Proposal

for

Imparting Short-Term Training to Foreign participants under ITEC Programme

Submitted to

सत्यमेव जयते

Ministry of External Affairs (MEA), Govt. of India, New Delhi

By

Central Institute of Petrochemicals Engineering &Technology (CIPET)

(Department of Chemicals and Petrochemicals, Ministry of Chemicals & Fertilizers, Govt. of India)

Head Office,

Guindy, Chennai – 600 032

Tel: 91-44-22254780 / 22254519

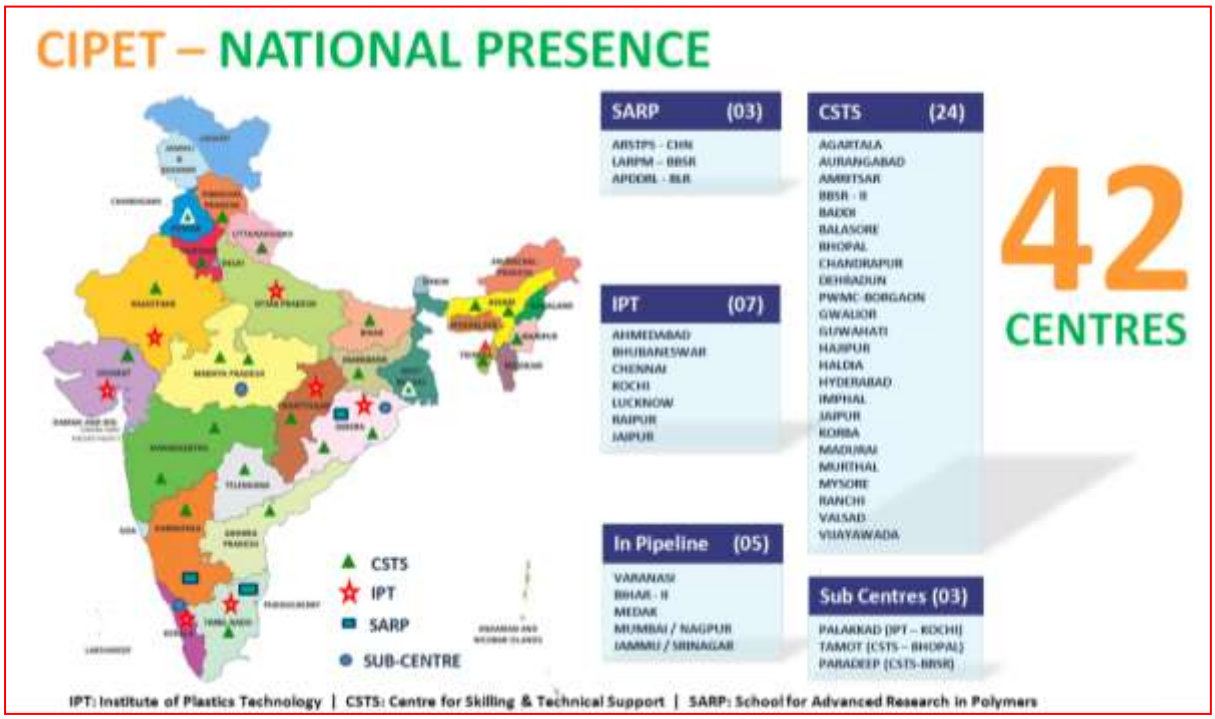
e-Mail: cipethovtc@cipet.gov.in; *Website*: www.cipet.gov.in

Executive Summary

1.	Proposal	Imparting Short-Term Training to foreign participants under Indian Technical and Economic Cooperation (ITEC) Programme
2.	Objective	To offer Advance Training Programme on "E-waste and its Value Addition Employing Recycling Technology" to the participants from the Developing Countries
3.	Details of Training Programme & Expenditure Head	Enclosed (Annexure – I)
4.	Deliverables	• Knowledge on E-waste Management, it's source, constituents & Segregation Methodology. • Understanding the Directive on E-waste & various hazardous substances in it. • Recycling of E-waste & its value addition. • Advanced characterization study of the various constituent of E-waste and the products obtained thereof. • Knowledge on International methodology and its implementation strategy.
5.	Training Centre	CIPET : School for Advanced Research in Polymers (SARP) - APDDRL - Bengaluru 7P,Hi-Tech Defence and Aerospace Park (IT Sector), Jalahobli, Bengaluru North, Near Shell R&D Centre, Devanahalli, Bengaluru - 562 149
6.	Implementing Agency	Central Institute of Petrochemicals Engineering & Technology (CIPET), Department of Chemicals & Petrochemicals, Ministry of Chemicals & Fertilizers, Govt. of India, Head Office, Guindy, Chennai – 600 032. Tel: 91-44-22254780 / 22254519 e-Mail: cipethovtc@cipet.gov.in Website: www.cipet.gov.in
7.	Supporting Agency	Ministry of External Affairs (MEA), Govt. of India

About CIPET:

Central Institute of Petrochemicals Engineering & Technology (CIPET) was established in 1968 by Government of India with the assistance of United Nations Development Programme (UNDP) at Chennai. The main objective of setting up of the institute was to develop manpower in different disciplines of Plastics Engineering & Technology as no similar institute was in existence in the country. International Labour Organization (ILO) served as the executing agency. During the initial project period between 1968 and 1973, the institute achieved the targets envisaged and was rated as one of the most successful UNDP projects implemented worldwide. Today CIPET is a premier national institution under the Department of Chemicals & Petrochemicals, Ministry of Chemicals & Fertilizers, Govt. of India, fully devoted to Skill Development, Technology Support Services, Academic and Research (STAR) in all the domains of plastics viz:- Design, CAD/CAM/CAE, Tooling &Mould Manufacturing, Plastics processing, Testing and Quality Assurance. CIPET operates from various locations spread across the country catering the needs of Polymer and allied industries. In order to cater the needs of plastics industries in effective manner CIPET has expanded its wings and today operates from 37 locations and 5 more are in the process of establishment.



Institute of Plastics Technology (IPT): Scholarly rigor along with a strong desire to broaden the practicality of the community as well as betterment of the society through technical education has been the goals of these IPT centres. IPT is also evolving as a centre for students to think analytically as well as to excel both in scholarship and research. They are trained to apply creative solutions to plastic technology and its allied subject.

Centre for Skilling and Technical Support (CSTS): Students are provided with training programme that provide skills with national recognition. These programme enable students to survive in today's competitive world. The skills they possess enable them to explore novel entrepreneurial capabilities.

School for Advanced Research in Polymers (SARP): In order to provide break-through solutions in advance materials and their applications in plastic Materials & Product Development, Innovative and cutting-edge research is performed. To undertake these research activities state-of-the-art R&D labs under the aegis of SARP is set up that can transfer technology, as well as create intellectual property for plastics and Allied Industries. These also serve as centres of excellence for researchers to make their career in an environment of applied research.

A Premier Institute for Education and Research in the field of Polymer Science & Technology, Post-independence, it became a matter of concern that Plastic Engineering & Technology was a growing science and yet there was not enough human resource to meet the demand. Imperative need was felt to establish CIPET -- the unique institute of its kind in the country and even today the institute holds a premier position. The primary objective of CIPET has been contributing towards the growth of the plastics industry through a combined program of education and research. The Institute has evolved through the years, creating closer ties with industries with the intent to create innovative plastic based solutions which are resource efficient and marketable. This has led to an exponential growth with activities and programs focusing on:

- Skill Training
- Technology Support
- Academics
- Research

CAMPUSES

From our first location in Chennai, we now have 37 locations and 5 more are in the process of Establishment. Every campus offers state-of-art facilities, turning out alumni with an innovative mind set and an entrepreneurial spirit. Our campuses are workshops for inventing the future, where students work with award winning faculty and experts to translate learning and research into action.

INFRASTRUCTURE

All the CIPET centres are equipped with state-of-the-art with excellent facilities in the areas of Design, CAD/CAM/CAE, Tooling &Mould Manufacturing, Plastics Processing, Testing and Quality Assurance with plan fund support from Government of India. In-line with the ever changing & challenging needs of the plastic industries, we continuously upgrade and modernize machinery, equipment and technology.

NATIONAL AND GLOBAL RECOGNITION

CIPET have gained global recognition for the research in the niche areas of Polymer Science & Technology and high quality education & skill development in the field of plastics. CIPET also plays a pivotal role in generating employment opportunities especially for unemployed and underemployed youth and promoting entrepreneurs though various skill development training programs.

CIPET believes strongly in sustainability and enriching institute-industry interface in accordance with the environment policies of the country while still being fit-for-purpose. Our sustained effort in creating awareness on environmental issues towards plastics and plastics waste management has been very well acknowledged by the industry.

INDUSTRY ALLIANCES

CIPET has an enviable interface with its business and industry partners. We provide technical / consultancy services in design, tooling, plastics processing & testing for the benefit of plastics & allied industry. We have been in the forefront of strengthening technological capabilities and have been constantly building capacities and leveraging

our expertise, calibre and skill sets to meet the emerging and evolving needs of the industry.

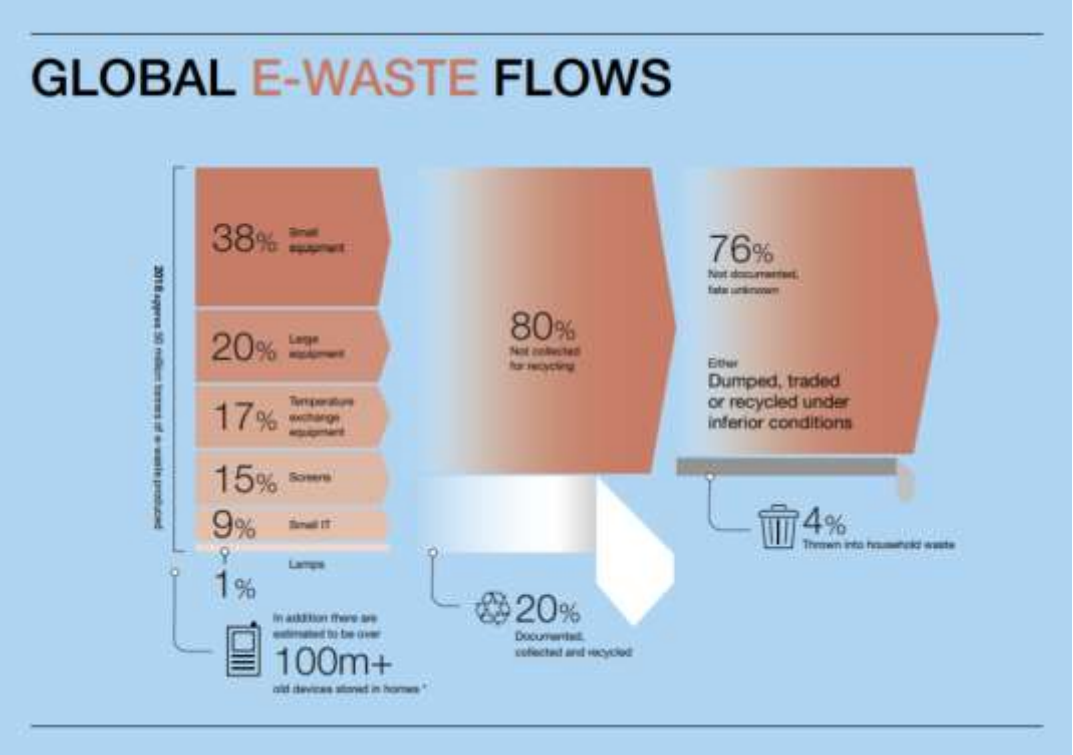
Over the span of 50 years, CIPET has been recognized by a large number of industry for the Technology Support Services in the areas of design, tooling, plastics processing and testing and quality assurance. This includes governmental agencies as well as public and private sector industries, both in India and abroad.

OVERVIEW OF THE PROPOSED TRAINING PROGRAMME:

1. GLOBAL SCENARIO AND CONCERN ON E-WASTE MANAGEMENT:

Modernization and advent of innovative electrical and electronic items has led to the rapid rise in E-waste generation. Increasing levels of electronic waste, and its improper and unsafe treatment and disposal through open burning or in dumpsites, pose significant risks to the environment and human health. Current trends suggest that the amount of E-waste generated will increase substantially over the next decades, thus better understanding and correct track of these developments are needed. Generation of E-waste Has Grown to 44.7 Million Metric Tonnes Annually – Equivalent to Almost 4,500 Eiffel Towers. The amount of e-waste is expected to increase to 52.2 million metric tonnes, or 6.8 kg/inh, by 2021.

By harvesting this valuable resource, we will generate substantially less CO_2 emissions as compared to mining the earth's crust with energy saving. However, majority of E-waste often incinerated or dumped in landfill. Many thousands of tonnes also find their way around the world to be pulled apart by hand or burned by the world's poorest workers. Further, recycling of E-waste without adopting scientific methodology poses serious health issues since it contains hazardous components, including contaminating air, water, and soil, and putting people's health at risk. Improper dismantling processes with lack of knowledge create additional threats to people and the planet.



Thus a better understanding on E-waste, it's directive and waste utilization with update technology will contribute towards the achievement of Sustainable Development and cleaner environment.

Further, according to the reports by ASSOCHAM India is the 5th largest producer of E-waste around the globe generating 2 Million Tonnes of electronic waste every year and imports another 50,000 tonnes into the country. Out of this mammoth e-waste pile, only 19,000 tonnes are recycled. India has an increasing demand of the electronic appliances and this shall escalate further increase in the quantum of E-waste generated by 2022.

2. IMPORTANCE OF IMMEDIATE ATTENTION FOR RECYCLING OF E-WASTE:

E-waste typically contains complex combinations of plastics and metals & other components down to microscopic levels. The wastes are broken down not just for recycling but for recovery of precious materials. The rapidly growing E-waste can be utilized as source of recyclable and recoverable materials with enormous employment opportunities through developed technology. During the recycling of WEEE, recovery of major plastics and metal is required for safe and sustainable recycling opportunities but availability of such facilities are quite limited. Thus, considering these facts, it is

important to reuse and recover these precious materials from environmental and economic perspective.

Further, the informal recyclers are not serious about the environmental guidelines and use hazardous methods of e-waste disposal like open burning for the recovery of targeted metals. Neither sophisticated machinery nor equipments are used for extraction of different materials, nor personal protection is given due importance. The entire work is being done by bare hands, hammers and screwdrivers, which can lead to exposure to toxic elements and gases. Waste components which does not have any resale or reuse value are openly burnt or disposed-off in open yards. Pollution problems associated with such backyard smelting using crude processes are resulting in fugitive emissions and slag containing heavy metals are of health concern. They use strong acids to retrieve precious metals such as gold. Working in poorly ventilated enclosed areas without masks and lack of technical expertise results in exposure to dangerous and poisonous chemicals, leads to serious health concerns.

E-waste handling practices

- ***Informal method:*** The informal sector recycles about 90-95% of the E-waste in India. The informal sector mainly consists of the urban slums wherein, unskilled labours use primitive techniques to perform the recycling processes. The E waste recycling processes in these sectors are not governed by any strict health and environmental regulations. The employees are involved in recycling processes without any safety precautions like gloves or masks. As a consequence, the workers are projected to harmful and toxic gases, which can cause health hazards like respiratory problems, skin ailments and cancer. Generally, the precious components are recycled for metal recovery, while, the non-recoverable items are disposed of into landfills during the informal recycling process. The metal recovery efficiency is around 28- 30 % whereas, the efficiency of gold extraction is around 99.9%. In India, the E-waste trade chain constitute of aggregators who buy scrap from households followed by segregators who manually dismantle the components and thereafter sell-off to recyclers who further process the waste for metal extraction.

Waste handling practices in informal sectors

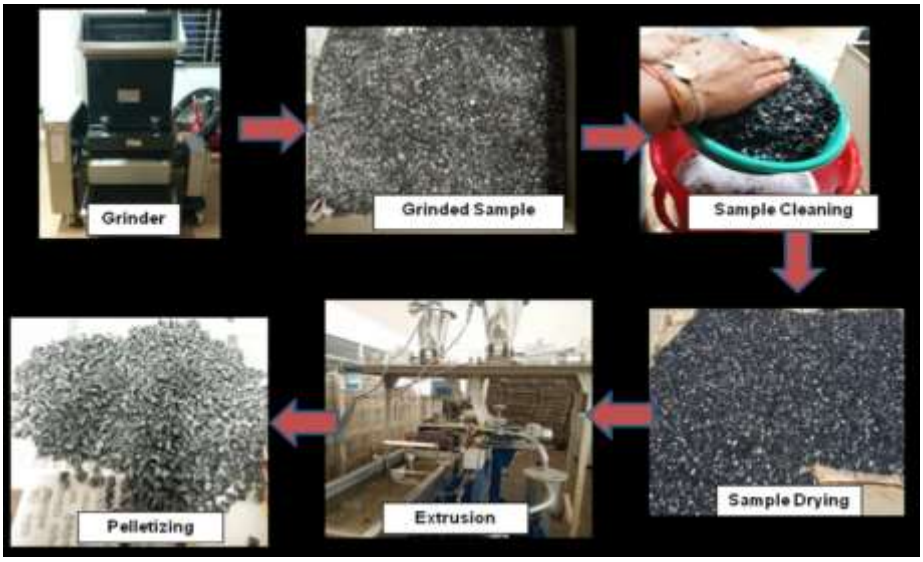
- ***Formal method:*** The formal/organized methods of E-waste recycling in India commenced from 2009 and deals with only 10 % of the total recycling process. Unlike the informal sector, the formal sector uses legal and environmentally sound techniques for recycling of E-waste. However, the major problem faced by the organized sector is the lack of disposal mechanisms and proper segregation of E-waste.

Waste handling practices in formal sectors

3. EXPERTISE AND CAPABILITY OF SARP IN SETTING UP OF E-WASTE RECYCLING UNIT:

R&D wings of CIPET has already undertaken various projects sponsored by Government funding agencies of India, wherein the proof-of-concept regarding utilization of the plastics generated from WEEE to value added products have been established and validated.

Various grades and formulations were developed utilizing plastics parts collected from E-Waste like, High Impact grade, improved Flow Grade, FR grade and improved Impact with Better flow grade, which have been validated for many high end applications.



Process adopted for recycling of plastics from WEEE

Several prototypes have been developed using conventional moulding techniques and the products displayed better repeatability and dimensional stability meeting the requisite properties in accordance with IS 14772 & IS 14434 (2000), suitable for electrical and other high end applications.

The Cost-Economic Analysis also indicates the developed formulation results in cost reduction to the tune of 60-70% as compared to virgin material. The life cycle analysis of the products also been carried out to see it feasibility for further use and was found that the material can be recycled further up to five times without compromising its performance characteristics. The results show that the developed formulation is stable to nearly

5-10 years in normal environmental conditions can be easily reprocessed at least two to three times without any appreciable change in its mechanical performance or durability.

Patent filed by CIPET SARP

"A process for preparing recycled plastic materials from waste electrical & electronic equipment", ***[Application No.204/KOL/2014 dated: 18.02.2014]***

CIPET has established a demonstration recycling unit in the state of Odisha with a capacity of 1000 kg per day for recycling of plastics recovered from major structural components like keyboards, computer monitors, printers, refrigerator & TV housing, laptop base & keypad.

E-waste recycling laboratory of CIPET SARP Dedicated to nation on June 22, 2018

		
Bottom part of Grinder	Armrest	Adaptor component
		
Automotive Blower	Bore well cap	Electronic Meter Cover

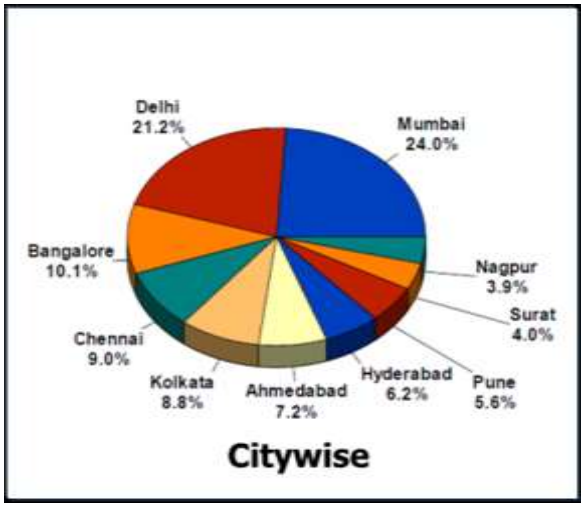
Glimpse of various products developed by the laboratory from E-waste

4. CIPET CENTRE PROPOSED TO CONDUCT ITEC PROGRAMME

CIPET : School for Advanced Research in Polymers (SARP) - APDDRL - Bengaluru
7P,Hi-Tech Defence and Aerospace Park (IT Sector),
Jalahobli, Bengaluru North, Near Shell R&D Centre,
Devanahalli, Bengaluru - 562 149
Phone No.: +91-80-28366454
Mobile No.: +91-9840376907
Email: apddrl@cipet.gov.in

Reason for selecting Bengaluru

Bengaluru being the state capital of Karnataka and it hub of India is the 3rd largest producer of e-waste preceded by Mumbai and Delhi, produces an estimated 2,00,000 tonnes of e-waste annually. But 90% of this goes to landfills or scrap dealers who then sell it to illegal recyclers. After end-of-life, these components are discarded and burnt in open atmosphere leading to environmental effects and huge loss of natural resources.



Percentage of E-Waste state and city wise

5. CONDITION TO THE PARTICIPANT

Senior level officials from Industries/ Working professionals/ Researchers/ Government officials/ Professors/ Consultants/ Manufacturers/ Engineers/ Investors/ Entrepreneur from the developing countries are eligible to participate in the programme with the following terms and condition under ITEC.

ITEC Terms & Conditions

- Participants are required to obtain from the Indian Mission the contact details of the Course Coordinator and the Training Institute and should keep the Institute informed of their travel plans well in advance.
- They must familiarize themselves with the weather conditions at the place of training and carry appropriate clothing with them.
- Participants are required to conduct themselves with discipline and abide by conduct rules, regulations and guidelines as stipulated by both the nominating Government and the Government of India.
- Participants are required to abide by the rules of the university/institution/establishment in which the participant is selected to undergo the training as well as participate in all Course-related activities including submission of periodic assessments/tests conducted by the Institute.
- Participants may be taken on educational study tour(s) as part of their Course Curriculum. This also typically includes visits to different Indian

heritage sites/places of interest located in the geographical vicinity of the institute. Participation in the study tour is mandatory.

- Participants are required to complete the training Course. Participants must ensure that there are no family or official commitments during the training programme. Request for leave during the course may not be acceded to by the Government of India. Participants are required to return to their countries upon completion of the training Course.
- Participants who leave the Course midway without prior intimation/permission of the Ministry of External Affairs or remain absent from the Course are required to refund the cost of training including airfare to Government of India.
- Participants must refrain from engaging in any political activity and/or any form of employment for profit or gain while on training.
- Candidates must not to carry any arms, ammunition drugs or any other prohibited and illegal items.
- Participants are not allowed to bring along their spouses or families for the duration of the Course. No such request will be entertained by Government of India.
- ITEC sponsorship could be canceled at any time due to unsatisfactory conduct, breach of conditions of the Programme, violation of rules of the institute/university/establishment, failure to make satisfactory progress in the training Course or for other sufficient cause as determined by the Government of India.
- Female participants are advised that if they are pregnant, issues related to their pregnancy will not be covered during their training on India.
- ITEC sponsorship may be canceled at any time due to unsatisfactory conduct, breach of conditions of the Programme, failure to make satisfactory progress in the training Course or for other sufficient reasons as determined by the Government of India.
- If any special assistance is required by a participant during his/her stay in India, it should be intimated to Mission as well as to the concerned Institute prior to departure for India.

- Female participants are advised to abstain from joining training Courses if they are in family way prior to their departure for India.

For further information, participants were requested to visit the website of "The Indian Technical and Economic Cooperation (ITEC) Programme" Ministry of External Affairs Govt. of India.

Details of Training Program

Annexure-I

Name of the proposed Training Program : E-waste & its value additions employing recycling technology

Batch size **:** Intake per batch minimum 15 & maximum 25 participants

Duration of the program : 02 weeks

E- Waste & Recycling (Course content)

S.No.	Content
1	**Introduction of Electronic waste (E-waste):** Introduction to E-waste, Constituents of E-waste, Classification of E-waste, Environmental effect of E-waste – consumption, Effect & Control Measures, Global Strategy for environmentally sound management of e-waste-Strategies Adopted in develop & developing countries, Domestic E-waste storage, collection, transfer system, processing and disposal, Basel convention.
2	**Source of E-waste Generationand its impact:** Availability and Socio-Economic Characteristics, Hazardous substances present in E-waste, Characteristics of Hazardous substances in E-waste, Environmental Impact of first, second and third generation E-waste.
3	**Legislation for Management of E-waste:** E-waste Management and handling rules, Major sections of hazardous waste (Management, Handling and Transboundary Movement) Rules, Hazardous waste (Management and handling) rules 2016 & 2018 with amendments,The Directive on waste electrical and electronic equipment (WEEE Directive) and the Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS Directive), EU Regulation 2019/290. National and Social Policies/ Laws/ Regulations/ Institutional Roles in developed& developing Countries.
4	**Recycling of E-waste :** Sustainable waste management practices, 4R principle for e-waste management. Physico-mechanical methods of treating E-waste. Thermo-chemical methods (Pyrolysis, gasification and incineration) of treating E-waste. E-waste processing and disposal, Technologies for recovery of resources from E-waste.
5	**Recycling of plastics from E-waste:** Plastics in E-waste, Life cycle analysis of E-waste plastics, Identification and segregation of plastics, E-waste re-processing techniques such as collection, sorting, grinding, density separation technique, washing and drying process, micro-pulverizing, stripping, electrostatic separator, hammering, cyclone

	separator for grinded plastic waste, Value addition of plastics and metal waste. Case studies on recycling approach of E-waste in different countries.
6	**Advanced characterization study for plastics from E-waste:** Advance characterization technique such as Thermal (DSC, TGA, DMA analysis), Morphological (SEM, AFM analysis), Mechanical test (Tensile, impact test etc.).
7	**Study tour to Certified E-waste recycler.**