Scheme of Teaching and Examination for

5 th Semester of 3 Years Diploma in Metallurgy Engineering.

Duration of Semester : **14 Weeks**

Maximum Student Contact Hours : **36 Hrs**

Total Marks : **800**

Effective from: 2017 -18 Session

Sl. No.	Name of Subject	Subject Code	Subject	Teaching Scheme			Examination Scheme					
				L	T	P	Hours of Exam	Full Marks of Subject	Final Exam / committee marks	Internal Assessment	Pass Marks Final / Ext. Exam	Pass Marks in Subjects
1.	Material Management & Quality control	MET 503	Theory	3		-	3	100	80	20	26	40
2.	Steel Making	MET 504	Theory	3	-	-	3	100	80	20	26	40
3.	Heat Treatment Technology	MET 505	Theory	3	-	-	3	100	80	20	26	40
4.	Mineral Dressing	MET 506	Theory	3	-	-	3	100	80	20	26	40
5.	Elective I	MET 507/508/509	Theory	3	-	-	3	100	80	20	26	40
6.	Heat Treatment Technology Lab	MET 510	Practical	-	-	2	4	50	40	10	-	20
7.	Mineral Dressing Lab	MET 511	Practical	-	-	2	4	50	40	10	-	20
8.	Elective I lab	MET 512/513/514	Sessional	-	-	2	4	50	30	20	-	25
9.	Metallurgical Design	MET 515	Sessional	-	-	2	-	50	30	20	-	25
10	Inplant Training	502	Sessional	-	-		-	50	30	20	-	25
11.	DLS	501	Sessional	-	-	4	-	50	30	20	-	25
	Total Hours of Teaching per week :			**15**		**12**						

Elective I (Corrosion- MET 507/ Composite Materials- MET 508/ Coating Technology- MET 509)

Total Marks : Theory : Practical : Sessional :

L : Lecture, T : Tutorial P : Practical

Note: 1. Period of Class hours should be of 1 hrs duration as per AICTE norms.

2. Remaining Hrs every week has been marked for students for Library and Student Centered Activities.

3. Drawing / Graphics / Practical / Sessional examinations will be held at parent institution.

4. Board will depute examiner for Practical examination.

5. Regarding sessional examination the parent institution will form a three member committee and this committee will examine the sessional records and hold viva of the examinee for 60 % marks allotted to the subject. Marks for remaining 40 % will be provided by the Faculty concerned on the basis of evaluation of each job / work throughout the semester.

6. In plant training of 04 weeks duration to be undertaken after 4th semester Exam and before start of 5th semester classes.

Subject : Material Management & Quality Control
Subject Code : MET503
Hours : 42
Full Marks : 80+20=100

Contents:-

1. Quality control &Inspection; (Hrs-12)
   Statistical quality control, Mean, Median and Mode, frequency distribution standard deviation use of control chart, principle of measurement ISI specification, British standard and US specification

2. Quality assurance: (08 Hrs)
   Definition, QA and QC, QAD as a separate department, process parameter of SMS and rolling/forging i.e working processes, Material inspection, sampling and chemical analyses of incoming materials and to judge metallic content and other traces present

3. Material management : (Hrs-08)
   Importance of materials handling and management purchase department and its role procurement of materials for further processing. Visual inspection and proper sampling for chemical analyses

4. Inventory control, ordering process materials identification, material storage facility, planning and control (Hrs-08)

5. Concept of international standards: definition and meaning of ISO 9000, TQM, ISO 9001, 9002, 9003 and 9004 complete procedural detail of ISO 9000, introduction of ISO 14000 series. (Hrs-06)

Books

1. Introduction to Material Management by J R Tony Anold
2. Material Management : An Integrated Approach by Prem Vrat
3. Integrated Material Management by Price & Renold

Subject : Steel Making
Subject Code : MET504
Full Marks : 80+20= 100
Hours : 42

Contents:-

1. Introduction and history of Steel Making, definition of steel, difference between iron & steel, classification of Steels, Based on carbon content and percentage of alloying elements, Raw materials for steel making, Bassemer process, open heart process, Thomos Process, basic Steel making, electric steel making. 8 Hrs

2. Modern Steel making process, special emphasis on LD process, oxegen blowing, oxegen lance design, Top & Bottom blown process, 8 Hrs

3. Inclusion in Steel, sources of inclusion, classification, influence of non metallic inclusion, on properties of steel, inclusion control. 10 Hrs

4. Vacuum degassing of steel, principle of degassing, Sievert's law, Degassing process, Stream degassing, ladle to ladle degassing. 4 Hrs

5. Continuous casting of steel : Principle merits & demerits of continuous casting, application of continuous casting process, advantages over ingot casting. 6 Hrs

6. Secondary Steel making process : Synthetic slag refining, decarboration technique, AOD, BOD, ESR & VAR process, Ladle furnace, merits of secondary steel making. 6 Hrs

Books
Introduction to Steel Making by R H Tupkari
Steel Making by V Kudrin
Steel Making by Basforth

Subject : Heat Treatment Technology
Subject Code : MET505
Hours : 42
Full Marks : 80+20= 100

Contents:-

1. Introduction & General aspects of Heat Treatment : Principle of Heat Treatment and its importance, Transformation of Pearlite in to Austenite, Common Heat Treatment process such as Annealing, Normalizing, Hardening and Tempering. 5 Hrs

2. Isothermal Transformation of Austenite, S-curve, TTT Diagram, characteristic of Martensite Transformation, Ms and Mf Tempesure, effect of carbon and alloying elements on TTT diagram 8 Hrs

3. Hardenability of Steel, difference between Hardenability and Hardness, pulling curves, Quenching media, factors affecting hardenability, Determination of Hardenabilty of Steel by Jominey End Quenching. 8 Hrs

4. Heat Treatment Process, Annealing versus normalising, Hardening versus Tempering, Austempering, martempering, Ausforming, Patenting, Case Hardening of Steel : Carborising, cyniding, nitriding, Laser hardening. 16 Hrs

5. Heat Treatment of Cast Iron, Annealing, stress reliving, malleablising, Heat treatment of high duty caste iron, SG iron, precipitation hardening of Al-Cu Alloy. 5 Hrs

Subject : Heat Treatment Technology Lab
Subject Code : MET510

List of Practical:

1. To study the mechanical properties of an annealed steel sample.
2. To study the property of normalized steel.
3. To study of hardening effect on asquenched steel.
4. To study the effect of quenching media on a hardened steel.
5. To study the effect of harden in on percentage carbon in steel.
6. To study the effect of tempresure on tempering steel.
7. To study the effect of alloying elements on harden ability of steel.
8. To study the effect of temperesure on spheroidising of steel.
9. To study the Ege hardening of a Aluminum based alloy.
10. To study the effect of carborising on the surface of low carbon steel.

Books

Heat Treatment by T V Rajan
Heat Treatment by U Lakhtin

Subject : Mineral dressing
Subject Code : MET506
Full Marks : 80+20= 100
Hours : 42

Contents:-

1. Introduction : ore mineral and their properties, Importance of mineral dressing, necessity and advantages, flow sheet of mineral beneficiation 12 Hrs
2. Status of mineral beneficiation industry in India survey report of mineral dressing in the country (H-05, M-15)
3. Sampling techniques, definition types and importance of sampling, equipments used in sampling screening sizing and classification 12 Hrs
4. Gravity concentration method, jigging, tabling, heavy Media separation, 12 Hrs
5. Flotation: natural and artificial flotation, collectors frothers, depressors, activator and modifiers, concentration of sulfide ores. 08 Hrs

Subject : Mineral dressing Lab
Subject Code : MET511

Contents:- Students are required to perform the following lab work:

1. Study of a jaw crusher and its role in mineral combination.
2. To study the process of pelletisation.
3. To Study the process of sintering of ores.
4. To study the froth floatation for separation of sulfide ores.
5. To study magnetic separation of metallic ores.
6. To perform the experiment on gravity separation method.
7. To find the reduction ratio of minerals in a Rod Mill.
8. To find the reduction ratio of minerals in a Ball Mill.
9. To separate the crushed ores by sieve analysis.
10. To concentrate the ores by tabling.

Books-

Mineral Dressing by A M Godin
Mineral dressing by B Wills
Principle of Mineral Processing by Maurace C

Subject : Corrosion Engineering (Elective I)
Subject Code : MET507
Full Marks : 100 (80+20)
Hours : 42

Contents:-

1. Introduction: definition of corrosion, corrosion Vs rusting, causes of corrosion, losses due to corrosion types of corrosion (Hrs- 08)
2. Principle of corrosion and its mechanism galvanic cell, effect of temperature and environment on corrosion of metals, emf series. (Hrs- 10)
3. Types of corrosion process, general corrosion, pitting, crevice corrosion, stress corrosion, corrosion in stainless steel (intergranular corrosion) (Hrs- 08)
4. Corrosion control methods: design parameters, avoidance of sharp bends, coating – metallic and non metallic, alloying methods, suitability of use of environment (Hrs- 10)
5. Galvanization, tinning, electroplating, nickel coating, effect of temperature and working atmosphere on corrosion reaction (Hrs- 06)

Subject : Corrosion Engineering Lab (Elective I)
Subject Code : MET512

Contents:-

1. Study the effect of environment on corrosion of metals and alloys
2. Study corrosion at the junction of two dissimilar metals
3. Study of coating of Zn on MS metals
4. Study of the time of atmospheric exposure on corrosion.
5. Study the effect of corrosion attack on as rolled and as annealed specimen.
6. Study the effect of corrosion on stainless steel.
7. Study the effect of salt on corrosion rate.
8. Study the Zinc Coat thickness on galvanized plate.
9. Study the effect on the sharp bend of metallic pipes.
10. Study the metallic loss in different working conditions

Books:

Corrosion Engineering by Fonatana

Subject : Composite Materials
Subject Code : MET 508
Full Marks : 80+20= 100
Hours : 42

CONTENTS

1) **INTRODUCTION**
MEANING OF COMPOSITE MATERIAL, DEFINITION OF COMPOSITE MATERIALS THEIR APPLICATIONS, PROPERTIES AND FUNCTIONS 8 hrs

2) **TYPES OF COMPOSITE MATERIALS**: FIBRE REINFORCED, NATURAL COMPOSITES, DISPERSION STRENGTHENED COMPOSITES, TRUE PARTICIPATE COMPOSITES 8 hrs

3) **MANUFACTURING FIBRES OF COMPOSITES**: APPLICATION OF LAMINATED COMPOSITES, SANDWICH STRUCTURE, WOOD , CONCRETE, ASPHALT 10 hrs

4) **INTRODUCTION TO FIBRE OPTICS AND JELLY**
ADVANTAGE OF COMPOSITE MATERIALS, ADVANCEMENTS IN COMPOSITE MATERIALS AND METALURGY 8 hrs

5) RECENT TRENDS IN MATERIAL ENGG, CAUSE OF HIGH STRENGTHS OF COMPOSITE MATERIALS 8 hrs

Subject : Composite Materials
Subject Code : MET 513

List of Practical's

1) Study the fatigue strength of composite material
2) Bend testing of a composite material
3) Comparison of glass fiber, carbon and aramid fibers
4) To study the properties of fiber reinforced composites
5) To analyze the elastic properties of composite laminates.
6) Prediction of failure behavior of fiber reinforces composites.
7) To prepare a composite path for vacuum infusion.
8) To manufacture a glass reinforce epoxy laminates.
9) Attenuation of signals by bending of fiber
10 Properties and comparison of Metallic glasses

Books-

1. Composite Materials by Krishna Chandra
2. Composite Material by Debroh Choudhary
3. Composite Material Design by J B Ever

Subject : Coating Technology (Elective I)
Subject Code : MET509
Full Marks : 100 (80+20)
Hours : 42

Contents:-

1. Introduction: Why Coating necessary? Functions of coatings. Types. Optical Coating. Catalytic Coating. Protective Coating. 8 hrs
2. Anti Corrosion Coating: Insulation, Waterproof Fabric. 6 hrs
3. Coating Process. Chemical Vapor Deposition. Spray Assisted Vapor Deposition. Vacuum Deposition. 10 hrs
4. Spraying: Spray Painting. Plasama Spray. Thermal Spraying. Common forms of powder coating. 10 hrs
5. Roll to Roll Coating Processes: Air Knife Coating. Gap Coating. Immersion Dop Coating. Roller Coating. Extrusion Coating. 8 hrs

Subject : Coating Technology Lab (Elective I)
Subject Code : MET514

Contents:-

1. Study of Protection of Ausnetic SS in refinery against corrosion.
2. Study of Surface Protection of Steel another hard material by water blast.
3. Study of Control of internal corrosion in Steel pipes.
4. Study of Organic Coating to external surface of Steel Pipes underground system.
5. Study of Application of Wax Type Protection Coating for underground metals.
6. Study of Extruded Asphalt Mastic type protective coating.
7. Study of Metallic Coating on Iron based alloys.
8. Galvanizing of structural materials
9. Surface finish by spray painting
10. Non metallic coating over metals

Books

Coating Technology by A Tracton
Foundation of Vacuum Technology by D M Mattox
Powder Coating Technology by Charlse A Stok

Subject : Metallurgical Design (Sessional)
Subject Code : MET515
Full Marks : 50

Objective

The aim of studying this part of metallurgy is to make the students able to -

1. To know the various aspects of metallurgical operations.
2. Develop aptitude of design in metallurgy.
3. Prepared drawing as per computer design.
4. calculate the input material and its output i.e. yield

Content:

1. Different mode of Heat Transfer : Conduction, Convection and Radiation
2. Calculations for heating elements in electrical furnace.
3. Calculation of fuels used in production of Unit mass of steel.
4. Design of pattern gating and risering for industrial components.
5. Design of cupola furnace.
6. Design of forging die and forg shop layout.
7. Design of rolling mill layout.
8. Design of ladle of LD furnace lining.
9. Material balance in Ladle furnace.
10. Design of Blast furnace.

Subject Title : Development of Life Skills (Common Paper)
Subject Code : 502
Full Marks : 50

Rationale:

In today's competitive world, the nature of individual and organizations is changing at very rapid speed. In this situation the responsibility of diploma holder is not unique. After completing his course work he has to face the world and seek meaningful employment also. Merely having knowledge is not sufficient these days. He has to show his communicative skill also. As such the individual skills with capability to show his strength and communicate his willingness new skills for further advancement with to impart his ability and acquiring has to be displayed and learned.

This subject will develop the student as an effective individual to grab the available situation and be member of the unseen team in which he may be put in . It will develop the abilities and skills to perform at highest degree of quality as an individual as well as a member of core group or team. Such skills will enhance his capabilities in the field of searching, assimilating information, managing the given task, handling people effectively, solving challenging problems.

Objectives: The students will be able to:

1. Develop acumen to face interview.
2. Lead in the group discussion and set goals and targets for others
3. Develop team spirit i.e. concept of working in teams
2. Apply problem solving skills for a given situation
3. Use effective presentation techniques
4. Apply techniques of effective time management
5. Apply task management techniques for given projects
6. Enhance leadership traits
7. Resolve conflict by appropriate method
8. Survive self in today's competitive world
9. Follow moral and ethics
11. Convince people to avoid frustration

CONTENTS:

SOCIAL SKILLS

1. Social understanding for group discussion, imaginative thinking and develop free ideas .
2. SWOT Analysis – Concept, and know himself in details. Learn how to make use of SWOT.
3. **Inter personal Relation:-** How to effectively counter arguments of others without hearting their feeling Sources of conflict and conflict resolution, Ways to enhance interpersonal dependence and relations.

4. Problem Solving

I) STEPS IN PROBLEM SOLVING,

1) Identify and clarify the problem,
2) Information gathering related to problem,
3) Evaluate the evidence,
4) Consider alternative solutions and their implications,
5) Choose and implement the best alternative,
6) Review

II) **Problem solving technique**.(any one technique may be considered)

1) Trial and error
2) 2) Brain storming
3) 3) Lateral thinking

5. Presentation Skills

Body language --
Dress like the audience, Posture, Gestures, Eye contact and facial expression. STAGE FRIGHT,
Voice and language – Volume, Pitch, Inflection, Speed, Pause, Pronunciation, Articulation, Language, Practice of speech. Use of presentation aids, Summarizing the facts

6. Group discussion –

Introduction to group discussion, Ways to carry out group discussion, Parameters— Contact, body language, analytical and logical thinking, decision making

7. INTERVIEW TECHNIQUE

Necessity, Techniques to influence interviews and giving directions, Tips for handling common questions.

8. Working in Teams

Understand and work within the dynamics of a groups.
Tips to work effectively in teams,
Establish good rapport, interest with others and work effectively with them to meet common objectives,
Tips to provide and accept feedback in a constructive and considerate way ,
Leadership in teams, Handling frustrations in group.

9. Task Management

Introduction, Task identification, Task planning ,organizing and execution, Closing the task

BOOKS:

Sr. No	Title of the book	Author	Publisher
1	Adams Time management	Marshall Cooks	Viva Books
2	Basic Managerial Skills for All	E.H. Mc Grath , S.J.	Pretice Hall of India
3	Body Language	Allen Pease	Sudha Publications Pvt.
4	Creativity and problem solving	Lowe and Phil	Kogan Page (I) P Ltd
5	Decision making & Problem Solving	by Adair, J	Orient Longman
6	Develop Your Assertiveness	Bishop , Sue	Kogan Page India
7	Make Every Minute Count	Marion E Haynes	Kogan page India
8	Organizational Behavior	Steven L McShane and Mary Ann Glinow	Tata McGraw Hill
9	Organizational Behavior	Stephen P. Robbins	Pretice Hall of India, Pvt Ltd
10	Presentation Skills	Michael Hatton (Canada – India Project)	ISTE New Delhi
11	Stress Management Through Yoga and Meditation	--	Sterling Publisher Pvt Ltd
12	Target setting and Goal Achievement	Richard Hale ,Peter Whilom	Kogan page India
13	Time management	Chakravarty, Ajanta	Rupa and Company
14	Working in Teams	Harding ham .A	Orient Longman

INTERNET ASSISTANCE

1. http://www.mindtools.com
2. http://www.stress.org
3. http://www.ethics.com
4. http://www.coopcomm.org/workbook.htm
5. http://www.mapfornonprofits.org/
6. http://www.learningmeditition.com http://bbc.co.uk/learning/courses/
7. http://eqi.org/
8. http://www.abacon.com/commstudies/interpersonal/indisclosure.html
9. http://www.mapnp.org/library/ethics/ethxgde.htm
10. http://www.mapnp.org/library/grp_cnfl/grp_cnfl.htm
11. http://members.aol.com/nonverbal2/diction1.htm
12. http://www.thomasarmstron.com/multiple_intelligences.htm
13. http://snow.utoronto.ca/Learn2/modules.html
14. http://www.quickmba.com/strategy/swot/