ChhattisgarhSwamiVivekanandTechnicalUniversity
Bhilai (C. G.)

Scheme of Teaching and Examination
B.E. (V Semester) Metallurgical Engineering

S. No	Boardof Study	Subject Code	Subject	Periods per Week			Scheme of Examination			Total Marks	Credit L+(T+P)/2
							Theory/practical				
				L	T	P	ESE	CT	TA		
1	Metallurgical Engineering	**338551 (38)**	Transport Phenomenon in Metallurgical Process	4	-	-	80	20	20	120	4
2	Metallurgical Engineering	**338552 (38)**	Industrial Pollution and Control	3	1	-	80	20	20	120	4
3	Metallurgical Engineering	**338553 (38)**	Iron Making	3	1	-	80	20	20	120	4
4	Metallurgical Engineering	**338554 (38)**	Mechanical Working Processes	3	1	-	80	20	20	120	4
5	Metallurgical Engineering	**338555 (38)**	Non Ferrous Extraction Metallurgy	3	1	-	80	20	20	120	4
6	Metallurgical Engineering	**338556 (38)**	Phase Diagram & Phase Transformation	4	1	-	80	20	20	120	5
7	Metallurgical Engineering	**338561 (38)**	Transport Phenomenon Lab	-	-	3	40	-	20	60	2
8	Metallurgical Engineering	**338562 (38)**	Mechanical Working Processes Lab	-	-	3	40	-	20	60	2
9	Metallurgical Engineering	**338563 (38)**	Phase Transformation Lab	-	-	3	40	-	20	60	2
10	Metallurgical Engineering	**338564 (38)**	Iron MakingLab	-	-	3	40	-	20	60	2
11	Humanities	**300565 (46)**	Personality Development	-	-	2	-		20	20	1
12	Metallurgical Engineering	**338566 (38)**	*Practical Training Evaluation and Library	-	-	1	-	-	20	20	1
Total				**20**	**5**	**15**	**640**	**120**	**240**	**1000**	**35**

L: Lecture **T:** Tutorial **P:** Practical

ESE: End Semester Examination **CT:** Class Test **TA:** Teacher's Assessment

**** Industrial Training of eight weeks is mandatory for B.E. student. It is to be completed in two parts. The first part will be in summer after IV sem. after which students have to submit a training report which will be evaluated by the college teachers during B.E. V semester.***

Chhattisgarh Swami Vivekanand TechnicalUniversity,Bhilai

Branch:	**Metallurgical Engineering**	Semester:	**V**
Subject:	**Transport Phenomenon in Metallurgical Process**	Code:	**338551(38)**
Total Theory Periods:	**48**	Total Tutorial Periods:	**NIL**
No. of class Tests to be conducted:	**2 (Minimum)**	No. of assignments to be submitted:	**2 (Minimum)**
ESE Duration:	**Three Hours**	Maximum Marks in ESE: **80**	Minimum Marks in ESE: **28**

OBJECTIVE:
To learn the concepts behind energy and mass flow in metallurgical furnaces and chimneys. Solve numerical based on these phenomena to evaluate the missing parameter.

EXPECTED OUTCOME:
Students will be comfortable in the crucial concepts and their application in finding out the required values in a given set of constraints. They will realize the reasons behind the limitations in the actual and theoretical values in the mass and energy flow system.

UNIT I **FluidFlow:** Classification of fluids, Velocity distribution in Laminar and Turbulent flows. Flow through pipes and ducts, and beds of solids. Application of dimensional analysis of fluid flow. Concept of boundary layer. Bed and Particulate fluidization. Energy balance; Macroscopic mass balance, Mechanical energy balance. Chimney draft, air leakage from openings, molecular Knudsen flow.

UNIT II **HeatTransfer I:** Thermal conductivity and mechanism of energy transport, Fourier's law of heat conduction. One dimensional steady state problems of heat flow through composite walls. Unsteady conduction in one dimensional system examples of heating and cooling of plates and cylinders. Thermal conductivity of gases and liquids. Convective heat transfer, equation of energy, free and forced convections. Application ofdimensional analysis to convection problems.

UNIT III **HeatTransfer II:** Energy transport by Radiation, Nature of thermal radiation, Black and Grey bodies, Plank's distribution law, Wien's displacement law, Stefan and Boltzmann law, Kirchhoff's laws, Intensity of radiation, Lamberts law, View factor. Heat transfer between two black walls in an enclosure. Radiation shields, Radiation through opening in furnaces, radiation from flames and gases. Combined effect of convection, conduction and radiation. Overall heat transfer coefficient. Example, problems and exercises on systems of steady heat flow important in Metallurgy.

UNIT IV **Mass transfer and kinetics:** Steady(state) one dimensional mass diffusion of component through stationary media. Convective mass transfer in fluids, concept of concentration boundary layer, Mass transfer coefficient. Heterogeneous reactions of metallurgical importance and the irate controlling steps. Nucleation and growth and bubble formation phenomenon, Interfacial reaction, Carbon gasification by CO_2, slag-metal reaction at the interface, Topo-chemical model of gas-solid reaction.

UNIT V **Process Rate Calculation in Reactor Engineering:** Metallurgical reactors, classification with examples, Staged Operations of metallurgical engineering, Pyro metallurgical reactors. Introduction to reactor kinetics, concept of retention times and other parameters of reactors. Analysis of rates in batch–typesemi- batchtype, co-current and counter current mode reactors. Mixing and residence time-distribution in metallurgical reactors, Determination of the value of E.

NAMEOFTEXTBOOKS:

1. Ghosh and Ray–Principles
2. Geiger and Poirier–Transport Phenomenon in Metallurgy, Addition–Wilsley readings,U.S.A.–1973
3. Rosenqvist–PrinciplesofExtractiveMetalluragy,McGrawHillInternationl, Singapore,1983
4. Szekeley and Themelis- Rate Phenomenon in process metallurgy, Wiley Interscience, New-York-1971
5. Schuumann,Jr, Metallurgical Engineering volume I, Addison Wilsley Readings,U.S.A.1952
6. Coudurier,HopkinsandWilkomirsky–FundamentalofMetallurgicalProcesses, PergamonPress,Oxford,1978
7. Ray,SridharandAabaraham–ExtractionofNon-ferrousMetrals,AssociatedEast-WestPressNew-Delhi,1985
8. Smith-ChemicalEngineeringkinetics,McGrawHillNew-York-1970
9. Bird,StewardandLight foot-TransportPhenomenon,JohnWileyandSons Inc.New-York-1960

TEACHING METHODOLOGY:

Delivering the concepts on board and rigorously training students for solving the numerical based on the concepts delivered.

Case study for the reactors and furnaces for the theoretical and practical mismatch of the mass and energy flow.

Chhattisgarh Swami Vivekanand TechnicalUniversity,Bhilai

Branch:	**Metallurgical Engineering**	Semester:	**V**
Subject:	**Industrial Pollution & Control**	Code:	**338552(38)**
Total Theory Periods:	**36**	Total Tutorial Periods:	**12**
No. of class Tests to be conducted:	**2 (Minimum)**	No. of assignments to be submitted:	**2 (Minimum)**
ESE Duration:	**Three Hours**	Maximum Marks in ESE: **80**	Minimum Marks in ESE: **28**

OBJECTIVE:

- To increase the awareness of the students towards the detrimental effects of the air pollutants emitted and solid wastes generated by various industries.
- To bring out the curiosity and the hidden potential of students towards suggesting methods to reduce such effect leading towards sustainable development.

EXPECTED OUTCOME:

Students will have an increased level of awareness towards environmental friendly industrial practice.

UNIT I Man and environment. Principles of environmental management. Sustainable development. Classification of pollutants, fossil fuel pollution, carbon emissions and global warming, biodegradable and non-biodegradable pollutants, thermal pollution, radiation pollution, metal pollution, chemical pollution, marine pollution.

UNIT II Air Pollution – Gaseous and particulates; primary and secondary air pollutants, hazardous effect of fly ash. Air pollution in industrial units; ferrous and non-ferrous metallurgical industries. Control of specific gaseous pollutants – SO_2, NO_2, CO_2 etc. air pollution sampling and measurement. Air pollution control methods and equipment.

UNIT III Water Pollution – caused by various industries, water pollution in selected process industries: integrated steel plants, electroplating & metal finishing industries,. NF industries waste water treatment technology in general; physical, chemical & biological processes.

UNIT IV Pollution control for specific pollutants; removal of Cr, Cd, Hg, As, Sb, Pb.

UNIT V Pollution control in selected process industries; Environmental aspects of sponge iron plants, pollutant emissions from alternative iron and steel making processes. Solid waste from coal, steel, non-ferrous industries; different disposal techniques, waste utilization techniques. Pollution control policies and laws.

REFERENCE BOOKS:

1. Air pollution – V. P. Kudesia
2. Pollution control in process industries – S.P. Mahajan
3. Environmental engineering – Pandey and Carney
4. Energy ecology, environment and society – Deswal and Deswal
5. Environment pollution=- V.K. Prabhakar
6. Pollution and Health – P.K. Ray
7. Environmental Pollution control Engineering –Rao

TEACHING METHODOLOGY:

- Explaining the basics of various types of pollution and pollutants
- Using various facts and figures to show the increase in the level of pollutants post industrialization
- Using PPTs at appropriate time to show and compare data and animated video etc.

Chhattisgarh Swami Vivekanand TechnicalUniversity,Bhilai

Branch:	**Metallurgical Engineering**	Semester:	**V**
Subject:	**Iron Making**	Code:	**338553(38)**
Total Theory Periods:	**36**	Total Tutorial Periods:	**12**
No. of class Tests to be conducted:	**2 (Minimum)**	No. of assignments to be submitted:	**2 (Minimum)**
ESE Duration:	**Three Hours**	Maximum Marks in ESE: **80**	Minimum Marks in ESE: **28**

COURSE OBJECTIVES

- To learn the processes of iron making through blast furnaces and other routes.
- To enhance the technical knowledge of the students over metallurgical Thermodynamics and Kinetics
- Apply basic scientific principles for technical problem solving in Iron Making areas to increase Technical Skills

EXPECTED OUTCOME

Blast Furnace is called as the mother in an integrated steel plant. So a good knowledge of iron making is a must for all metallurgists. Students will know the theory and practice of iron making through BF and also the alternative routes of iron making and production of Ferro alloys. They will have an wide range of acceptability after graduation

UNIT I HistoryofIronmakinginIndia. Rawmaterials forironmaking.Availability of ironoresand metallurgicalcoals in India.Coke making. Agglomeration ofiron ore fines;sintering and pelletizing. Propertiesofblast furnaceburden materialsandtheir effect onblast furnaceperformance.

UNIT II Chemical processes in Blast Furnace, Reactions in Tuyere, Hearth Bosh and stack zones. Transfer and distribution of Si and S between metal and slag. Temperature profile inside the furnace. Thermodynamics and equilibrium conditions in a Blast furnace. Stoichiometry and enthalpy balance. Blast furnace aerodynamics.

UNIT III Blast furnace plant layout and operation. Design ofblast furnace and its main accessories; gas cleaning system and stoves and cooling systems. Blastfurnace refractory. Burden charging mechanisms. Irregularities in BF operation and the irremedies. Blowing in and blowing out of BF. Quality control and fuel efficiency in B.F.

UNIT IV Modern trends in Blast furnace practice - production and use of super-fluxs inter, pellets, and cold bonded pellets. Auxiliary fuel injection, High temperature, humidified and oxygen enriched blast, high top pressure. External Desulphurization of hot Metal.

UNIT V Alternate routes of iron making: charcoal blast furnace, direct reduction processes. Applicability and present status of Technology in India. Production of Ferro-alloys. Ferro-alloy industries in India.

TEXT BOOKS:

1. The manufacture of Iron– G.R. Bashforth
2. Iron making and steel making; theory and practice- Ahindra Ghosh and Amit Chatterjee
3. Principles of Blast Furnace iron making–Dr. A. K Biswas
4. Production of ferro-alloys-Rissand Lipnitzky

REFERENCE BOOKS:

1.MakingshapingandTreatingofsteel–US.Stel
2.Physicalchemistry of iron and manufacture steel–Bodsworth C.h and S.Bell
3.The reduction of iron–Boadandy L.V. and S.j.Engell
4.The theory and practice–Blast Furnace ltd.–J.H. Siressearger
5.Blast Furnace Theory–l Practice Strauff

TEACHING METHODOLOGY

- Explaining the basic principles of treatment of iron ores, reactions inside the blast
- Furnace, thermodynamics and aerodynamics. The design features of BFs, advancement in BF technology. Alternative routes of Iron Making by:Lecture, PPT- Presentation, Class Discussions
- Students' self study
- Tutorial Classes
- Interactions with the respective Faculty
- Industry Visit

Chhattisgarh Swami Vivekanand TechnicalUniversity,Bhilai

Branch:	**Metallurgical Engineering**	Semester:	**V**
Subject:	**Mechanical Working Processes**	Code:	**338554(38)**
Total Theory Periods:	**36**	Total Tutorial Periods:	**12**
No. of class Tests to be conducted:	**2 (Minimum)**	No. of assignments to be submitted:	**2 (Minimum)**
ESE Duration:	**Three Hours**	Maximum Marks in ESE: **80**	Minimum Marks in ESE: **28**

COURSE OBJECTIVE

To learn the process of mechanical deformation of metals as well as the different techniques of metal forming.

EXPECTED OUTCOME

Metal forming is the final step in the processing of the metal. The process requires precision and a good combination of theory and practical knowledge. The student will be able to handle any job situation.

UNIT I Fundamental concept of metal forming, plastic behavior, flow stress, yield criteria, shear stress, Von-mises theory classification of metal forming operations on the basis of cold, hot &warm working, effect of variables, speed of deformation, friction, lubricants, metallurgical structures, strain rate, temperature of metal working, heating of steels effect of incorrect heating, rate of heating.

UNIT II Rolling-principle of metal rolling process, theory of longitudinal rolling, simple concept about angle of bite, spread, deformation coefficient, forward and backward slip, relationship between roll diameter and friction angle, specific roll pressure, power requirements.

UNIT III Classification of rolling mills on the basis of roller arrangement, mill lay out and products, rolling mill equipment. Classification of rolled products, blooms billets, slabs, plates, strips, sheets, wire rod etc. importantconsiderationsin roll pass design, Rolling defects.

UNIT IV Forging–Importance and characteristics of forging, fiber structure, open die and closed die forging typical forged products, Diematerials, forging equipments, Hammers and presses, calculation of forging load, selection of press/hammer capacity, special forging processes rotary swaging, roll pressure, horizontal forging, forging defects and their removal.

UNIT V Extrusion Types of variables, defects and typical products. Drawing–Types of drawing, wire drawing, deep-drawing, seamless tube making-various methods. Sheet metal forming- stretching, bending, shearing, trimming, caming, sizing etc. High velocity forming–significance of high velocity forming operations, principles, classification and applications.

TEXT BOOKS*:*

1. MechanicalMetallurgy–Dieter
2. Rolling mill practice–Polukhia
3. Principles of metal working–Dr.SurendraKumar

REFERENCE BOOKS :

1. Theory of plastic working of metals–Masterovsky(mir)
2. Rolling practice–Burtsev
3. Principles of rolling–Chaturvedi
4. RollingMill–ASM
5. IndustrialMetalWorking-Rowe
6. Forging Practice–Kamenschikov

TEACHING METHODOLOGY

Explaining the basic principles of deformation and different techniques of metal forming. In addition to theory classes, students will visit the different industries and mills to have the first hand knowledge of the metal processing.

Chhattisgarh Swami Vivekanand TechnicalUniversity,Bhilai

Branch:	**Metallurgical Engineering**	Semester:	**V**
Subject:	**Non –FerrousExtractionMetallurgy**	Code:	**338555 (38)**
Total Theory Periods:	**36**	Total Tutorial Periods:	**12**
No. of class Tests to be conducted:	**2 (Minimum)**	No. of assignments to be submitted:	**2 (Minimum)**
ESE Duration:	**Three Hours**	Maximum Marks in ESE: **80**	Minimum Marks in ESE: **28**

COURSE OBJECTIVE

Non-ferrous metals are the next to steel in its use and specialized application. Non ferrous extraction is a vast and diverse field. A thorough understanding is required of the processes and technology. The knowledge of the basic processes of ore beneficiation and non-ferrous metal extraction processes is mandatory.

EXPECTED OUTCOME

The graduates will be able to work in any NF industry as well as can develop newer and better processes

UNIT I Discovery of metals and their importance, important landmarks, non-ferrous metals in Indian history, uses of non-ferrous metals. Non-ferrousmetalproductionandconsumption:global and Indian scenario.Sources of nonferrous metals. Sources in land and sea, exploration methods, methods of beneficiation. General methods of orebeneficiation; comminution, classification and concentration, electrostatic, magnetic separations.

UNIT II Principles of metals extraction; Thermodynamic principles, homogeneous and heterogeneous reactions, Ellingham diagrams, kinetic principles, principles of electro-chemistry. Pyro-metallurgy – calcinations, roasting and smelting, Hydrometallurgy – leaching, solvent extraction, ion exchange, precipitation, and electrometallurgy – electrolysis and electro-refining

UNIT III Extraction of metals from oxide sources; Basic approaches and special features of specific extraction processes, Extraction of Magnesium by PIDGEON Process, Aluminum by Bayer process, Hall-Heroult Process, ALCOA Process, TOTH Process, ALCAN Process. Tin; smelting in a reverberatory furnace, pyro-refining of tin.

UNIT IV Extraction of metals from sulphide ores; Pyro-metallurgy and hydro-metallurgy of sulphides, production of metals such as copper, lead, zinc, nickel etc. Extraction of zinc from horizontal and vertical retort processes, imperials melting process, production of other metals by ISP. Zinc from leads lag. Zinc production in India. Extraction of Lead : lead blast furnace; base bullion production. Modern developments in leads melting.

UNIT V Refining processes: Refining of zincby distillation in refluxing units, Refining of lead bullion by Parks process. Electro refining of copper, Nickel, Lead, Tin and Aluminum. Extraction of Precious Metals: Gold, Silver and Platinum. Secondary metals and utilization of Metallurgical Wastes. Environmental issues.

TEXTBOOKS:

- ExtractionofNon-ferrousMetals– HS Ray, R Shridhar and KP Abraham
- Principles of Extractive Metallurgy-T. Rosenquist
- ExtractiveMetallurgyofCopperPargamanpress,1980–A.K.BiswasandW.G.Davenport

TEACHING METHODOLOGY

Explaining the basic principles of treatment of ores, the basic principles of pyro, hydro and electro metallurgy and extraction processes for important Non-Ferrous metals

Chhattisgarh Swami Vivekanand TechnicalUniversity,Bhilai

Branch:	**Metallurgical Engineering**	Semester:	**V**
Subject:	**Phase Diagram &Phase Transformation**	Code:	**338556(38)**
Total Theory Periods:	**48**	Total Tutorial Periods:	**12**
No. of class Tests to be conducted:	**2 (Minimum)**	No. of assignments to be submitted:	**2 (Minimum)**
ESE Duration:	**Three Hours**	Maximum Marks in ESE: **80**	Minimum Marks in ESE: **28**

COURSE OBJECTIVE

To impart the knowledge of Phases, phase transformation, characteristics of different phases and their implication. These are the basics for metal treatment and processing.

EXPECTED OUTCOME

This will help in design and selection of alloys

UNIT I Introduction: Gibb`s phase rule, phases, component & degree of freedom, various types of phase diagram (Unary, Binary phase diagram), determination of phase fraction by using Lever rule, uses of phase diagrams, determination of phase diagrams.

UNIT II Thermodynamics related to phase diagrams-Gibb`s free energy for single and Binary solutions. Variation of free energy with temperature, Ideal and Regular solutions, chemical potential of a solution. Ordered and intermediate phases.

UNIT III Diffusion, Atomic mechanism of diffusion, interstitial & substitutional (self and vacancy) diffusion Fick`s law of diffusions, determination of diffusion coefficient, effect of temperature on diffusion coefficient, Kirkendal effect, Darken's equation, application of diffusion in some metallurgical processes like carburizing & nitriding of steels.

UNIT IV Solidification- introduction to solidification, energetic of solidification, nucleation and growth mechanism, homogeneous and heterogeneous nucleation, growth of solids, different types of interfaces.

UNIT V Interphase interfaces in solids, coherent, semi-coherent & in-coherent interfaces, role of interfacial energy on fully coherent, partially coherent and in-coherent precipitates, interface and diffusion controlled growth.

TEXTBOOKS

- Phase transformation in metal and alloys- David A. Porter, E. Easterling& M. Y. Sherif.
- Physical metallurgy principles- Reed Hill.

METHODOLOGY

- Explaining the basic principles of alloying and phase transformation
- Lecture, PPT- Presentation, Class Discussions
- Students' self study
- Tutorial Classes

Chhattisgarh Swami Vivekanand TechnicalUniversity,Bhilai

Name of Program:	**Bachelor of Engineering**	Semester:	**V**
Branch:	**Metallurgical Engineering**		
Subject:	**TransportPhenomenonLaboratory**	Code:	**338561 (38)**
TotalLab Periods:	**36**	Batch Size:	**30**
Maximum marks in ESE:	**40**	Minimum marks in ESE:	**20**

OBJECTIVE: To determine material and energy flow during various metallurgical processes.
METHODOLOGY: By performing the list of experiments and analyzing the results to get a practical sense of the process.
EXPECTED OUTCOME: students will know the various factors driving the flow of energy and material in different metallurgical processes.

LIST OF EXPERIMENTS:

1. Determination of Heat Transfer in Natural Convection
2. Determination of heat transfer in forced convection.
3. Determination of thermal conductivityof metal Rod.
4. Determination of Parallel flow/counter flow byheat exchanger
5. Determination of thermal radiation bySteffen Boltzmann
6. Determination of thermal conductivityof Insulatingpowder
7. Determination of heat transfer through composite walls.
8. Determination of EmissivitybyEmissivitymeasurement apparatus.
9. Fluid Bed heat transfer unit
10. Determination of Temp. ofdifferent materials at a given time.

LISTOF EQUIPMENTS/MACHINEREQUIRED:

1. Natural convection unit
2. Thermal conductivityunit
3. Heat Exchanger
4. StefanBoltzmann apparatus.
5. Emissivitymeasurement apparatus
6. Brass Tub fitted in a rectangular duct in a vertical fashion
7. Thermocouple
8. Ammeter
9. Voltmeter
10. Voltagestabilizer.

RECOMMENDED BOOKS:

Smith- Chemical EngineeringKinetics, McGraw Hill
Bird, Steward and Light foot-Transport Phenomenon ,JohnWiley

Chhattisgarh Swami Vivekanand TechnicalUniversity,Bhilai

Name of Program:	**Bachelor of Engineering**	Semester:	**V**
Branch:	**Metallurgical Engineering**		
Subject:	**MechanicalWorking ProcessesLaboratory**	Code:	**338562 (38)**
TotalLab Periods:	**36**	Batch Size:	**30**
Maximum marks in ESE:	**40**	Minimum marks in ESE:	**20**

OBJECTIVE: To learn the process of mechanical deformation of metals as well as the different techniques of metal forming.

METHODOLOGY: Explaining the basic principles of deformation and different techniques of metal forming. In addition to theory classes, students will visit the different industries and mills to have the first had knowledge of the metal processing.

EXPECTED OUTCOME: Metal forming is the final step in the processing of the metal. The process requires precision and a good combination of theory and practical knowledge. The student will be able to handle any job situation.

LIST OF EXPERIMENTS:

1. Rollingofmetalstrip
2. Calculationof–Angleofbite,C
   - Changeinlength
   - Changeinwidth
   - Changein thickness
   - Spread
3. Studyofrollpasses
4. Hotrollingofmildsteel.
5. Studyofmicrostructureofrolledproduct& rollingdefects.
6. Study ofvarious rollarrangementsforrolling
7. ComparativestudyofDirectand IndirectExtrusion.
8. Study ofopenandclosedDieforging.
9. Coldwork–annealcycleofcopperbasedalloys.
10. DrawingtheRollingmilllayout.
11. Studyofvariousforgingequipments.
12. CalculationofforgingLoad.
13. SheetMetal

LISTOFEQUIPMENTS/MACHINEREQUIRED

1. Rollingmill
2. Models
3. Charts
4. Tables
5. Drawing
6. VideoClipping(CD)

RECOMMENDEDBOOKS:

1. MetalsHandbook
2. MakingshapingandTreatingofMetals
3. ProductionEngineeringBy Jain

Chhattisgarh Swami Vivekanand TechnicalUniversity,Bhilai

Name of Program:	**Bachelor of Engineering**	Semester:	**V**
Branch:	**Metallurgical Engineering**		
Subject:	**Phase Transformation Laboratory**	Code:	**338563 (38)**
Total Lab Periods:	**36**	Batch Size:	**30**
Maximum marks in ESE:	**40**	Minimum marks in ESE:	**20**

OBJECTIVE

1. introduce students to the basic understanding of the interpretations of iron-carbon diagrams and isothermal transformation diagrams
2. provide students with the skills needed to determine the temperatures to which steel must be heated to cause it to harden
3. Use TTT and CCT diagrams to predict conditions for the heat treatment of steels.
4. Explain how phase transformations control the microstructures of metals and ceramics.

METHODOLOGY

Explaining the basic principles of phase diagrams and heat treatment techniques of materials. In addition to theory classes, students will visit the different industries and mills to have the first had knowledge of the heat treatment and metal forming processes.

EXPECTED OUTCOME

Upon successful completion of this course, the student will be able to:

1. Describe important structural forms of steel and iron
2. interpret an iron-carbon diagram
3. evaluate several industrial isothermal transformation diagrams
4. recognize that different steels have very different isothermal transformation diagrams
5. cite the value of an isothermal transformation diagram and how it can be used;
6. differentiate between the different heat treatment procedures and the structural changes
7. that accompany them
8. identify different structures of alloy;
9. understand the different structural changes that accompany structure modifications

LIST OF EXPERIMENTS

1. Experimental determination of a binary phase diagram
2. Solidification macro/microstructure of some single phase and eutectic alloys
3. Heat Treatment of Steels
4. Solidification Macrostructure of Cast Metals
5. Metallographic sample preparation to study phase changes
6. Microstructure of eutectic systems
7. Study of the Solidification History in Welded Microstructure of Steels
8. Study of pearlite transformation in eutectoid steel
9. Study of the TTT and CCT diagrams
10. Study of the rolling and recrystallisation annealing

LISTOFEQUIPMENTS/MACHINEREQUIRED

1. Microscopes (Optical and Electron Microscopes)
2. Muffle furnace and Induction furnace
3. Tubular furnace
4. Hot and Cold rolling machines
5. Polishing machines
6. Hot mounting press
7. Ultrasonic cleaner

RECOMMENDEDBOOKS

1. Materials Science and Engineering, V. Raghvan
2. Phase Transformation in Metals and Alloys, D. A. Porter & K. E. Easterling
3. Physical Metallurgy, Lakhtin

Chhattisgarh Swami Vivekanand TechnicalUniversity,Bhilai

Name of Program:	**Bachelor of Engineering**	Semester:	**V**
Branch:	**Metallurgical Engineering**		
Subject:	**Iron Making Laboratory**	Code:	**338564 (38)**
TotalLab Periods:	**36**	Batch Size:	**30**
Maximum marks in ESE:	**40**	Minimum marks in ESE:	**20**

OBJECTIVE: To learn the processes iron making through hands on training.

METHODOLOGY: To observe the design features of BFs and other processes by visit to industry, and doing literature survey.

EXPECTED OUTCOME: Students will know the theory and practice of iron making through BF and also the alternative routes of iron making

LIST OF EXPERIMENTS:

1. Study the layout of an integrated steel plant and indicate the role of BF
2. Study the auxiliary equipment in the BF Complex
3. Draw a cross-section of a BF and locate the different reaction zones within.
4. Study the effect of sinter/pellets on the productivity and coke rate in a BF
5. Study the effect of hot blast, humidification, auxiliary fuel injection on the productivity and coke rate in a BF
6. Study the desulfurization process of Hot Metal
7. Study of the alternative routes of iron making
8. Study of DRI process of iron making
9. Mass and heat balance in BF
10. Comparison between DRI and BF process of iron making with respect to economics and fuel efficiency.

TEXTBOOKS:

1. The manufactureofIron– G.R.Bashforth
2. Iron Making and Steel Making; theory and practice- AhindraGhosh and AmitChatterjee
3. PrinciplesofBlastFurnaceiron making–Dr.AKBiswas

REFERENCEBOOKS:

1. MakingshapingandTreatingofSteel–US.Steel
2. Physicalchemistry ofironandmanufacture steel–BodsworthC.h and S.Bell
3. The reductionofiron–Boadandy L.V.andS.j.Engell
4. The theoryandpractice–BlastFurnaceltd.–J.H.Siressearger
5. BlastFurnaceTheory–lPracticeStrauff

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of Program:	**Bachelor of Engineering**		
Branch:	**Common to All Branches**	Semester:	**V**
Subject:	**Personality Development**	Code:	**300565 (46)**
No. of Lectures:	**2/Week**	Tutorial Period:	**NIL**
Total Marks in ESE:	**NIL**	Marks in TA:	**20**
Minimum number of Class Tests to be conducted:	**Two**		

Objective: The course is introduced to develop one's outer and inner personality tremendously and enrich the abilities to enable one to meet the challenges associated with different job levels. Personality Development is essential for overall development of an individual apart from gaining technical knowledge in the subject.

Course Objectives

Upon completion of this course, the student shall be able

- To understand the concept of personality and image;
- To develop leadership, listening and interacting skills;
- To develop attitudinal changes;
- To develop decision-making qualities; and
- To communication skill.

UNIT I **Personality concepts:** What is Personality – its physical and psychic aspects. How to develop a positive self-image.How to aim at Excellence.How to apply the cosmic laws that govern life and personality.How to improve Memory – How to develop successful learning skills.How to develop and effectively use one's creative power.How to apply the individual MOTIVATORS that make you a self-power personality.

UNIT II **Interpersonal Skills:** Leadership: Leaders who make a difference, Leadership: your idea, What do we know about leadership? If you are serious about Excellence. Concepts of leadership, Two important keys to effective leadership, Principles of leadership, Factors of leadership, Attributes.Listening: Listening skills, How to listen, Saying a lot- just by listening, The words and the music, How to talk to a disturbed person, Listening and sometimes challenging.How to win friends and influence people, How to get along with others.How to develop art of convincing others. How can one make the difference.How to deal with others particularly elders.Conflicts and cooperation.

UNIT III **Attitudinal Changes: Meaning of attitude,** benefits of positive attitudes, How to develop the habit of positive thinking.

Negative attitude and wining: What is FEAR and how to win it.How to win loneliness.How to win over FAILURE.How to win over PAIN.How to win over one's ANGER and others anger. What is stress and how to cope up with it? The art of self-motivation.How to acquire mental well-being.How to acquire physical well-being.

UNIT IV **Decision Making:** How to make your own LUCK. How to plan goals/objectives and action plan to achieve them.How to make RIGHT DECISION and overcome problems.How to make a Decision. Decision making: A question of style. Which style, when? People decisions: The key decisions. What do we know about group decision making?General aids towards improving group decision making.

UNIT V **Communication Skills: Public Speaking:** Importance of Public speaking for professionals. The art of Speaking - Forget the fear of presentation, Symptoms of stage fear, Main reason for speech failure, Stop failures by acquiring Information; Preparation & designing of speech, Skills to impress in public speaking & Conversation, Use of presentation aids & media.

Study & Examination: How to tackle examination, How to develop successful study skills.

Group discussions: Purpose of GD, What factors contribute to group worthiness, Roles to be played in GD.

Course Outcomes:

- The students will be able to develop inner and outer personality exposure;
- The students will be able to develop effective leadership qualities and interacting skills;
- The students will be able to develop positive attitude, motivating skills and develop winning philosophies;
- The students will be able to develop decision-making tools; and
- The students will be able to develop group presentation, public speaking and impressive conversation.

Text Books:

1. Basic Managerial Skills for all by E. H. McGrawth, prentice Hall India Pvt. Ltd., 2006
2. Basic Employability Skills by P. B. Deshmukh, BSP Books Pvt. Ltd., Hyderabad, 2014

Reference Books:

1. How to Develop a Pleasing Personality by AtulJohn Rego, Better Yourself Books, Mumbai, 2000
2. How to Succeed by Brain Adams, Better Yourself Books, Mumbai, 1969
3. Personality: Classic Theories & Modern Research; Friedman ; Pearson Education, 2006
4. How to Win Friends and Influence People by Dale Carnigie, A. H. Wheeler 2006