Professional Training Programme
(2018-19)

CSIR-National Metallurgical Laboratory
Jamshedpur 2018
Overview of CSIR-National Metallurgical Laboratory

The foundation stone for National Metallurgical Laboratory was laid by Hon'ble Mr. C. Rajagopalachari on 21st November, 1946. It was formally inaugurated and dedicated to the nation on 26th November, 1950 by Pandit Jawaharlal Nehru "in a spirit of hope and in a spirit of faith in the future". The laboratory was an element of Sir Shanti Swaroop Bhatnagar's vision of providing India with a network of research institutions for taking the country ahead in science and technology. CSIR-NML played a significant role in the industrial revolution of India starting from 1950 especially in the areas of mineral processing, iron and steel making, ferroalloys and extraction of non-ferrous metals, notably magnesium. Asia's largest creep testing facility was also set up at CSIR-NML in the early 1970s and even today it ranks as the second largest creep testing lab in Asia. CSIR-NML continues to play a vital role in the quest of the country towards scientific and technological leadership and providing scientific solutions to the industries in the areas of minerals, metals and materials.

Since inception CSIR-NML has diversified its research areas ranging from mineral beneficiation and processing, indigenous alloy development, extractive metallurgy, refractories, corrosion, mathematical and physical modeling of metallurgical processes, advanced materials and materials tailoring, integrity evaluation of critical industrial components and cleaner and sustainable metals production. CSIR-NML is also carrying out major activities for creating awareness among the common masses on issues relating to health, environment, rural technology and sustainable development.

With a strong and committed staff having a wide spectrum of expertise and modern facilities, CSIR-NML endeavors to move ahead to meet the challenges of the global economy and reach greater heights.

**Vision**

To be a nationally relevant, globally benchmarked and self-sustained technology & innovation centre in Minerals, Metals and Materials Engineering

**Mission**

To develop technologies that meet the need of the country, provide sustainable solutions to Industry and add value to our society through dissemination of knowledge, skill building and developing entrepreneurship

**Broad Area of Activities**

- **Mineral Processing**: Beneficiation, Petrography & Process Mineralogy, Agglomeration
- **Extractive Metallurgy**: Hydrometallurgy, Pyrometallurgy, Electrometallurgy and Process Modeling
- **Surface Engineering**: Corrosion, Tribology and Surface Modification
- **Applied & Analytical Chemistry**: Chemical Analysis, Water Chemistry and Surface Chemistry
- **Materials Engineering**: Alloy Development, Advanced Materials (Structural, Bio, Magnetic) & Processing, Solidification & Casting, Metal Forming and Materials Joining
- **Evaluation of Materials**: Mechanical Behavior of Materials, Microstructural Characterization, Non-destructive Evaluation and Materials Modeling
- **Software & Services**: Engineering Design, Project & Process Engineering, Process design and simulation, Research and technology management consulting, IP management services, Information management, Technology/Business intelligence services
Forward

CSIR-National Metallurgical Laboratory is organizing Professional Training Programme (PTP) for last couple of years. Professionals from industries, Academic and R & D institutions, Entrepreneurs participated in the Profession Training Programme organized by the Laboratory. The primary objective to conduct such programme is to develop future collaboration with industries & academic institutions in the areas of Metals, Materials, Minerals and Metallurgy. Executives from Tata Steel, BHEL, BPCL, GAIL, CESE, PFIZER, GEC, Tata Sponge, Aditya Birla, Sriram Piston, SKF Technologies, Ambica Steel, RITES, Tata Hitachi and various academic institutes like NIT, Bangladesh CSIR, PSG College of Technology, etc. participated in the training programme during FY:2017-18. These professional courses have benefited not only in enhancing technical knowledge of the participants but also helped in developing R&D collaboration among few industries. Besides professional Training programme, CSIR-NML also conducts Corporate Training Programme (CTP) according to the specific need of the Industries.

During the current FY:2018-19 Laboratory is organizing four professional training programme - (i) Laboratory Quality Management System as Per NABL requirement, (ii) Experimental Tools and techniques for materials Characterization, (iii) Metallurgical Analysis of Failures in Materials and (iv) Mineral Characterization, Beneficiation and Agglomeration. We are inviting executives from various industries as well as academic institutions to participate in the above programmes.
Professional Training Programme: 2018-19

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Training Objectives

- To enhance technical knowledge in the areas of Metals, Materials, Minerals and Metallurgy.
- To offer hands-on training on state-of-the-art equipment facilities.
- To develop interaction between R&D laboratory, industry and academic institutions.

Who will be benefited?

The professional training programmes are exclusively designed and delivered for Industry and Academic organizations. The middle & Senior level managements from Industries, Scientists, Academic Staff and Research Scholars working in the area of Metals, Materials, Minerals and Metallurgy.

Training Fees

- The training fee is Rs. 25000/- + GST per participant for each training programme and to be paid in form of DD/ Cheque drawn in favour of Director, NML payable at State Bank of India, NML Branch, Jamshedpur. The fee can also be paid through on-line transfer by mentioning "PTP2018" in the transaction information. The bank details: State Bank of India, NML Branch, Bank Code: 3329, Account No: 30271713826, IFSC Code: SBI N 0003329. GSTIN No: 20AAATC2716R

- The training fee does not include accommodation and transport facility.

- For foreign participant, the registration fee is US$750 including accommodation and transport facility within Jamshedpur.

How to Register?

Each course is designed for a limited number of participants and participation shall be accepted on the first-cum-first basis. The participant can register online at:

http://www.bdmserver.nmlindia.org/PTP/register.php
Laboratory Quality Management System as per NABL requirement (LQMS 2018)

|April 25-26, 2018|

The Quality Management of any laboratory is important for establishing and implementing the management system for effective operations of testing & calibration. So it is essential that the designated Quality Manager should be well versed with the requirements of ISO/IEC 17025. It is now the requirement of NABL that Quality Manager of the laboratories holding or seeking accreditation from NABL should undergo 4 days training on ISO/IEC 17025. All the NABL accredited/applicant laboratories of NABL are to comply with above requirements and all laboratories applying for NABL accreditation are required to comply with this requirement which will be verified during Pre/Final assessment by NABL. Apart from being a mandatory requirement of NABL, this training course is also suitable for Technical Managers of testing/calibration laboratories.

The aim of the course is to provide a concerted and comprehensive training on development & implementation of ISO/IEC 17025 Laboratory Management System (LMS) for building competence of Quality/Technical Manager and other personnel of testing and calibration laboratories. At the end of the course, participants will be able to: Interpret the requirements of ISO/IEC 17025 and how to apply these requirements correctly implement ISO/IEC 17025 LMS effectively.

Course Contents

1. Certification and Accreditation

2. Overview of LMS and structure of ISO 17025

3. Management Requirements of ISO/IEC 17025 with detailed examination of important management system elements
   - Document control, Control of non-conformities, Corrective action, Preventive action & Management Review.

4. Technical Requirements of ISO 17025 with detailed examination of important technical operations
   - Personnel, Accommodation and Environmental conditions, Test & calibration methods and method validation, Overview of measurement uncertainty, Equipment, Measurement Traceability, Assuring Quality of Test & Calibration Results

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Several important macroscopic properties, especially of metallic materials, are highly sensitive to the microstructure. Critical mechanical properties, like tensile strength, are directly related to the microstructure. The understanding of the relationship between the microstructure and macroscopic properties plays a key role in the development and manufacturing of materials. Therefore, metallography is one of the most important tools of quality assurance of metallic materials. Metallography just by using light microscopes can help in assessing some key properties e.g. a) grain size can be correlated with yield strength and hardness, b) Anisotropic in mechanical properties, c) loss in ductility with inclusions, d) initiation of failure sites etc.

Microstructure quantification of a component can give a fairly good understanding of its performance. Further analysis of microstructure at various stages of the process can aid in determining optimum process parameters and thus can be used as an inspection tool for production and manufacturing process control, and even failure analysis if needed. The principles of metallography help to ensure product reliability.

**Course Contents**

- Introduction to basics of microstructure evolution; Grains, Crystal, Grain / Phase Boundary, Solid solution, Precipitation
- Development of understanding of metallography techniques; Etching techniques to reveal Sulphur distribution, coring structure, segregation pattern, flow pattern, welding Characteristics, phases/precipitates
- Application of microscope in learning and interpretation of microstructures; Grain size, phase fraction, case depth, Inclusion rating
- Hands-on training of various metallographic techniques; Macro and micro etching techniques
- Familiarization with electron microscopes (SEM) and its application; Different mode of operation like SE / BSE / CRL, Spectroscopy
- Visual examination of different mode of fracture and its interpretation
- Introduction to techniques for residual stress measurement in components; strain gauge, x-ray diffraction
- Interactive sessions with various experts
Failures in engineering components is common during service exploitation. Major reasons are defective materials, faulty operation, imperfect design and normal aging. Failure of components results in shutdown of plants, financial loss due to high downtime and in some cases casualty. Post failure initiative involves removing, repairing and re-fitting of components, which are sometime very cumbersome. Therefore, from engineering point of view, prevention / reduction in frequency / avoidance of future catastrophes of failure is of great importance for healthy, hazards free, smooth and desired service life of the components.

Different engineering component have diverse modes of failure depending on nature of operation, material and environment. MFIEC 2019 at CSIR-NML is all about understanding the science behind various failure mechanisms, practical investigations of failed components and relevant remedial measures to acclimatize with the subject. Practicing engineers from industry and faculty members from academic institutions may find this program useful.

Course Content

• Introduction to metallurgical failure of engineering components – basic approaches
• Modes of failure: damage mechanisms
• Metallurgical investigation of failed components
• Investigation of different failed components using various characterization and evaluation techniques
• Interactive session and discussion on case studies

Hands-on training on:

Identifying the problem, Selection of test specimen, Sampling and cutting, Visual examination, Compositional analysis, Microstructural investigation based on optical microscopy / scanning electron microscopy / X-ray diffraction study, Finding out the cause of malfunctioning / failure i.e identifying predominant damage mechanism like creep, fatigue, overload etc and Suggestion to prevent them in future
Mineral processing plays a vital role in exploitation of natural ore resources. It is a basic step in the field of metallurgy and is being practiced by small and large mineral based industries. It involves a number of unit operations ranging from comminution to dewatering. A basic understanding of various unit operations is considered to be useful for the efficient operation of mineral processing plant. CSIR-NML has the facility of Laboratory scale, Bench Scale as well as pilot scale mineral beneficiation facility. This course is intended to impart the knowledge on the basic principles of characterization and various unit operations of mineral processing. This will also cover development in this area through lectures followed by hands on training/demonstration in laboratory and pilot scale equipment. This programme also envisages visit to other related R&D facilities existing in the laboratory. This course will be suitable for plant operators/students/researchers and other people connected with mineral processing activities.

The objective of the training programme is (i) to enhance technical knowledge in mineral characterization, beneficiation and agglomeration, (ii) to offer hands-on training on state-of-the-art equipment facility and (ii) to develop interaction between R&D laboratory, industry and academic intuitions.

Course Contents

- Mineral characterisation
- Comminution and classification
- Gravity and enhanced gravity separation
- Magnetic and electrostatic separation
- Froth flotation-Principles and advances
- Dewatering
- Agglomeration

Hands-on training on:

- Mineral characterisation
- Mineral processing unit operations
- Agglomeration

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Professional Training Calendar 2018-19

April 2018

May 2018

June 2018

July 2018

August 2018

September 2018

October 2018

November 2018

December 2018

January 2019

February 2019

March 2019
Professional Training Programme

- Monitoring and Prevention of Industrial Corrosion (MPIC 2017)
- Experimental Techniques in Iron and Steel making (ETIS 2017)
- Metallurgy for Engineers (M4E 2017)
- Metallurgical Analysis of Failures in Materials (MAF 2018)

Corporate Training Programme

- Metallurgical Analysis for Quality Assessment (MAQA 2017)
- Metrology and Calibration for Quality Assurance (MCQA 2017)
- Inspection and Evaluation of flash butt Welded Rails (IEFBR 2018)

Skill Training

- Training on Electroplating
- Train the Trainers Programme on E-Waste deconstruction (EWD 2018)
- Entrepreneurship Development Programme on Skill Training on Energy Efficient Brass Melting Furnace (EEF 2018)
- Entrepreneurship – How to start a Tech Company (TECE 2018)

Technology Awareness Programme

Various Technology Awareness Programme for MSME, CII-Young Indians and Pitching sessions on Technopreneurship