BOARD OF PRACTICAL TRAINING

(EASTERN REGION)

COURSE CONTENT

FOR

FACULTY-INDUSTRY ATTACHMENT PROGRAM

(FIAP)

BOARD OF PRACTICAL TRAINING (ER)

UNDER MINISTRY OF EDUCATION

GOVT. OF INDIA

BLOCK-EA, SECTOR-I, SALT LAKE CITY, KOLKATA-700064

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FACULTY-INDUSTRY ATTACHEMENT PROGRAMME (FIAP)

Course Name: Mechanical Engineering.

Industry Partner: Tata Steel Limited
Venue of Training: Jamshedpur, Jharkhand.
Duration of Training: 3 weeks.
Batch Size: 12 – 15 Participants.

Sl. No.	Topics	Responsibility	Visits
1	**Industrial hydraulic :** Introduction and basic principles of Hydraulics, Hydraulic Fluids, Strainers and Filters, Introduction to Pump, Gear Pump, Vane Pump, Piston Pump, Pressure Relief Valve, Reducing Valve, Check Valve, Direction Control Valve, Flow Control Valve, Actuator, Accumulator, Hydraulic Circuits.	R K Mishra , SNTI / Vivek Srivastav , MED	
	Demonstration of industrial hydraulic Lab equipments.		1
	Plant visit (Mills area) to see the haydraulic system application.		1
2	**Advanced lubrication system:** Lubrication and types of lubricants & their use, Selection of lubricants, Various performance additives used in lubricant, Oil lubrication system, Methods of grease lubrication system, Different lubrication pumps, Warning and protective devices of lubrication system and its maintenance, Accessories and fitting used in lubrication system, Lubrication of tribo components, Inspection and condition monitoring of lubricants, Cleanliness of lubricant.	S Manjunathan, MED-M	
	Demonstration of lubrication system equipments at lubrication lab.		1
	Plant visit (Mills area) to see the lubrication system application.		1
3	**Rolling contact bearing:** Introduction to bearing, Selection of bearing, Types of bearing ,Bearing (ISO) designation, Mounting & dismounting of R.C.Bearing, Mounting preparation, Bearing arrangement, Fits on rolling bearings, Checking fit integrity, Mounting of bearing, Mounting of Taper Roller Bearing, Dismounting of bearings, Lubrication of bearing, ISO bearing damage classification, Do's and Don'ts related to bearings	G R P Singh, SSTG / Rajesh Kumar, MED	
	Bearing failure case study.	G R P Singh, SSTG	
	SNTI Lab visit to see various type of bearing.	Suman Bhagat, SNTI	1

Sl. No.	Topics	Responsibility	Visits
4	**Gear box maintenance:** Introduction, Advantages and limitations of Gear Drive, Classification of Gears, Type of Gears, Gear Nomenclature & some Formulae, Gear Train, Gear-box, Sequence of overhauling a gearbox, how to ensure proper meshing of gears, Inspection and running maintenance of gear boxes, Condition monitoring of gear boxes, Gear teeth failures, Gear – box failures	T Thirumurugan , SSTG	
	Shop floor visit to see the Gear box maintenance.	Ravindra Jain, Assembly shop	1
5	**Industrial valve:** Globe valve, Diaphragm valve, Gate valve, Pinch valve, plug valve, Check valve, Ball valve, Safety/relief valve, Needle valve, Reducing valve, Butterfly valve. **Centrifugal Pump:** Introduction of Centrifugal Pump, Centrifugal Pump and Its Purpose, Classification of Centrifugal Pump, Component Of Centrifugal Pump, Type Of Impellers.	Shashi Kant Prasad.	
	Lab visit to see various type of valve & Pump.		1
6	**Condition monitoring and diagnostic technique :** What is condition monitoring, Objectives of condition monitoring, Steps of condition monitoring, Condition measurement, Condition monitoring techniques,	Sudip Kumar Mukherjee, MED M	
	Lab visit to see the demo of various tools used.		1
7	**Welding & Gas cutting :** Oxy-fuel gas cutting, Plasma Arc Cutting, SMAW, TIG, MIG, Welding Joints, Welding Position, Weld symbols ,Welding Machines, Electrodes, Welding defects, Inspection technique.	Ratan Kumar, SNTI	
8	Welding Lab visit for demo of various machines.		1
	Shop floor visit to see the fabrication.		1
	Automobile : Automatic transmission, Mobile hydraulic, IC Engine	R A Bahadur, SNTI	
	Automobile Lab visit to see the various parts of automobile.		1
9	**Conveyor belt system:** Conveyor belt construction, components and functions. Conveyor belt jointing. Conveyor belt maintenance and trouble shooting. Conveyor belt failure case study. Inspection of conveyor system & prevention of failures.	Ranjan Goswami, RTG	
	Site visit to see the application and maintenance of these conveyor system.		1

FACULTY-INDUSTRY ATTACHEMENT PROGRAMME (FIAP)

Course Name: Electrical Engineering.

Industry Partner: Tata Steel Limited
Venue of Training: Jamshedpur, Jharkhand.
Duration of Training: 3 weeks.
Batch Size: 12 – 15 Participants.

Sl. No.	Topics	Responsibility	Visits
1	**Elect Machine, Protection & Power system:** electrical safety & positive isolation; use of numerical relays in protection of transmission line, feeder, transformer, motor; Standard Maintenance Practices (SMP) of motor & transformer; condition monitoring of electrical equipment: motor, transformer, cable etc.	Mr P K Das, SNTI	
	Visit to BPRS (Bulk Power Receiving Substation) to visualize practical use, operation & maintenance of AIS, GIS, Switchgear, CT, PT, Busbar etc.		1
	Tata Steel Network; Load Management; visit to Load Dispatch Center (LDC).		1
2	**Elect Drive**: applications-process control, position control, energy saving; speed and torque control; VFD basics; control modes-scalar & vector; single, multi-motor & multi-drive architecture; mechanical and electrical braking-active front-end; drive hardware-control unit, power module, line infeed, motor modules and option modules; configuration, commissioning & automatic optimization; parameterization, data backup and diagnostics; software features-monitoring & protection; standard maintenance practices; demonstration with simulators of Siemens & ABB drives.	M/S Vijay Narayan Singh/Sajit K Sahu, SNTI	
	Journey of drives in Tata Steel.	Mr A Deb, Head MUEM-CRM	
3	**Programmable Logic Controller (PLC):** levels of automation; types of PLC and their specification; PLC operation and watchdog; various hardware and their working; communication and addressing; hardware configuration; programming languages & instructions; structured programming; HMI configuration; difference between PLC & HMI; maintenance & troubleshooting; demonstration and hands-on.	Mr Sushil Kumar, SNTI	
4	**Process Automation & Distributed Control System (DCS):** process measuring sensors & transducers; SMART transmitter configuration & calibration with HART configurator; data communication & presentation; automatic process control - flow, temp, pressure, level, etc.; DCS & its interface with Foundation Fieldbus (FF) devices; final control elements & their accessories; calibration & maintenance; demonstration and hands-on.	Mr U K Choudhary, SNTI	
	Plant Visit		1

Sl. No.	Topics	Responsibility	Visits
5	**In-house developed automation solutions:** image processing; machine learning; radio frequency; microwave; IoT & embeded solutions; process support solutions for blast furnace & coke oven.	Mr Prabal Patra, Head Automation	
	Visit & demo at automation lab.		1
	Roller Table DC Motors Current Trend Detection (CTD) System at Hot Strip Mill (HSM): digitalization & improved maintenance practices.	Mr B Vijay Kumar, Foreman MED-Electronics	
6	**Automation at Hot Strip Mill (HSM)**: process automation level; automation level-2 for automatic setup calculation; HSM architecture; automation equipment.	Mr A Nag, Sr Manager MUEM-HSM	
	Visit to HSM	M/S B Vijay Kumar/A Nag	1
7	**Automation at Cold Rolling Mill (CRM)**: process automation level; automation equipment; Pickling Line and Tandem Cold Mill (PLTCM) architecture; Continuous Galvanizing Line (CGL) architecture; Coil Tracking & Transfer System (CTTS).	Mr A Deb, Head MUEM-CRM	
	Visit to CRM		1

FACULTY-INDUSTRY ATTACHEMENT PROGRAMME (FIAP)

Course Name: Metallurgical Engineering.

Industry Partner: Tata Steel.
Venue of Training: Jamshedpur, Jharkhand.
Duration of Training: 3 weeks.
Batch Size: 12 – 15 Participants.

Coke Making						
Day	**09:15 - 10:30**	**10:45 - 12:00**	**12:00 - 13:15**		**14:15 - 15:30**	**15:45 - 17:00**
Day 1	Coal Properties and coal selection for coke making	Coal handling plant operation and critical Equipments		Lunch Break	Coal handling Observation visit	
Day 2	Battery construction and Anchorage system	Battery operation			Battery operation observation visit	
Day 3	Quenching system and Coke Dry Quenching (CDQ) operation	Coke handling plant operation, wharf and grading activities	Quality Testing of Coke		Wharf and Coke Handling Observation visit	
Day 4	Overview of By Product Plant (BPP) Operation and critical equipments		Gas Holders and its operation		Visit to BPP	
Day 5	Effluent processing and handling, chemicals used in BPP		Operation of BOT and Norms		Visit to BOT (Biological Oxidation Treatment Plant)	

Agglomeration-Sinter & Pellet Making						
Day	**09:15 - 10:30**	**10:45 - 12:00**	**12:00 - 13:15**		**14:15 - 15:30**	**15:45 - 17:00**
Day 1	Raw Material Management Overview	Raw Material Bedding & Blending (RMBB) Process	RMBB Equipment	Lunch Break	RMBB Process observation visit	
Day 2	Sinter Making Process Flow	Sinter Making Process Parameters& its effect on sinter quality	Quality Testing of Sinter		Sinter Plant Visit	
Day 3	Overview of Raw Material Preparation for Pellet	Raw Material (Pellet) Preparation Process Parameters and its control	Raw Material (Pellet)equipment & its maintenance.		Raw Material(Pellet) preparation area Visit	
Day 4	Pellet Making Process		Quality Testing of Pellet		Pallet plant Visit	
Day 5	Visit to R &D Testing Lab				Role of Agglomerate in Blast Furnace	

Blast Furnace Operation

Day	09:15 - 10:30	10:45 - 12:00	12:00 - 13:15	Lunch Break	14:15 - 15:30	15:45 - 17:00
Day 1	Blast Furnace Design & Construction	Blast Furnace Refractories	Stock House Operation		Stock House Visit	
Day 2	Blast Furnace Stove Operation	Blowing Parameters in Blast Furnace			Blast Furnace Control Room Visit	
Day 3	PCI Technology and its impact on Bl.Fce Iron making process.	Quality of Coal suitable for PCI and various quality checks required	Coal Grinding & its injection		Pulvarized coal Injection (PCI) Observation Visit	
Day 4	Phenomena in Blast Furnace with coal injection.	Blast Furnace Reactions & its different zones	Cast House Operation		Cast House Visit	
Day 5	Burden Distribution & Calculation		Gas Cleaning Plant		Blast Furnace Visit (Stove & GCP area)	

LD Steel Making

Day	09:15 - 10:30	10:45 - 12:00	12:00 - 13:15	Lunch Break	14:15 - 15:30	15:45 - 17:00
Day 1	Introduction to Steel	Desulphurization process			Desulphurization Process Observation Visit	
Day 2	Primary Steel Making		LD Vessel Design & Construction		LD Steelmaking Observation Visit	
Day 3	Importance of secondary steel making process	LF steel making	RH Steel making		Secondary Steel Making Observation Visit	
Day 4	Basics and casting operation and its accessories	Details of Billet casting operation and its defect	Details of Slab casting operation and its defect		Billet Casting Observation Visit	
Day 5	Virtual Steel Making (Simulation and Gamification)				Slab casting Observation Visit	

Flat & Long Product Rolling

Day	09:15 - 10:30	10:45 - 12:00	12:00 - 13:15	Lunch Break	14:15 - 15:30	15:45 - 17:00
Day 1	Rolling Fundamentals	Overview of Hot Strip Mill	Defects in Hot Rolled Coils		Hot Strip Mill Visit	
Day 2	Over view of Cold Rolling at TSL Jamshedpur		Defects in Cold Roll Coils		CRM Visit (PLTCM, ECL SPM, RCL)	
Day 3	Galvanizing Basics	Galvanizing Process description			CGL 1 & CGL # 2 Visit	
Day 4	Overview of Long Product Mill	Wire Rod Rolling	TMT Rolling		Wire Rod Mill Visit	
Day 5	Guides and Roll Pass in Long Product Rolling		Defects in Wire rod & TMT Bars		Merchant Mill Visit	New Bar Mill Visit

Steel Plant Refractory

Day	09:15 - 10:30	10:45 - 12:00	12:00 - 13:15	Lunch Break	14:15 - 15:30	15:45 - 17:00
Day 1	Fundamental of refractory technology	Properties and testing of refractory			Refractory technology advance lab visit	
Day 2	Battery construction and Refractory lining		CDQ lining practices		Coke battery refractory lining	
Day 3	Blast furnace lining practice	cast house /tap hole refractory practices	hot blast stove lining		Blast furnace cast house visit for lining observation/torpedo relining	
Day 4	LD vessel relining and maintenance practice.	ladle relining and accessories fixing	Caster refractory practice and tundish lining		Steel making refractory area visit	
Day 5	Reheating furnace design and relining		Refractory failure analysis		Visit to mills refractory area	

INCLUSION::
1. Training infrastructure
2. One complimentary industry oriented E-learning which will be valid for 3 months from the date of issuance of license.

FACULTY-INDUSTRY ATTACHEMENT PROGRAMME (FIAP)

Course Name: **Certificate in IOT Techniques and Applications – Arduino Track.**

Industry Partner: Aunwesha Knowledge Technologies Pvt. Ltd.(Aunwesha Academy), Kolkata
Venue of Training: Kolkata, West Bengal.
Duration of Training: 3 Weeks
Batch Size: 05 – 15 Participants.

Sl. No.	Topics
1.	**Introduction to IoT:** What is IoT? – Evolution of internet – IoT case studies – Smart vehicles – smart buildings – health care – agriculture - Web based demo of IoT system
2.	**IoT Environment:** Embedded systems – Micro-controllers - Sensors – Controllers – Memory mapped IO – Input – Display – Notifications – Embedded Boards - IoT Architecture - IoT devices - IoT Platforms – Wearable platforms – Embedded platforms – Cloud platforms – Arduino – Raspberry Pi
3.	**Refresher on C language:** Variables and constants - Data Types - Characters, integers, and floating point numbers – Operators - Expressions - Functions - Loops
4.	**Refresher on Basic Electronics:** Electrical Circuits - Passive Components – Sensors – Resistive Sensors - Actuators – Analog Actuators - Pulse Width Modulation
5.	**The Arduino Platform:** The 3 components of the Arduino platform – Arduino board – Arduino IDE – Arduino Shields – Schematics - Direct programming - Installing the Arduino IDE – Adruino tool chain – Cross compilation - Structure of an Arduino program or sketch – the compilation process – Basic Arduino setup
6.	**Arduino Experiments:** Working with Pins – Input and Output - the use of the setup and loop functions - Using a bread board to wire a circuit – Monitoring Temperature, Humidity, Smoke & Flame – LCD display - Fading LED – RGB & Active Buzzer Circuit Design - Controlling RGB & Active Buzzer - controlling Relay - Making sounds - Building a basic music system - Use of software libraries with an Arduino sketch - Arduino Shields – Ethernet shield – Wifi shield - Servo motors - Using the Servo library to control servo motors
7.	**IoT Security:** Security & privacy implications – Hackable devices – Cyber security methods – Security issues of Arduino (memory, keypad PIN, etc.)
8.	**Industry Project:** Each participant will be required to work on a mini project relevant to the industry.

Note:
Training: Theory and practical class timings in the ratio of 30:70. Participants need to bring their laptops and IoT kit.

FACULTY-INDUSTRY ATTACHEMENT PROGRAMME (FIAP)

Course Name: Certificate in IOT Techniques and Applications – Raspberry Pi Track.

Industry Partner: Aunwesha Knowledge Technologies Pvt. Ltd.(Aunwesha Academy), Kolkata
Venue of Training: Kolkata, West Bengal.
Duration of Training: 3 Weeks
Batch Size: 05 – 15 Participants.

Sl. No.	Topics
1.	**Introduction to IoT:** What is IoT? – Evolution of internet – IoT case studies – Smart vehicles – smart buildings – health care – agriculture - Web based demo of IoT system
2.	**IoT Environment:** Embedded systems – Micro-controllers - Sensors – Controllers – Memory mapped IO – Input – Display – Notifications – Embedded Boards - IoT Architecture - IoT devices - IoT Platforms – Wearable platforms – Embedded platforms – Cloud platforms – Arduino – Raspberry Pi
3.	**Refresher on Basic Electronics:** Electrical Circuits - Passive Components – Sensors – Resistive Sensors - Actuators – Analog Actuators - Pulse Width Modulation
4.	**Refresher on Python language:** History of Python – Features of Python – Applications of Python - Using the IDLE3 IDE – Statements and comments – Data types and Variables – Operators – Input/output
5.	**The Raspberry Pi Platform:** Overview – Raspberry Pi board – Raspberry Pi processor – Raspberry Pi Operating System – Raspberry Pi Configuration and setup - Standard network extensions of Raspberry Pi 3 like Ethernet, WiFi, Bluetooth
6.	**Raspberry Pi Experiments:** GPIO Pins - Protocol Pins – RPi.GPIO library – GPIO Access – Pulse Width Modulation - Blinking LED – GPIO Simulator - Monitoring Temperature, Humidity, Smoke & Flame - RGB & Active Buzzer Circuit Design - Controlling RGB & Active Buzzer - Standard network extensions of Raspberry Pi 3 - Ethernet - WiFi – Bluetooth - Communicating with Cloud (Thingspeak) - Send to and Receive email from GMail – Create a Gmail notification light
7.	**IoT Security:** Security & privacy implications – Hackable devices – Cyber security methods – Securing the Raspberry Pi
8.	**Industry Project:** Each participant will be required to work on a mini project relevant to the industry.

Note:
Training: Theory and practical class timings in the ratio of 30:70. Participants need to bring their laptops and IoT kit.

FACULTY-INDUSTRY ATTACHEMENT PROGRAMME (FIAP)

Course Name: Certificate in BlockChain Technology and Applications.

Industry Partner: Aunwesha Knowledge Technologies Pvt. Ltd.(Aunwesha Academy), Kolkata
Venue of Training: Kolkata, West Bengal.
Duration of Training: 3 Weeks
Batch Size: 05 – 15 Participants.

Sl. No.	Topics
1.	**Overview of Blockchain:** What is blockchain? – Histroy of blockchain - Crypto currency and blockchain – Bitcoin – Etherium – Distributed ledgers – Why blockchain? – Trust
2.	**Business use of block chain:** Requirements for a blockchain in a business environment - Permissionless vs permissioned blockchains – Business use cases – Supply chain – Manufacturing – Heathcare - Entertainment
3.	**Foundational concepts:** Blocks – Transactions - Hashing – Private and Public keys – Signing of documents – P2P network – Distributed transactions - Consensus mechanisms – Smart contracts
4.	**Crypto currencies:** What is a crypto currency? – Current Market scenario - How does crypto currencies work? – Mining - Crypto economics - The Bitcoin system
5.	**Ethereum:** History of Ethereum - Ethereum network – Mist – Metamask - Ethereum Virtual Machine – Solidity smart contracts– Building Dapps - Blockchain Explorer Dapp - Truffle
6.	**The Hyperledger ecosystem:** Histroy – Linux Foundation - The Hyperledger vision – Modular Approach – Frameworks – Tools – Fabric – Iroha –Sawtooth – Burrow – Indy – Composer – Explorer - Cello
7.	**Hyperledger Composer Web Playground:** Assets - participants – transactions - access control - Business application modeling language - The Playground browser based User interface
8.	**Blockchain as a Service:** Why BaaS? - Basic BaaS capabilities - IBM Bluemix - Microsoft Azure - AWS – Oracle –Alibaba - Baidu
9.	**Industry Project:** Each participant will be required to work on a mini project relevant to the industry.

Note:
Training: Theory and practical class timings in the ratio of 30:70. Participants need to bring their laptops.

FACULTY-INDUSTRY ATTACHEMENT PROGRAMME (FIAP)

Course Name: Certificate in Data Science and Analytics – Python Track.

Industry Partner: Aunwesha Knowledge Technologies Pvt. Ltd.(Aunwesha Academy), Kolkata
Venue of Training: Kolkata, West Bengal.
Duration of Training: 3 Weeks
Batch Size: 05 – 15 Participants.

Sl. No.	Topics
1.	**Introduction to Data Science:** What is data Science? - Applications of data science - Skills required – tools required – Models and methods - The data science process - Type of data - Nominal data - Ordinal data - Interval data - Ratio data – Relationship between different types of data Use of graphs to see characteristics of data
2.	**Overview of Statistics:** Descriptive Statistics – Central tendency – Spread – Distributions - Inferential Statistics - Hypothesis testing – Chi-Square – Correlation- Regression
3.	**Statistical computing in Python - I:** Using Jupyter Notebooks - Statements and comments – Data types and Variables – Introduction to Numpy and Pandas - Descriptive statistics in Python
4.	**Data visualizations in Python:** Perceptions of visual cues - Bar chart – dot plot – scatter plot – histogram – plotting in Python - numerical – categorical – time series – Matplotlib
5.	**Statistical computing in Python - II:** Inferential statistics using Pandas and Scipy.stats library – Chi-Square Test - Correlation - T-test - ANOVA
6.	**Data cleaning and Preparation in Python:** Missing values – outliers – sorting – merging - Dropping Columns in a DataFrame - Changing the Index of a DataFrame - Tidying up Fields in the Data - Combining str Methods with NumPy to Clean Columns - Cleaning the Entire Dataset Using the applymap Function
7.	**Creating data visualisations in Tableau:** What is Tableau – Features of Tableau – Applications of Tableau – The Tableau products - Install Tableau Public - Tableau Workspace – Build views - Connect to data source – Creating dashboards – Data blending
8.	**Analytics for Business Domains:** Marketing and Retail - Web and Social Media – Banking and Finance – Supply chain and Logistics
9.	**Industry Project:** Each participant will be required to work on a mini project relevant to the industry.

Note:
Training: Theory and practical class timings in the ratio of 30:70. Participants need to bring their laptops.

FACULTY-INDUSTRY ATTACHEMENT PROGRAMME (FIAP)

Course Name: Certificate in Data Science and Analytics – R Track.

Industry Partner: Aunwesha Knowledge Technologies Pvt. Ltd.(Aunwesha Academy), Kolkata
Venue of Training: Kolkata, West Bengal.
Duration of Training: 3 weeks
Batch Size: 05 – 15 Participants.

Sl. No.	Topics
1.	**Introduction to Data Science:** What is data Science? - Applications of data science - Skills required – tools required – Models and methods - The data science process - Type of data - Nominal data - Ordinal data - Interval data - Ratio data – Relationship between different types of data Use of graphs to see characteristics of data
2.	**Overview of Statistics:** Descriptive Statistics – Central tendency – Spread – Distributions - Inferential Statistics - Hypothesis testing – Chi-Square – Correlation- Regression
3.	**Statistical computing in R - I:** Basic data types – variables – vectors – matrices - control structures – functions - Factors – Data frames – lists – Useful R packages – Basic statistics in R - Reading in data - Descriptive statistics in R
4.	**Data visualizations in R:** Basic plotting in R – Using GGPlot2 – Aesthetics – Faceting – Geoms - Position Adjustments - Saving Graphs
5.	**Statistical computing in R - II:** Inferential statistics using R – Chi-Square Test – Covariance - Correlation - T-test – Wilcox - ANOVA
6.	**Data cleaning and preparation using R:** Reshaping – melt – dcast - rbind – cbind - Treating Missing values - Using dplyr – Using tidyr - Working with Continuous and Categorical Variables - Joining Data Sets - Grouping Data
7.	**Creating data visualisations in Tableau:** What is Tableau – Features of Tableau – Applications of Tableau – The Tableau products - Install Tableau Public - Tableau Workspace – Build views - Connect to data source – Creating dashboards – Data blending
8.	**Analytics for Business Domains:** Marketing and Retail - Web and Social Media – Banking and Finance – Supply chain and Logistics
9.	**Industry Project:** Each participant will be required to work on a mini project relevant to the industry.

Note:
Training: Theory and practical class timings in the ratio of 30:70. Participants need to bring their laptops.

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