and send it along with a fee of Rs 800/- (Rs400/- for SC/ST) by demand draft in favour of National productivity council payable at Chennai along with copies of proof of educational qualification, date of birth, caste certificate if applicable. Please write your name & application Number on reverse of DD

COURSE FEE

- 1. Self Sponsored candidates- Rs.1,00,000/- per year (Rs.50,000/- per semester**
- 2. Industry sponsored candidates- Rs.2,00,000/- per year**

CURRICULUM IN DETAIL

B. FOUNDATION MODULES

1. ENVIRONMENTAL CHEMISTRY

PH and buffer solutions, Principles of Oxidation and reduction, Basic thermo dynamics of chemical reactions Viz. Exothermic & endothermic, Chemical kinetics, Equilibrium chemistry, solubility, gas laws, vapour pressure of gas, liquids & Solids, Surface tension. Osmosis, dialysis, solvent extraction, electrochemistry, adsorption / absorption , Main categories of compound of environmental significance, Principles of colloidal chemistry, emulsions, basic concepts from biochemistry.

2. ATMOSPHERIC CHEMISTRY, SOURCES AND EFFECTS OF POLLUTANTS

Atmosphere : composition, structure, evolution, chemical & photochemical reactions in the atmosphere, green house effect, Atmospheric scavenging process, effects of air pollutants on physical, biological and economic systems. Air pollutant-sources, transport, characteristics, properties and their environmental significance (Carbon-monoxide, NO-Nox, Hydrocarbons, Sulphur oxides, Suspended Particulate matters, heavy metals and micro-organisms; bacteriology, Water quality standards. Composition of liquid wastes. Physical chemical and bacteriological industries.

2A FLUID MECHANICS

Introduction to hydraulics: Basic hydrodynamics and Bernoulli's Equation; Head losses in pipes, Design and calculation of negative pressure systems; Uniform flow in open channels and pipes; Partially filled sewers; sediment transport, Types of weirs; particle dynamics for solid-solid interactions. Gas laws, measurement techniques, density of gas, humidity of air correction factor, measurement of various parameters for fluid flow in pipes / ducts.

2B MATERIAL AND ENERGY BALANCES

Units and dimensions – Conversion of units, expressions and equations. Law of conservation of Mass; relations in chemical reactions, degree of completion, excess reactant, Ideal gas law and gas reactions; density and specific gravity of ideal gases.

Simple material balance calculations. Material balance in Unit Operations. Material and energy balance involving chemical reactions, combustion, recycle systems etc.

3. PROCESS TECHNOLOGY

Physical and chemical reactions, exothermic and endothermic reactions, equilibrium conversion, material balance, Factor which effect chemical process, Characterization of process, Principles, Methods and equipments used for heat exchange, condensation, evaporation, drying, filtration, crystallizations, gas absorption, leaching, size reduction, separation and distillation. Special process of chemical processing industries.

4. ENVIRONMENTAL MICROBIOLOGY

Basic principles of microbial transformations of matter-biodegradation, acclimatization of wastes and microbial inhibition mechanisms; structure & function of microbial cell constituents, Pure and mixed cultures, Metabolism-aerobic and anaerobic pathways; microbial growth and growth kinetics, nutrition, factors affecting growth and death. Microbial taxonomy, Classification & morphological aspects of bacteria, fungiprotozoa algae. Bio assay tests for toxicity evaluation; Pathogenic and indicator Organisms. Role of micro-organisms in water and wastewater treatment. Microbiology as applied in air-pollution control, e.g. in bio filters, bio reactors and bio scrubbers.

4A ENVIRONMENTAL LAWS & REGULATIONS

Implementation of environmental regulations and role of regularity bodes. Industry specific standards; Concentration versus load based standards, Production specific standards. Sectional effluent / emission standards, stream standards, international standards for air / liquid / solid wastes; Promotion of Environmental Policy, Environmental taxes, incentive schemes etc. for effective Resource Management & Environmental taxes, incentive schemes etc. for effective Resource Management & environmental protection measures.

5. WASTE MINIMISATION AND CLEANER PRODUCTION

Waste minimisation : Overview, Techniques, Assessment methodology, Practical aspects of waste minimisation in industries, Barriers and motivation for waste minimisation implementation, Group Exercises.

6. WATER QUALITY MANAGEMENT

Point and Non-point sources of pollution, classification of water, bodies-river, sea, estuary, ground water; Water quality index, including saprophobic index; Parameters related to assimilation and self purification capacity of various streams aeration, re-aeration, Oxygen assimilation and self purification capacity of various streams aeration, re-aeration, Oxygen sag curve, bio accumulation, bio magnification, strategy for control of non-point sources of pollution; Prevailing water quality monitoring net works, GEMS, integration of industrial clusters versus water quality management; Environmental standards setting; Computer tools for water quality management.

7. AIR QUALITY MANAGEMET

Ambient Air Quality, representation & methods of analysis, data handling & analysis. AAQ in different areas, regulations / standards. Transport and diffusion of stack emissions; single & multiple stacks, significant atmospheric characteristics; plume types, plume characteristics-analysis techniques by plume rises & diffusion, experimental methods for determination of plume characteristics. Air quality simulation models, need approaches and basic model application. General composition of models, numerical modeling approaches; Gaussian diffusion model; inherent problems in air quality stimulation modeling. Exposure to a few commonly used models; meteorological measurements, parameters, instruments and analysis.

B. APPLICATION MODULE

1. INDUSTRIAL SAFETY & TOXICOLOGY

General discussion on toxicological manifestation, metabolism, threshold limiting value of various inorganic and organic pollutants. Toxicology, source, physiological effects and analysis. Organic compounds and their characterization. International regulations, tetrogenic, mutaenic and carcinogenic compound. Classification of hazardous wastes – by source and by groups. Occupational health and safety concepts, Industrial risk & disaster management.

2. HAZARDOUS WASTES MANAGEMENT

Definitions of Hazardous wastes, intrinsic hazardous properties like ignitability corrosivity, reactivity and EWP Toxicity, Hazardous wastes classification; integrated approach for minimization of air, water & solid pollutants, Hazardous wastes collection, storage, transportation, treatment and disposal options; concept of waste-exchange, 'Trip-ticket' system and centralized waste management techniques.

3. ENVIRONMENTAL IMPACT ASSESSMENT

Definition and terminologies, basic description of EIA process. EIA in project assessment and evaluation. Types of EILA; Pre and post audit of developmental projects. Preparation for EIA report, Environmental Impact Statement (EIS), different types of EIA.

4. LABORATORY - I

Air pollution preparatory works for stack & fugitive emission monitoring, calibration of instruments pre and post sampling operations, photometry & titrometry analysis of specific gaseous pollutions, analysis of commonly encountered pollutants. Water pollution. Sample preservation; Waste water characterization, analysis of PH, COD,

BOD, TSS, Oil / grease. Acidity / alkalinity, Volatile acids Volatile solids specific heavy metals, total Nitrogen & Phosphorous, Cyanide, Water hardness.

5. AUXILLARY EQUIPMENTS & INSTRUMENTATION

Types of different pumps and characteristics; selection in air & water pollution control applicants materials of construction for pump, valves & control accessories and selection for different applications, Pumps for dosing applications, type of blowers, fans and chemical mixers. Process Control: Objectives and conditions, elements and levels of control, basic design concepts for commonly used Air & Water Pollution Control process Instrumentation.

6 INDUSTSRIAL EXHAUST & VENTILATION

Basic principles of gas flow, room & work environment exhaust systems, design of duct, bends etc; static & dynamic pressure loss computations and duct balancing; design of extraction systems for corrosive & non-corrosive gases; Types of Fan & blowers used in air pollution control systems; Selection, installation, commissioning and routine operations of Fans & blowers. Process instrumentation systems associated with exhaust & ventilation systems.

7. AIR POLLUTION MONITORING

Monitoring plan for Stack, fugitive and ambient air quality aspects; Instrumentation and methods for analytical examination of particulate emission and gaseous contents in air samples.

Calibration and maintenance of monitoring instruments, Representative sampling, preparation and stabilization of samples. Air analysis, Emission & emission measurement, Chemical analysis; Ion selective, electrodes, spectroscopy. Data quality assurance. Field monitoring kits for rapid assessment. Field demonstration of monitoring techniques of selected industries and locations.

8. AIR POLLUTION CONTROL SYSTEMS

Design and Operation of Cyclones, Fluid and particle movement, calculation of fluid dynamic properties; calculation separation efficiency; mechanism of particle separation; calculation of separation efficiency; mechanism of particle separation; calculation of separation efficiency and dust emission rate, Design calculation; Cyclone and Multiclone arrangement; comparison and separation efficiency for various arrangement of Cyclones; impact of various design parameters; application and limitation of cyclones.

Design consideration of Wet Scrubbers; Fundamentals of wet cleaning systems, types of wet cleaning systems. Application of scrubbers in flue gas cleaning process with examples, Design of scrubbers in absorption process, comparison of different types of absorbers.

Design considerations of Fabric Filters: Fundamentals – filtration theory, variables in design theory, Filter fabric-types, characteristics, applications, types and importance of fabric finishes. Bag Houses, mechanical shaker types, reverse flow, pulse jet, cartridge type; basic characteristics, salient features, cleaning effectiveness, applications, criteria for selection. Filter bag criteria size, hardware, factors affecting life, fabric selections, case examples.

Design considerations of Electrostatic Precipitators: Fundamentals elements of ESP, Corona discharge, particle charging, particle collection, removal of collected particles, Deutch-Anderson equation, limitation and applications; precipitator design and sizing parameters; ESP construction, electrical systems, dust characteristics, application of ESP, specification of ESP's for ordering trouble shooting.

No detailed engineering aspects of ESP will be considered in this course. However, basics for selection, application and operation & Maintenance aspects will be focused. Design consideration of Absorption and Special air Pollution Control Systems.

9. DESIGN EXERCISES

Sectional drawings for Air Pollution Control General Arrangement (LGA) drawings. Group works for detailed designing and exercise on air pollution control systems. Design of fume extraction and ventilation systems, cyclones, Multiclone bag filters, scrubbers.

10. WASTE WATER TREATMENT

10A. PRE & PRIMARY TREATMENT

Pre-treatment Units : design, selection and application of Screens (bar screens, fine screens, self cleaning and cutting screens). Grit chambers (Aerated & Plain), Oil & grease removal systems, Dissolved Air Flootation Systems and static & rotary strainers.

Sedimentation: Characteristics of settleable solids; theory of sedimentation; hydrodynamic principles; quiescent settling, continuous flow basins, settling tanks; design of sedimentation tanks; standard design loading detention period; sludge removal.

Filtration systems; Selection, design and application of gravity, up flow, multimedia and pressure filters for various industrial water & waste water, Filter elements, filtration; back

washing and rate control; application of micro & ultra filter for specific treatment and resources recovery.

10B. PHYSIO-CHEMICAL TREATMENT

Chemical Coagulation : Dosing of coagulants, mixing flocculation; clarification; G-values design of flocculation and setting tanks, chemical precipitation.

Water conditioning; Diagnosis of Water & treated wastewater quality for effective recycle through different chemical and biological methods of water conditioning. Evaluation & application of Langlier and predictive scale indexed for corrosion control; prevention of after growth and corrosion.

Distinction: Techniques, control and management of chlorinating ozonisation and UV light treatment.

Special treatment operations: Selection and application of ion exchange, reverse, osmosis, electro dialysis, absorption and chemical oxidation systems for specific industrial wastes.

10C. BIOLOGICAL WASTE WATER TREATMENT

Biological Filters: Theory of filter operation, modification of basic process, low rate filters, high rate filters roughing filters, single-stage and tow-stage filters, factors affecting performance and design (Pretreatment, organic loading, hydraulic loading re-circulation, ventilation, temperature); construction features, media, under drains and walls.

Activated sludge process : Influence of the nature of the waste, hydraulic, sludge & BOD load, nature of eh activated sludge, oxygen utilizations; oxygen supply, DO concentration, ASP systems; function of the secondary setting tank; aeration systems, surface aeration; compressed aeration, turbine aeration methods of operation; design of activated sludge tanks and aeration systems.

Anaerobic biological process : Types of anaerobic treatment systems applied for treatment of high strength industrial effluents, anaerobic sludge digestion; digestibility of sludge; sludge digestion tanks, specials digester elements; determination of sludge volume; conventional digestion; multiple digestion; high rate digestion; methods of starting new digestion tanks; digestion gas; operation of digesters and process control.

Land intensive Treatment Systems: Design, construction and operation of waste stabilisation ponds, performance as function of temperature, types of ponds and other factors, mechanically aerated lagoons of facultative, flow through and extended aeration type, maturation ponds with vascular aquatic plants, utilisation of treated effluent on land for irrigation.

10D. SLUDGE HANDLING, TREATMENT AND DISPOSAL

Sources, quantities and composition of sludge; flow sheets for the treatment and disposal of sludge. Compaction process, volume reduction process; design criteria, efficiency and operation of gravity thickeners, centrifuges and flotation thickener, sludge stabilization, anaerobic & aerobic and chemical; chemical conditioning.

10E ADVANCED WASTE WATER TREATMENT

Needs for waste water treatment beyond secondary stages; Removal of nutrients (nitrification – denitrification & phosphate removal), persistent organic compounds and environmental toxicants; Coagulation, adsorption and demineralization as waste water treatment methods; Opportunities for waste water recycle/recycle.

10F. DESIGN EXERCISES

Sectional drawings for Air Pollution Control and Waste water treatment plants. Interpretation of RCC and General Arrangement (GA) drawings. Quality and cost estimation of Civil, Mechanical and Electrical works. Design of Control Systems with case exercise on tender specifications. Drafting of Civil & Mechanical Engineering specifications. Group works for detailed designing and exercise on waste water treatment operations.

10G POLLUTION AUDIT

Process survey, inventorisation of pollution sources, preparation of pro-audit plan, execution of pollution audit. Preparation of pollution prevention schemes, evaluation of Improvement / Control alternatives, cost-benefit computations, execution of detailed audit.

10H. LABORATORY – 2

Conduct of treatability studies: Jar test, dissolved air floatation systems, evaluation of Oxygen uptake rates, sludge setting rate, detoxification of Cyanide; Oxidation – reduction and chemical precipitation of selected industrial wastes. Parameters like sludge volume index.

Solid Wastes: Characterisation and classification of selected hazardous wastes.

11. ENVIRONMENTAL MGT. SYSTEMS; ENV. ECONOMICS ENVIRONMENTAL AUDIT, WASTE MINIMISATION

Principles of environmental Management Systems, Methodology and guide-lines of ISO 14000, Environmental Audit methodology and requirements, Industrial case studies on waste minimization techniques.

B. APPRECIATION MODULES

1. PRODUCTIVITY

Concept and philosophy of productivity, productivity & Standard of living productivity measurement and productivity techniques, sharing the gains of productivity.

2. GENERAL MANAGEMENT, PERSONNEL MANAGEMENT & BEHAVIOURAL SCIENCES

2A. GENERAL MANAGEMENT

Functions of Management, Planning, Organisational Objectives Organisation Principles; Decision making Communication, Delegation, Motivation and Morale, Leadership , Management Styles, Industrial psychology.

2B. PERSONNEL MANAGEMENT & BEHAVIOURAL SCIENCE

Personnel Functions and Procedures; Selection Placement, Induction & Training, Personnel records and research; Industrial relations; Wage administration and job evaluation; Organisation Behaviour; Industrial Hygiene and Pollution. Factory act and industrial Dispute Act.

3. PLANT LAYOUT-MATERIALS HANDLING

Plant Location-Location factors-plant layout-types of manufacture and layout-legislation with reference to layouts-Types of layouts, Development of block, shop & workplace layouts. Aids to develop layouts. Layouts of lines and group technology. Line balancing, Flexible manufacturing systems. Office layout, colour wash schemes, principles of storage, horizontal and vertical space. FSN analysis of RM goods; material location, storage, identification to layout; diagnosis and analysis of MH problems, physical and chemical, material or characteristics and choice of MH equipment; specifications of materials handling equipments; stimulation of facility planning; unit handling systems, packaging and containerization, Bulk handling.

Theory of safety, electrical, physical, chemical hazards, safety devices and guards / equipment, industrial pollution prevention & control, Methodology, legislation.

4. FINANCIAL MANAGEMENT & COST CONTROL

Principles of accountancy, classification of accounts and records; Debit and Credit, Trial balance; Balance sheet, Profit & Loss account, financial ratios and analysis. Elements of

manufacturing cost; standard costing; overhead distribution. Budgeting for control of costs and revenues. Equivalence and interest formulae; application of annual cost and present worth method; Break-even analysis and applications; DCF and rate of return studies. Principles of engineering economy, investments, interest rate, discount rate, rate of return, amortisation, depreciation, annual equivalent cost, present value, benefit-cost ratio, unit cost. Techniques for economic and financial analysis, comparative cost and financing schemes.

5. TRAINING TECHNIQUES

Determination of training needs, designing and administering training programme, training methods; training aids, evaluation of training programmes; principles of learning and motivating the learner. Programmed instructions and development of lessons, computer interactive learning.

6. METHODOLOGY OF CONSULTANCY, REPORT WRITING & TECHNICAL DRAWING

Objective and scope of Consultancy, Preliminary survey, Diagnosis and sectorial surveys, code of conduct & ethics in Consultancy. Report writing purpose and types of reports. Preparation of reports. Checklists for report writing characterization of report., Report Presentation. Basic principles of technical drawings including exercises.

7. EDP SYSTEMS & SAD

Introduction to data processing, computer hardware & software basic configuration, peripherals and Addons, programming language-Basic, Exposure to application software, like Word Processing, HG, HTPM, MS-DOS etc. Exercise of flow charts, exercise on simple programmes, system analysis and design; document flowchart, different type of file a& file design, input-output form design and flow diagram, illustration of CAD in environmental systems.

FACULTY

1. **Mr. R.Virendra
Director Head (AIP)** Energy Management
2. **Mr. H.R. Jindal,
Director** Energy Management
3. **Mr. V.S.S. Bhaskaramurty, Director,
Coordinator Env Mgt Prog.** Air Pollution Monitoring, Design &
Up-gradation of Control Systems
4. **Mr. P. Dharmalingam Director,
Co-ordinator (EM)** Energy Management
5. **Mr. S. Shivakumar, Director,
Coordinator IE Prog.** Production Management, HRD,
General Mgt., Manufacturing Mgt.
6. **Mr. R. Suryanarayanan
Deputy Director (Sr.)** Environmental Mgt. & Energy Mgt.
7. **Mr. J. Nagesh Kumar
Director** Energy & Environmental Mgt.
8. **Ms. Chitra .P, Asst. Director** Energy Management.
9. **Mr. M. Xavier, Director** Technology Management
10. **Mr. M.Natarajan
Dy. Director** Technology Management
11. **Mr. B.Girish,
Dy.Director** T.Q.M
12. **Mr. R.S. Maharajan,
Dy. Director** Industrial Engineering
13. **Mr. K.Vijayaraju Asst. Director** Industrial Engineering/Energy Mgmt
14. **Mr. V.Velayutham Asst.Director** Energy Management
15. **Mr. Pavan Kumar Riyali Asst.Director** Energy Management