

STATE COUNCIL FOR TECHNICAL EDUCATION AND VOCATIONAL TRAINING, ODISHA

TEACHING AND EVALUATION SCHEME FOR 3rd Semester Metallurgy (wef 2019-20)

Subject Number	Subject Code	Subject	Periods/week			Evaluation Scheme			
			L	T	P	Internal Assessment/ Sessional:	End Sem Exams	Exams (Hours)	Total
Theory									
Th.1		Elementary mechanical Engg.	4		-	20	80	3	100
Th.2		Mineral Processing	4		-	20	80	3	100
Th.3		Fuels & Refractories	4		-	20	80	3	100
Th.4		Ferrous metallurgy I	4			20	80	3	100
Th.5		Environmental studies	4			20	80	3	100
		<i>Total</i>	20			100	400	-	500
Practical									
Pr.1		Mineral Processing	-	-	6	25	75		
Pr.2		Fuel testing & Chemical Analysis	-	-	6	25	75		
Pr.3		Workshop	-	-	4	50			
		Student Centred Activities(SCA)		-	3	-	-	-	-
		<i>Total</i>	-	-	19	100	150	-	250
		Grand Total	20	-	39	200	550	-	750

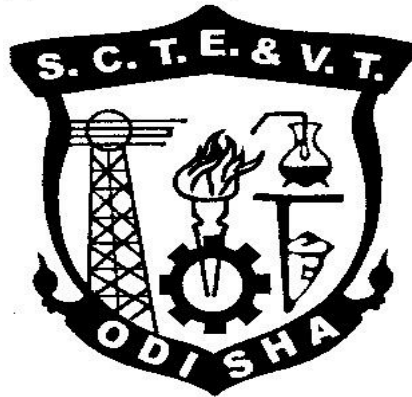
Abbreviations: L-Lecturer, T-Tutorial, P-Practical . Each class is of minimum 55 minutes duration

Minimum Pass Mark in each Theory subject is 35% and in each Practical subject is 50% and in Aggregate is 40%

SCA shall comprise of Extension Lectures/ Personality Development/ Environmental issues /Quiz /Hobbies/ Field visits/ cultural activities/Library studies/Classes on MOOCS/SWAYAM etc., Seminar and SCA shall be conducted in a section.

There shall be 1 Internal Assessment done for each of the Theory Subject. Sessional: Marks shall be total of the performance of individual different jobs/ experiments in a subject throughout the semester

CURRICULLUM OF 3RD SEMESTER
For
DIPLOMA IN METTALURGY ENGINEERING
(Effective FROM 2019-20 Sessions)



**STATE COUNCIL FOR TECHNICAL
EDUCATION & VOCATIONAL TRAINING,
ODISHA, BHUBANESWAR**

**THIRD SEMESTER METALLURGICAL ENGINEERING
ELEMENTARY MECHANICAL ENGINEERING (Th-01)
(COMMON TO METALLURGY & CERAMIC)**

Name of the Course: Diploma in Metallurgical Engineering			
Course code:		Semester	3 rd
Total Period:	60	Examination :	3 hrs
Theory periods:	4P / week	Internal Assessment:	20
Maximum marks:	100	End Semester Examination ::	80

A. RATIONALE:

Metallurgical Engineering is intimately related with certain areas of mechanical engineering. It is therefore, essential for a metallurgical engineer to have basic knowledge of mechanical engineering.

B. OBJECTIVES:

After the completion of this subject students will have knowledge about:

1. Shear Force, bending moment and stresses on different types of load.
2. Links kinematic chain and different types of mechanism.
3. Working of belt, ropes and chain drives, brakes and dynamomentans.
4. Basic principles of thermodynamics and steam tables.
5. Functions and types of boiler and turbines with idea on steam condensers.
6. IC engine, types of I.C.engines and calculation of power and efficiency.
7. Refrigeration and Air Conditioning,
8. Different types of conventional machine tools with idea on CNC milling and Turning.

C. TOPIC WISE DISTRIBUTION OF PERIODS		
SL.NO.	TOPIC	PERIODS
1	Shear Force and Bending Moment	10
2	Machine and Mechanism	08
3	Belt, Rope and Chain drives, Brakes and Bearings	08
4	Basic Principles of Thermodynamics	06
5	Boilers and Turbines	10
6	Internal Combustion Engines	06
7	Refrigeration and Air-Conditioning	06
8	Machine Tools	06
	TOTAL	60

D. COURSE CONTENTS (in terms of specific objectives):

1.0 Shear Force and Bending Moment

- 1.1 Define shear force and bending moment
- 1.2 Construct shear force and bending moment diagram of cantilevers, simple supported beam with point load and uniformly distributed load.
- 1.3 Determine stress of loaded beams

2.0 Machine and Mechanism

- 2.1 Define machine, mechanism, kinematics, link, kinematics pair, kinematics chain
- 2.2 Illustrate four – bar linkage, crank – connecting rod, quick return mechanism
- 2.3 Understand function of a cam and cam follower

3.0 Belt, Rope and Chain drives, Brakes and Bearings

- 3.1 Determine the length of open belt drive
- 3.2 Determine the ratio of tensions and power transmitted by belt drive
- 3.3 Discuss advantage of rope and chain drive
- 3.4 State working principle of simple brake and dynamo meters
- 3.5 Define and classify bearings (bush and anti-friction)

4.0 Basic Principles of Thermodynamics

- 4.1 Define heat and work and derive inter – relationship
- 4.2 Determine work done by compression and expansion of gases
- 4.3 Explain properties of steam (sensible, latent heat & dryness fraction)
- 4.4 Discuss use of steam tables.

5.0 Boilers and Turbines

- 5.1 Explain the functions of the boiler
- 5.2 Define fire tube, water tube, boiler.
- 5.3 Define and classify steam turbines (impulse and reaction type and steam condensers)

6.0 Internal Combustion Engines

- 6.1 Define and classify internal combustion (I.C.) engine
- 6.2 Explain Otto and Diesel cycles
- 6.3 Explain and compare 2 stroke and 4 stroke and I.C. engine
- 6.4 Define Indicate power, brake power and mech, efficient.

7.0 Refrigeration and Air-Conditioning

- 7.1 Define Refrigeration and Air – conditioning and state various application
- 7.2 Explain simple vapour compression refrigeration system
- 7.3 State types of refrigerants and explain their properties
- 7.4 Describe the basic concept of air – conditioning with reference to a room air conditioner

8.0 Machine Tools

- 8.1 Define machine tools
- 8.2 Describe different machine tools and their functions (lathe, drill, shaper, milling machine and grinding machine)
Brief idea on CNC milling and CNC Turning

Portion for Internal Assessments:

Topics: - 1, 2&3

Learning Resources:			
Sl.No	Title of the Book	Name of Authors	Name of Publisher
1.	Strength of material	R.S.Khurmi	S.Chand Publisher
2.	Engineering Thermodynamics	P.L.Ballanney	Khanna Publisher
3.	Refrigeration and Air Conditioning	R.S.Khurmi	S.Chand Publisher
4.	Theory of Machine	R.S.Khurmi	S.Chand Publisher
5.	Basic Mechanical Engineering	Dr.N.R.Banapurma Mr.V.S.Yaliwal	Vikas Publisher

MINERAL PROCESSING (Th-02)

Name of the Course: Diploma in Metallurgical Engineering			
Course code:		Semester	3 rd
Total Period:	60	Examination :	3 hrs
Theory periods:	4P / week	Internal Assessment:	20
Maximum marks:	100	End Semester Examination ::	80

A.RATIONALE:

Ores and minerals are the sources of all metals and alloys. Ores and minerals, as available in nature are mixed with various other substances and of odd sizes which are not suitable for various extraction processes. Useable quality and size of ores / minerals are obtained by different process called mineral dressing. Thus this subject is of great important in the study of metallurgy.

B.OBJECTIVES:

After the completion of this subject students will have knowledge about:

1. Ores and minerals of metals and their resources.
2. Size reduction operation of the minerals
3. Various sizing and screening processes.
4. Concentration methods based on the different physical and chemical / surface properties of ores.

C.TOPIC WISE DISTRIBUTION OF PERIODS		
SL.NO.	TOPIC	PERIODS
1	Various Mineral Resources in India	03
2	Crushing	10
3	Grinding	07
4	Laboratory Sizing	06
5	Industrial Screening Classification	06
6	Gravity Concentration	08
7	Heavy Media Separation	06
8	Flotation	08
9	Magnetic and Electrostatic Separators	06
	TOTAL	60

D.COURSE CONTENT (in terms of specific objectives):

1.0 Various mineral resources of India

2.0 Unit Operations : Ore dressing :

- 2.1 Distinction between Mineral and Ore
- 2.2 Explain the scope and objective of Ore dressing
- 2.3 Comminution and liberation
- 2.4 Different physical and chemical property of ore with their application to mineral dressing

3.0 Crushings :

- 3.1 Describe crushing operations
- 3.2 Explain the type of crushers: Blake and Dodge jaw Crushers
- 3.3 Describe capacity and reduction ratio of crusher
- 3.4 Explain angle of nip of a crusher
- 3.5 Explain in details gyratory and roll crushers
- 3.6 Explain the principle of operation of gyratory and roll crushers

4.0 Grinding:

- 4.1 Classify different types of grinding equipment
- 4.2 Explain the ball mill operations
- 4.3 State the difference between open circuit and close circuit grinding
- 4.4 State the difference between dry grinding and wet grinding

5.0 Laboratory Sizing Technique :

- 5.1 Explain the methods of size analysis
- 5.2 Describe different types of standard screens with screening techniques
- 5.3 Explain in details Rotap sieve shaker

6.0 Industrial Screening :

- 6.1 Explain the principle of screening
- 6.2 Classify types of screening
- 6.3 Explain the effectiveness, capacity, efficiency of Industrial screens
- 6.4 Explain different types of classifiers and their applications

7.0 Gravity Concentration :

- 7.1 Describe the general principles of flowing film concentration
- 7.2 Describe in details the operations and application of wilfley table
- 7.3 Define jigging
- 7.4 Describe the factors affecting stratification in jigs
- 7.5 Explain the types of jigs and their uses

8.0 Heavy Media Separations :

- 8.1 Explain the fundamental principle of heavy media separations
- 8.2 Explain the different industrial process using heavy liquid and heavy suspensions, Du - Pont process, chance process

9.0 Flotation :

- 9.1 Define are froth and skin flotation
- 9.2 Explain the elementary principle of froth flotation
- 9.3 Explain the practical utility of frother, collector, modifier, activators, depressant (without physic – chemical Principle)
- 9.4 Describe the application with practical examples of froth flotation process
- 9.5 Describe different types of flotation cells

10.0 Magnetic & Electrostatic Separator :

- 10.1 Explain the principles of magnetic and Electrostatic separator with their application to mineral dressing

Portion for Internal Assessment:

Topics:-1, 2, 3 & 4

Learning Resources:			
Sl.No	Title of the Book	Name of Authors	Name of Publisher
1.	Principle of Mineral Dressing	Gaudin A.M.	Tata Mc Graw-Hill
2.	Non-Ferrous Metallurgy	H.S.Roy Sridhar & Abraham	EWP
3.	Hand book of Mineral/Dressing Ores & Minearls	A.F.Taggart	Willey Handbook Series
4.	Minearl Processing Technology	B.A.Wills B.H.Butterworth	Heineman
5.	Fundamentals of Mineral Dressing	C.Mohapatra	JJTP

FUELS AND REFRACTORIES (TH - 03)

Name of the Course: Diploma in Metallurgical Engineering			
Course code:		Semester	3 rd
Total Period:	60	Examination :	3 hrs
Theory periods:	4P / week	Internal Assessment:	20
Maximum marks:	100	End Semester Examination ::	80

A. RATIONALE:

For different metallurgical processes starting from extraction of metals from ores down to shaping and treating of metals, heating is an essential operation for which fuel is used. To allow all these thermal processes in a furnace, use of refractory is a must to contain heat and protect the furnace structure. Study of fuels and refractories is thus a very important topic in Metallurgy.

B. OBJECTIVES:

After completion of this subject students will have knowledge about

1. Solid liquid and gases fuels.
2. Various manufacturing processes and uses of solid liquid and gaseous fuels.
3. Testing of various fuels for their suitability.
4. About combustion processes.
5. Various refractories , their type and use.
6. Manufacturing of various refractories.

C.TOPIC WISE DISTRIBUTION OF PERIODS		
SL.NO.	TOPIC	PERIODS
1	Fuels	04
2	Solid Fuels	12
3	Liquid Fuels	10
4	Gaseous Fuels	10
5	Combustion	08
6	Refractories	08
7	Special Refractories	03
8	Selection of Refractories	05
	TOTAL	60

D. COURSE CONTENT (in terms of specific objectives):

1.0 Fuels :

- 1.1 Define the Fuel
- 1.2 Classify the types of fuel
- 1.3 State the importance of Solid, Liquid and Gaseous fuels
- 1.4 Describe different fuels and resources of india

2.0 Solid Fuels :

2.1 COAL :

- 2.1.1 Explain the origin of coal
- 2.1.2 State the composition of coal
- 2.1.3 Discuss the characteristics and significance of constituents
- 2.1.4 Distinguish between proximate and ultimate analysis
- 2.1.5 Define the calorific value of coal
- 2.1.6 Describe coking properties and swelling index of coal
- 2.1.7 Discuss the criteria of selection of metallurgical coal.

2.2 COKE :

- 2.1.1 Discuss the scope and objectives of carbonization of coal
- 2.1.2 Explain the carbonization of coal
- 2.1.3 Differentiate between high temperature carbonization and low temperature carbonization
- 2.1.4 State the merits and demerits of H.T.C and L.T.C
- 2.1.5 Discuss different tests carried out for coke (Shatter and Micum index)

3.0 Liquid Fuels

- 3.1.1 Explain origin and constitution of petroleum
- 3.1.2 Discuss the properties of petroleum products
- 3.1.3 Discuss the distillation process of crude petroleum
- 3.1.4 Explain the production and uses of coal tar.

3.1 Testing of liquid Fuels:

- 3.1.1 Define specific gravity, viscosity, flash point, cloud point & pour point, aniline point, octane number and cetane number.
- 3.1.2. Discuss the methods of testing of following properties:
Specific gravity, viscosity, flash point, cloud point and pour point

4.0 Gaseous Fuels

Explain the production and utilization of following gaseous fuels:

Methane, water gas, producer gas, carbureted water gas, coke oven gas, blast furnace gas, natural gas, mixed gas.

5.0 Combustion

- 5.1 Discuss the elementary principle of combustion, Hess's law of constant heat summation, Kirchoff's law.
- 5.2 Work out simple combustion calculation.

6.0 Refractories :

- 6.1 Define and Classify Refractories
- 6.2 Explain the desirable properties of Refractories in details
- 6.3 Discuss the raw – materials, methods of manufacturing and properties of silica, fire clay, magnesia, dolomite, chrome magnesite, graphite and magnesia carbon bricks.

1. Special Refractories

Discuss about the special refractories like high alumina, mullite, SIC, Zirconia

2. Give criteria for selection and types of refractories selected for blast furnace, L.D., open hearth, arc furnace, ladle, soaking pit, coke oven, reheating furnaces, copper smelting flash and reverberatory furnaces.

Portion for Internal Assessment:

Topics: - 1,2 &3

Learning Resources:			
Sl.No	Title of the Book	Name of Authors	Name of Publisher
1.	Refractories	Cheisty M.L.Mishra	PHI
2.	Fuels & Combustion	Samir Sankar	Orient Longman
3.	Fuels	Himus	L.HILL
4.	Elements of fuels, Furnaces & Refractories	R.C.Gupta	PHI

FERROUS METALLURGY - I (TH-04)

Name of the Course: Diploma in Metallurgical Engineering			
Course code:		Semester	3 rd
Total Period:	60	Examination :	3 hrs
Theory periods:	4P / week	Internal Assessment:	20
Maximum marks:	100	End Semester Examination ::	80

A. RATIONALE:

Pig Iron is by far the most important and maximum used engineering material. Therefore, ferrous metallurgy is one of the most important subjects in steel and cast iron under metallurgical engineering studies.

B. OBJECTIVES:

After completion of this subject student will have idea about

1. Raw materials require for iron making and their quality requirements.
2. Bourden preparation
3. Principle of iron making.
4. Different furnaces and accessories.
5. Irregularities and their remedies during blast furnaces operation,

C. TOPIC WISE DISTRIBUTION OF PERIODS		
SL.NO.	TOPIC	PERIODS
1	Raw Materials for iron making	04
2	Quality requirements of raw materials	08
3	Blast Furnace Fuels	08
4	Blast Furnace operations	08
5	Blast Furnace accessories	08
6	Blast Furnace irregularities and blast furnace operational problems	08
7	Chemistry of blast furnace operation & charge calculation	08
8	Modern development of blast furnace operation	08
	TOTAL	60

D. COURSE CONTENTS (in terms of specific objectives):

1.0 Raw Materials for Iron Making

- 1.1 Different Raw Materials and their functions
- 1.2 Deposits of iron ores flux and coal in india with particulars reference to Odisha

2.0 Quality requirements of raw materials

- 2.1 Different types of iron ores
- 2.2 Composition and characteristics of raw materials.
- 2.3 Evaluation of iron ores.
- 2.4 Metallurgical coal
- 2.5 Difference between coal and coke
- 2.6 Required properties of coke for making iron
- 2.7 Flux and its types
- 2.8 Evaluation of Flux (available base & basicity)

3.0 Burden Preparation

- 4.1 Quality of burden (physical & chemical properties)
- 4.2 Different types of agglomeration required for burden preparation for blast furnace

4.0 Blast Furnace Fuel :

- 4.1 Function of coke
- 4.2 Quality requirement of coke
- 4.3 Preparation of B.F. fuel in India
- 4.4 Auxiliary fuels
- 4.5 Fuel Injection
- 4.6 Factors affecting fuel consumption in blast furnace

5.0 Blast furnace Operation

- 5.1 Charging methods and process
- 5.2 Blowing in
- 5.3 Drying
- 5.4 Filling
- 5.5 Blowing out
- 5.6 Banking in
- 5.7 Blowing down
- 5.8 Tapping
- 5.9 Fanning
- 5.10 Back draughting
- 5.11 Disposal of slags
- 5.12 Slags granulation & their utilization

6.0 Blast furnace Accessories :

- 6.1 Blast furnace refractories
- 6.2 Stack lining
- 6.3 Hearth lining
- 6.4 Hearth walls
- 6.5 Bosh lining
- 6.6 Blast furnace cooling arrangement
- 6.7 Shaft coolers
- 6.8 Hearth & bosh coolers
- 6.9 Tap holes and top hole drilling machine
- 6.10 Cast house
- 6.11 Tuyeres assembly
- 6.12 Raw materials section
- 6.13 Charge hosting appliances
- 6.14 Top charging system
- 6.15 Blowers, boilers, pumps
- 6.16 Gas cleaning plant
- 6.17 Blast furnace stoves

7.0 Blast Furnace irregularities and Remedies :

- 7.1 Hanging
- 7.2 Scaffolding
- 7.3 Slip
- 7.4 Chilled hearth
- 7.5 Pillaring
- 7.6 Break out
- 7.7 Chocking of gas off take
- 7.8 Flooding and coke ejection through tap hole
- 7.9 Leaking tuyers tap holes and coolers
- 7.10 Channeling

8.0 Chemistry of Blast Furnace operation :

- 8.1 Blast furnace profile
- 8.2 Thermal, physical and chemical profile
- 8.3 Physical chemistry of blast furnace process
- 8.4 Reactions in tuyere zone
- 8.5 Reaction in stack
- 8.6 Reaction in bosh
- 8.7 Reaction in hearth
- 8.8 Efficiency of B. F. process
- 8.9 Direct & indirect reduction
- 8.10 Silicon & sulphur reaction

8.11 Burden calculation for B/F operation

9.0 Modern Development of Blast furnace operation

9.1 Bell less charging

9.2 High top pressure operation

9.3 Humidification & oxygen enrichment of blast

9.4 External disiliconisation

9.5 desulphurization

Portion for Internal Assessments:-

Topics:- 1,2,3& 4

Learning Resources:			
Sl.No	Title of the Book	Name of Authors	Name of Publisher
1.	Iron & Steel	Basforth Vol- I	Chapman & Hall
2.	Iron making	Tupkaray R.H.	Khanna Publication
3.	Iron & Steel Making	A.K.Biswal	SBA Publication
4.	An Introduction to physical chemistry of iron & steel making	Ward-Hodder	Stoughton in education
5.	Blast Furnace Iron Making	A.K.Biswas	SBA Publisher.

ENVIRONMENTAL STUDIES (TH-05)

(Common to All Branches)

Name of the Course: Diploma in Metallurgical Engineering			
Course code:		Semester	3 rd
Total Period:	60	Examination :	3 hrs
Theory periods:	4P / week	Internal Assessment:	20
Maximum marks:	100	End Semester Examination	80

A. Rationale:

Due to various aspects of human developments including the demand of different kinds of technological innovations, most people have been forgetting that, the Environment in which they are living is to be maintained under various living standards for the preservation of better health. The degradation of environment due to industrial growth is very much alarming due to environmental pollution beyond permissible limits in respect of air, water industrial waste, noise etc. Therefore, the subject of Environmental Studies to be learnt by every student in order to take care of the environmental aspect in each and every activity in the best possible manner.

B. OBJECTIVES:

After completion of study of environmental studies, the student will be able to:

1. Gather adequate knowledge of different pollutants, their sources and shall be aware of solid waste management systems and hazardous waste and their effects.
2. Develop awareness towards preservation of environment.

C. TOPIC WISE DISTRIBUTION OF PERIODS		
SL.NO.	TOPIC	PERIODS
1	The Multidisciplinary nature of environmental studies	04
2	Natural Resources	10
3	Systems	08
4	Biodiversity and it's Conservation	08
5	Environmental Pollution.	12
6	Social issues and the Environment	10
7	Human population and the environment	08
	TOTAL	60

Unit 1: The Multidisciplinary nature of environmental studies

Definition, scope and importance, Need for public awareness.

Unit 2: Natural Resources

Renewable and non renewable resources:

- a) Natural resources and associated problems.
 - Forest resources: Use and over-exploitation, deforestation, case studies, Timber extraction mining, dams and their effects on forests and tribal people.
 - Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems.
 - Mineral Resources: Use and exploitation, environmental effects of extracting and using mineral resources.
 - Food Resources: World food problems, changes caused by agriculture and over grazing, effects of modern agriculture, fertilizers- pesticides problems, water logging, salinity, .
 - Energy Resources: Growing energy need, renewable and non-renewable energy sources, use of alternate energy sources, case studies.
 - Land Resources: Land as a resource, land degradation, man induces landslides, soil erosion, and desertification.
- b) Role of individual in conservation of natural resources.
- c) Equitable use of resources for sustainable life styles.

Unit 3: Systems

- Concept of an eco system.
- Structure and function of an eco system.
- Producers, consumers, decomposers.
- Energy flow in the eco systems.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following eco system:
 - Forest ecosystem:
 - Aquatic eco systems (ponds, streams, lakes, rivers, oceans, estuaries).

Unit 4: Biodiversity and it's Conservation

- Introduction-Definition: genetics, species and ecosystem diversity.
- Biogeographically classification of India.
- Value of biodiversity: consumptive use, productive use, social ethical, aesthetic and optin values.
- Biodiversity at global, national and local level.
- Threats to biodiversity: Habitats loss, poaching of wild life, man wildlife conflicts.

Unit 5: Environmental Pollution.

Definition Causes, effects and control measures of:

- a) Air pollution.
- b) Water pollution.
- c) Soil pollution
- d) Marine pollution
- e) Noise pollution.
- f) Thermal pollution
- g) Nuclear hazards.

Solid waste Management: Causes, effects and control measures of urban and industrial wastes.

Role of an individual in prevention of pollution.

Disaster management: Floods, earth quake, cyclone and landslides.

Unit 6: Social issues and the Environment

- Form unsustainable to sustainable development.
- Urban problems related to energy.
- Water conservation, rain water harvesting, water shed management.
- Resettlement and rehabilitation of people; its problems and concern.
- Environmental ethics: issue and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies.
- Air (prevention and control of pollution) Act.
- Water (prevention and control of pollution) Act.
- Public awareness.

Unit 7: Human population and the environment

- Population growth and variation among nations.
- Population explosion- family welfare program.

- Environment and human health.
- Human rights.
- Value education
- Role of information technology in environment and human health.

Syllabus coverage upto I.A

Units 1, 2, 3

Learning Resources:			
Sl.No	Title of the Book	Name of Authors	Name of Publisher
1.	Textbook of Environmental studies	Erach Bharucha	#UGC
2.	Fundamental concepts in Environmental Studies	D.D. Mishra	S.Chand&Co-Ltd
3.	Text book of Environmental Studies	K.Raghavan Nambiar	SCITECH Publication Pvt. Ltd
4.	Environmental Engineering	V.M.Domkundwar	Dhanpat Rai & Co

MINERAL PROCESSING LABROTORY

Name of the Course: Diploma in Metallurgical Engineering			
Course code:		Semester	3 rd
Total Period:	90	Examination :	3 hrs
Theory periods:	6P / week	Sessional	25
Maximum marks:	100	End Semester Examination ::	75

(Students are required to perfoform atleast 5 experiments)

11.1 **Crushing:**

- (i) Reduction Ratio
- (ii) Determination of capacity

11.2 **Grinding:**

- (i) Grinding Index
- (ii) Performance of Ball Mill

11.3 Screening & size analysis

11.4 jigging

11.5 Tabling

11.6 Flotation

11.7 Magnetic separation

11.8 Electrostatic separation

Experiments to be done in the laboratory will be decided by the teacher.

Sl.No	Title of the Book	Name of Authors	Name of Publisher
1	Modern Ore Testing	K.K.Krishnamurthy	Khanna publisher
2	Principle of Minearl Dressing	Gaudin A.M.	Tata MC Graw - Hill

FUEL TESTING & CHEMICAL ANALYSIS LAB

Name of the Course: Diploma in Metallurgical Engineering			
Course code:		Semester	3 rd
Total Period:	90	Examination :	3 hrs
Theory periods:	6P / week	Sessional	25
Maximum marks:	100	End Semester Examination ::	75

(Students are required to perform at least five experiments)

1. Proximate analysis of coal
2. Determination of flash point and fire point
3. Determination of Fe in iron ore
4. Determination of Mn in manganese ore
5. Determination of Calcium, Magnesium in Dolomite
6. Determination of Cu, Zn in Brass
7. Determination of Chromium in Chromite ore

WORKSHOP PRACTICE – II

Name of the Course: Diploma in Metallurgical Engineering			
Course code:		Semester	3 rd
Total Period:	60	Examination :	3 hrs
Theory periods:	4P / week	Sessional	50
Maximum marks:	50	End Semester Examination ::	80

1.0 MACHINE SHOP

- 1.1 Shop talk on different types of machine tools, their functions, different tools used and general safety precautions to be observed.
- 1.2 Study a centre lathe
- 1.3 Operate a centre lathe on a cylindrical ob and perform following operations like plain turning, taper turning, facing, parting
- 1.4 Operate a drill machine to perform drilling and counter boring operation on a job
- 1.5 Observe milling, shaping and grinding operations during demonstration at the shop floor

2.0 FOUNDRY SHOP

- 2.1 Prepare a simple wooden pattern
- 2.2 Make a green sand mould using above pattern

3.0 WELDING SHOP

- 3.1 Observe demonstration of different type of welding methods and TIG & MIG welding

SI.No	Title of the Book	Name of Authors	Name of Publisher
1	Workshop Technology - II	Hazra & Choudhury	Media Promoters Publisher
2	Advance welding Technology	Dr.Ali Hasan Dr.Islam Nawaz	SCITECH Publisher.