

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,
BHILAI**

**DIPLOMA PROGRAMME IN METALLURGICAL ENGINEERING
Semester – VI**

COURSE OF STUDY AND SCHEME OF EXAMINATION

S.No	Board of Study	Course Code	Course	Periods/Week (in Hours)			Scheme of Examination					Credit L+(T+P)/ 2	
				L	T	P	Theory			Practical			Total Marks
							ESE	CT	TA	ESE	TA		
1.	Metallurgical Engineering	238611 (38)	Foundry Practice	4	1	-	100	20	20	-	-	140	5
2.	Metallurgical Engineering	238612 (38)	Testing of Engineering Material	4	1	-	100	20	20	-	-	140	5
3.	Metallurgical Engineering	238613 (38)	Physical Metallurgy	4	1	-	100	20	20	-	-	140	5
4.	Metallurgical Engineering	238614 (38)	Engineering Material	4	1	-	100	20	20	-	-	140	5
5.	Mechanical Engineering	200615 (37)	Entrepreneurship Development	4	1	-	100	20	10	-	-	130	5
6.	Metallurgical Engineering	238621 (38)	Foundry Lab	-	-	2	-	-	-	50	20	70	1
7.	Metallurgical Engineering	238622 (38)	Engineering Material & Testing Lab	-	-	2	-	-	-	50	20	70	1
8.	Metallurgical Engineering	238623 (38)	Physical Metallurgy Lab	-	-	3	-	-	-	50	20	70	2
9.	Metallurgical Engineering	238624 (38)	Project	-	-	4	-	-	-	80	20	100	2
TOTAL				20	5	11	500	100	90	230	80	1000	31

L : Lecture hours : T : Tutorial hours, P : Practical hours

ESE – End of Semester Exam.; CT – Class Test; TA- Teacher's Assessment

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,
BHILAI**

- A) **SEMESTER** : **VI**
 B) **SUBJECT TITLE** : **FOUNDRY PRACTICE**
 C) **CODE** : **238611 (38)**
 D) **BRANCH/DISCIPLINE** : **METALLURGICAL ENGINEERING**
 E) **RATIONALE** :

The objective of this Subject is to impart the knowledge of manufacturing different types of objects by casting process. They should know about the merits and different steps of casting process. Foundry is a commercial establishment and so the knowledge of this subject will be very useful for the students for starting their own enterprise. Any metallurgical industry cannot run without foundry shop. It can run independently for production of different objects for number of customers or it may be an integral part of a big industry to produce necessary casting objects required in by the industry.

F) TEACHING AND EXAMINATION SCHEME :

Course Code	Teaching Scheme (Hours/Week)				Scheme of Examination						Credit L+(T+P)/2
	L	T	P	Total Hours	Theory			Practical		Total Marks	
					ESE	CT	TA	ESE	TA		
238611 (38)	4	1	-	-	100	20	20	-	-	140	5
238621 (38)	-	-	2	-	-	-	-	50	20	70	1

G) DISTRIBUTION OF MARKS AND HOURS:

Chapter No.	Chapter Name	Hours	Marks
1	Introduction	04	05
2	Pattern Making	12	15
3	Mold Making	10	10
4	Core Making	04	05
5	Melting and Pouring	12	15
6	Gating and Riser System	12	15
7	Casting Processes	13	15
8	Solidification of Castings	05	10
9	Defects in Castings	05	06
10	Inspection & Cleaning	03	04
	Total	80	100

H) DETAILED COURSE CONTENTS:

Chapter – 1 Introduction:

- Advantages of casting over other methods of shaping,
- Types of different foundries,
- Cast Iron foundry, Steel foundry, Non-ferrous foundry, Jobbing foundry, Productive and Independent foundry,
- Basic steps in making a casting,
- Layout of a foundry shop.

Chapter – 2 Pattern Making:

- Pattern making tools, different pattern materials their merits and demerits,
- Different types of patterns such as single piece, Cope and Drag, Follow board, Match plate pattern etc.,
- Different pattern allowances and their description. Pattern colours and importance,
- Fundamentals of pattern design.

Chapter – 3 Mold Making:

- Mold making tools, Mould materials,
- Types of sand, Sand ingredients, Binders used in molding sand, Effect of different binders,
- Important properties required in a molding sand,
- Molding Sand Tests: Moisture test, Strength test, Permeability test,
- Bench molding method and Machine molding method,
- Different types of molding machines.

Chapter – 4 Core Making :

- Core making materials,
- Core sand, its ingredients and properties,
- Binders & machines used in core making,,
- Types of Cores,
- Core making processes,
- Core baking by different methods,
- Finishing of Cores.

Chapter – 5 Melting and Pouring :

- Principle, Operation and process of melting metals in Induction furnace, Cupola furnace and Electric Arc furnace,
- Raw materials used,

- Constructional and operational details of the above furnaces,
- Melting of Non ferrous metals and alloys.

Chapter – 6 Gating and Riser System :

- Different elements of gating system – riser, runner, pouring cup, down spur, ingates etc.,
- Functions and types of risers,
- Functions of other gating elements,
- Chills, types and functions,
- Different types of ladles.

Chapter – 7 Casting Processes :

Details of different casting processes –

- Sand Casting,
- Plaster mold casting,
- Permanent mold casting,
- Die casting,
- Centrifugal casting,
- Shell mold casting,
- Investment casting,
- CO₂ process of casting,
- Continuous process.

Chapter – 8 Solidification of Castings :

- Solidification of pure metals,
- Solidification of alloys,
- Comparison of solidification curves,
- Directional solidification,
- Methods of obtaining directional solidification.

Chapter- 9 Castings Defects:

Causes and remedies of following defects

- Blow holes,
- Gas holes,
- Pin holes,
- Scabs,
- Hots tears,
- Cold cracks,
- Shrinkage cavity.

Chapter – 10 Inspection & Cleaning :

- Dimensional and metallurgical inspections of castings,
- Different cleaning methods.

I) SUGGESTED INSTRUCTIONAL STRATEGIES:

- **Lecture method.**
 - Teaching through models charts& transparencies.
 - LCD Projectors.
 - Video CD packages.
- **Industrial visits**
 - Plant visits in related field.
- **Experts Lecture.**
 - Through different field managers, engineers.
- **Demonstration.**
 - Seminar on selected topics.
 - Regarding riser and runner calculation.

J) SUGGESTED LEARNING RESOURCES:

(a) Reference Books:

Sl. No.	Title	Author, Publisher, Edition & Year
1	Principles of Metal casting	R. Heine & Rosenthal, TMH
2	Foundry Engineering	Howard F. Taylor, Wiley Eastern Ltd.
3	Test book of foundry technology	M.Lal & O.P. Khanna, Dhanpat Rai & Sons.
4	Foundry Engineering	T.R. Banga, R.L. Agrawal & Hanghni
5	Foundry technology	K.P. Sinha & D.B. Goel, Standard Publishers & Distributors.
6	Foundry Engineering	P.L. Jain. TMH.
7	Applied metallurgy	S. Burton.
8	Metal Casting Technology	P.C. Mukherjee, Oxford & IBH

(b) Others :

- Educational CD.
- Models, Charts.

- Power point presentation.

SUBJECT TITLE : FOUNDRY PRACTICE LAB

PRACTICAL CODE: 238621 (38)

HOURS: 32

SUGGESTED LIST OF PRACTICALS / TUTORIALS :

1. Study of different foundry tools & their functions.
2. Study of different furnace (melting units) present in the laboratory.
3. Preparation of various types of patterns.
4. Preparation of molding sand.
5. Preparation of different molds using different types of patterns.
6. Preparation of cores for hollow castings.
7. Melting and pouring in cupola and crucible furnaces.
8. Melting and pouring of non-ferrous metals and alloys.
9. Testing of molding and core sand.

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,
BHILAI**

- A) SEMESTER : VI
 B) SUBJECT TITLE : TESTING OF ENGINEERING MATERIALS
 C) CODE : 238612 (38)
 D) BRANCH/DISCIPLINE : METALLURGICAL ENGINEERING.
 E) RATIONALE :

This subject gives an idea of different mechanical tests, both destructive as well as non-destructive testing. After studying this course the students will be able to conduct the different tests to know the different mechanical properties of the metals and alloys and defects inside the metallic parts.

F) TEACHING AND EXAMINATION SCHEME :

Course Code	Teaching Scheme (Hrs./week)				Scheme of Examination						Credit L+(T+P)/2
	L	T	P	Total Hours	Theory			Practical		Total Marks	
					ESE	CT	TA	ESE	TA		
238612 (38)	4	1	-	-	100	20	20	-	-	140	5
238622 (38)	-	-	2	-	-	-	-	50	20	70	1

G) DISTRIBUTION OF MARKS AND HOURS :

Sl. No.	Chapter No.	Chapter Name	Hours	Marks
1	1	Mechanical Properties Of Metals.	08	10
2	2	Tensile Test	08	10
3	3	Hardness Test	14	20
4	4	Impact Test	14	20
5	5	Fatigue Test	08	10
6	6	Creep Test	08	10
7	7	Non-Destructive Tests	15	15
8	8	Computers Application In Material Testing	05	05
		Total	80	100

H) DETAILED COURSE CONTENTS:

Chapter – 1 Mechanical Properties of Metals :

- Importance of mechanical testing,

- Principles and types of mechanical testing,
- Different mechanical properties of metals such as – Ductility, Brittleness, Malleability, Stiffness, Resilience, Hardness & Toughness.

Chapter – 2 Tensile Test :

- Tensile properties of metals,
- Machine used for tensile test,
- Standard tensile test specimen, other accessories for the test,
- Principle, Test procedure,
- Elastic and plastic deformations,
- Percentage elongation, Percentage reduction in area,
- Yield and Ultimate strength,
- Stress – Strain curves for different ferrous and non-ferrous metals and their interpretation.

Chapter – 3 Hardness Test :

- Moh's scale of Hardness,
- Brinell Hardness test – Principle, Machine used, Penetrators & loads used, Precautions and limitations of the test,
- Rockwell Hardness Test – Principle, Machine used, Penetrators, loads and scales used, Procedure, Precautions, merits and demerits of the test, Rockwell superficial Hardness Test,
- Vickers Hardness Test – Principle, Machine used, Procedure, precautions and limitations of the test,
- Shore Scalerescop Test – Principle, Tester used, Procedure, Precaution and limitations of the test,

Chapter – 4 Impact Test :

- Izod and Charpy test, Machine used for the test,
- Standard specimen for the tests,
- Principle, Importance, Procedure,
- Precautions of the above tests,
- Comparison between Izod and Charpy tests,
- Effect of variables on the impact test values,(striking velocity, size and shape of the specimen, temperature, grain size, composition of the metal, cold work etc.),
- Embrittlement phenomena-Temper Embrittlement.

Chapter – 5 Fatigue Test :

- Principle, procedure,
- Precautions and importance of the fatigue test,
- Stress-Number of cycles (S-N) Curve,

- Factors affecting fatigue strength.

Chapter – 6 Creep Test :

- Principle, procedure,
- Precautions and importance of the creep test,
- Creep curve,
- Factors affecting creep strength.

Chapter – 7 Non-Destructive Tests :

- Principle, procedure and precautions of the above tests.
 - Dye penetrant,
 - Magnetic, Radiographic,
 - Acoustic & Ultrasonic methods of non-destructive testing,
- Advantages of non-destructive testing.

Chapter – 8 Computers Applications in Material Testing.

- Use of computers in-
 - Mechanical testing of metals.
 - Universal testing Machine.
 - Hardness testers.
 - Various Non Destructive tests.

I) SUGGESTED INSTRUCTIONAL STRATEGIES:

- **Lecture method.**
 - Teaching through models charts & transperancies.
 - LCD Projectors.
 - Video CD packages.
- **Industrial visits.**
 - Plant visits in related field.
- **Experts Lectures.**
 - Through different field managers, engineers, site officers.
- **Demonstration.**
 - Seminar on selected topics.
 - Testing of various specimen and about its fracture.

J) SUGGESTED LEARNING RESOURCES:

(a) Reference Books

Sl. No.	Title	Author, Publisher, Edition & Year
1	Testing of Metallic materials	A.V.K. Surya Narayan, Prentice Hall of India Pvt. Ltd.
2	Metallurgy for Engineers	L.G. Rollason
3	Mechanical Metallurgy	Dieter. Mc Graw Hill
4	Elements of Metallurgy	Swaroop, Rastogi publications
5	Practical Non destructive Testing	Raj. B, Narosa Puublication House, Delhi.

(b) Others

- Lab-manual.
- ISI Codes.
- Learning package.

SUBJECT TITLE: TESTING OF ENGINEERING MATERIALS LAB

PRACTICAL CODE: 238622 (38)

HOURS: 32

LIST OF PRACTICALS / TUTORIALS :

1. Study of Universal Testing Machine (UTM).
2. Study of Extensometer.
3. Study of Brinell & Rockwell hardness testers.
4. Study of Charpy & Izod Impact testing machines.
5. Tensile testing of mild steel using UTM.
6. Compression testing of C.I./wood on UTM.
7. Single shear & Double shear on Mild Steel bars using UTM.
8. Hardness testing of Ferrous and Non-Ferrous metals.
9. Impact testing of Mild Steel, Cast Iron & Aluminum specimen.
10. Fatigue testing of material on Fatigue testing m/c.
11. Study of Ultrasonic Flaw Detector.

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,
BHILAI**

- A) SEMESTER : VI
 B) SUBJECT TITLE : PHYSICAL METALLURGY
 C) CODE : 238613 (38)
 D) BRANCH/DISCIPLINE : METALLURGICAL ENGINEERING
 E) RATIONALE :

The subject of physical metallurgy deals with the theories and practices of different heat treatment process of ferrous and non ferrous metals & alloys. The knowledge of this subject is essential for a metallurgist. This subject covers the field of application of special materials required in Nuclear and other modern industries. In addition the methods of determining crystal structures has also been included in the curriculum. The subject has a vital role controlling the heat treatment processes in different industries.

F) TEACHING AND EXAMINATION SCHEME :

Course Code	Teaching Scheme (Hrs./week)				Scheme of Examination						Credit L+(T+P)/2
	L	T	P	Total Hours	Theory			Practical		Total Marks	
					ESE	CT	TA	ESE	TA		
238613 (38)	4	1	-	-	100	20	20	-	-	140	5
238623 (38)	-	-	3	-	-	-	-	50	20	70	2

G) DISTRIBUTION OF MARKS AND HOURS:

Chapter No.	Chapter Name	Hours	Marks
1	Crystal Structure	10	15
2	Photomicrography	08	10
3	Heat Treatment Of Steel	15	20
4	Surface Hardening Methods	12	15
5	Functions Of Alloying Element In Steel	15	15
6	Age Hardening	12	15
7	Alloy Steels	08	10
	Total	80	100

H) DETAILED COURSE CONTENTS:

Chapter – 1 Crystal Structure:

- Review of crystal structure of metals,

- Principles of X-Ray diffraction,
- Determination of crystal structure by X-Ray diffraction methods,
- Principles of electron microscopy.

Chapter – 2 Photomicrography:

- Principles of photomicrography,
- Photo micrographic instruments,
- Main parts of Metallography and their functions.

Chapter – 3 Heat Treatment of Steel:

- Isothermal transformation of Austenite. T.T.T. & C.C.T. diagrams,
- Cooling curves. Austenite grain size its determination, importance,
- Annealing, Normalizing, Hardening, Tempering. Austempering, Martempering and Ausforming of steel, Hardenability – factors affecting harden ability,
- Jominy end Quenched test,
- Determination of hardenability, use of hardenability data,
- Problem arising during heat treatment, effect of heating temperature, soaking period,
- Heat treatment of Spring steel, Gears, Magnets & Tool steels.

Chapter – 4 Surface Hardening Methods:

- Carburizing,
- Nitriding,
- Cyaniding,
- Carbonitriding,
- Induction and flame hardening.

Chapter – 5 Functions of Alloying Element in Steel:

- Ferrite formers, austenite formers, carbide formers and stabilizers, their effects on critical temperatures,
- Hardenability & Tempering,
- Their effect on TTT diagram,
- Eutectoid temperature and composition,
- Effect of alloying element on TTT diagram.

Chapter – 6 Age Hardening :

- Mechanism of age hardening,
- Treatment of age hardenable alloys,
- Precipitation hardening of important ferrous and non ferrous alloys.

Chapter – 7 Alloy Steels :

- Classification of alloys steels,
- Study of different types of alloy steels such as-
 - Low alloy high strength steel,
 - Tool steel, Stainless steel,
 - High Mn steel,
 - Maraging steel,
 - Super alloy steels,
- Different national and international standards.

I) SUGGESTED INSTRUCTIONAL STRATEGIES:

- **Lecture method.**
 - Teaching through models charts & transparencies.
 - LCD Projectors.
 - Video CD Packages.
 - Seminar on selected topics
- **Industrial visits.**
 - Plant visits in related field.
- **Experts Lectures.**
 - Through different field managers, engineers, site officers.
- **Demonstration.**
 - Of different alloy steel specimen & their microstructure using microscope.

J) SUGGESTED LEARNING RESOURCES:

(a) Reference Books

Sl. No.	Title	Author, Publisher, Edition & Year
1	Physical metallurgy for engineers	Donald .S. Clark and R. Varney, East West Press Pvt. Ltd. New Delhi.
2	Introduction to Physical Metallurgy	Sidney H. Avner, Prentice Hall India
3	Engineering Physical Metallurgy	Y. Lakhtin, Mir Publication, Moscow
4	Structure & Properties of Alloys	Brick and Phillips.
5	Physical Metallurgy	Raghavan, Prentice Hall India
6	Principles of Metallographic Laboratory practice	Robert M. Kehi.
7	Engineering Metallurgy part I .	R.A. Higgins
8	Hand book of Heat Treatment of Steel	Prabhu Dev, Tata Mc Graw Hill

(b) Others :

- Models, chart, transparencies on various topics & Educational CDs and interactive packages on related topics.
- Charts of phase diagrams & Lab Manual.

SUBJECT TITLE: PHYSICAL METALLURGY LAB

PRACTICAL CODE: 238623 (38)

HOURS: 48

LIST OF PRACTICALS / TUTORIALS:

1. Study of Microstructure of Carbon steel, Tool steel, Stainless steel, High Mn steel, Cast iron etc.
2. Heat treatment of steel and study of microstructure.
3. Melting and casting of low melting point alloys and study of microstructure and other properties.
4. Photomicrography of steel, Cast Iron , Non-ferrous metals and alloys.
5. Plotting of cooling curves of metals and alloys.
6. Jominy end quench test.

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,
BHILAI**

- A) SEMESTER : VI
 B) SUBJECT TITLE : ENGINEERING MATERIAL
 C) CODE : 238614 (38)
 D) BRANCH/DISCIPLINE : METALLURGICAL ENGINEERING
 E) RATIONALE :

This subject is taught to the students to gain knowledge about the contents of metals & alloys, their properties and industrial uses. By this the students will be able to know the strength and other related properties of metals to use them accordingly.

F) TEACHING AND EXAMINATION SCHEME :

Course Code	Teaching Scheme (Hours/Week)				Scheme of Examination						Credit L+(T+P)/2
	L	T	P	Total Hours	Theory			Practical		Total Marks	
					ESE	CT	TA	ESE	TA		
238614 (38)	4	1	-	-	100	20	20	-	-	140	5

G) DISTRIBUTION OF MARKS AND HOURS:

Chapter No.	Chapter Name	Hours	Marks
1	Cast Iron	05	08
2	Steels	12	15
3	Alloys Steel	12	15
4	Non-Ferrous Metals & Alloys	08	10
5	Aluminium-Alloys	10	12
6	Copper-Alloys	10	12
7	Some Important Alloys	07	08
8	Ceramics	08	10
9	Composites Materials	08	10
	Total	80	100

G) DETAILED COURSE CONTENTS :

Chapter – 1 Cast Iron :

- Different types of cast irons, their properties,
- composition and uses of wrought iron, properties and uses.

Chapter – 2 Steels :

- Different types of steels,
- Classification of plain carbon steel, their properties, composition and uses,
- Alloy steel their properties, composition and uses

Chapter – 3 Special Alloy Steels:

Composition properties and uses of

- High speed steels,
- Stainless steels,
- Heat resisting steels,
- Free cutting steels,
- Spring steels,
- High strength low alloy steel.

Chapter – 4 Non-Ferrous Metals & Alloys :

- Advantages of Non-ferrous metal & alloys over ferrous metals & alloys,
- Properties of Cu, Al, Zn, Pb and Sn on the basis of their phase diagrams.

Chapter – 5 Aluminum-Alloys :

- Duralumin, Y-alloys, their composition properties and uses and
- Their phase diagram.

Chapter – 6 Copper-Alloys:

Composition, properties and uses of

- Brass,
- Bronze,
- Gun metal,
- Muntz metal
- cartridge brass,
- admiral brass,
- German silver,
- Babbit metal and Bearing metals.

Chapter – 7 Some Important Alloys :

Composition, properties and uses of

- Constantan type metal,

- Invar,
- Bell metal etc.

Chapter – 8 Ceramics:

- Introduction,
- Composition of ceramics,
- Uses & their importance.

Chapter – 9 Composites:

- Introduction,
- Materials, Uses and their importance,
- Reinforcement, material for reinforcement.

H) SUGGESTED INSTRUCTIONAL STRATEGIES:

- **Lecture Method.**
 - Teaching through models charts & transparencies.
 - LCD Projectors.
 - Video CD packages.
- **Industrial visits.**
 - Plant visits in related field.
- **Experts Lecture**
 - Through different field Managers, Engineers, site officers.
- **Demonstration.**
 - Seminar on selected topics.

I) SUGGESTED LEARNING RESOURCES:

(a) Reference Books:

Sl. No.	Title	Author, Publisher, Edition & Year
1	Metallurgy & Material Science	O.P. Khanna, Dhanpat Rai & Sons.
2	Material Science	Narang, Khanna Publishers
3	Physical Metallurgy	Raghvan, Prentice Hall India
4	Elements of Metallurgy	Swaroop, Rastogi Publication
5	Engineering Materials	B.K. Agarwal
6	Metallurgy for Engineering	Rollason
7	Material Science and	William D. Callister

	Engineering	
8	Material Science	Narula, Tata Mc Graw Hill
9	Engineering Materials- properties & Selection	Budniski & Budniski, Prentice Hall India

(b) Others:

- CD's and interactive learning packages
- Display boards
- Charts of microstructure of different alloy
- Sample of different materials
- IS Codes.

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,
BHILAI**

- A) **SEMESTER** : **VI**
 B) **COURSE TITLE** : **ENTREPRENEURSHIP DEVELOPMENT**
 C) **CODE** : **200615 (37)**
 D) **BRANCH/DISCIPLINE** : **METALLURGICAL ENGINEERING**
 E) **RATIONALE** :

It has been experienced in most parts of the world that entrepreneurship development is a means of rapid economic development vis-à-vis creation of gainful employment of masses. The myth that entrepreneurs are born and not made no longer holds good. Experiences of last few decades in India show that it is possible to develop entrepreneurs through planned efforts. These designed efforts are more essentially required in polytechnics where increasing unemployment has necessitated promoting self-employment/entrepreneurship as career option thereby creating more job providers than job seekers. This course focuses on inputs required for students to undertake entrepreneurial activities as career option.

F) TEACHING AND EXMINATION SCHEME:

Course Code	Teaching Scheme (Hours/Week)				Scheme of Examination						Credit L+(T+P)/2
	L	T	P	Total Hours	Theory			Practical		Total Marks	
					ESE	CT	TA	ESE	TA		
200615 (38)	4	1	-	-	100	20	10	-	-	130	5

G) DISTRIBUTION OF MARKS AND HOURS:

Chapter No.	Chapter Name	Hours	Marks
1.	Entrepreneurship Development	10	12
2.	Forms of business organization	8	10
3.	Institutional support for SSI	8	10
4.	Planning a small scale industry	10	18
5.	Management of small business firms	8	12
6.	Project selection, formulation and appraisal	12	10
7.	Problems of small industries	12	12
8.	Entrepreneurial motivation training	12	10
	Total	80	100

H) DETAILED COURSE CONTENTS:

Chapter-1 Entrepreneurial Development:

- Definition of entrepreneurship,
- Characteristics of entrepreneurs,
- Factors influencing entrepreneurship,
- Need for promotion of entrepreneurship and small business
- Entrepreneurial Environment
- Environmental analysis.
- Government policies for setting up new small enterprises
- Opportunities in service industries.

Chapter –2 Forms of Business Organization:

- Forms of ownership
- Sole Proprietorship
- Partnership
- Cooperative society
- Joint – stock company
- Private Limited Companies
- Public Limited Companies

Chapter – 3 Institutional support to SSI:

- Institutional set up
- Industries centers,
- Industrial estates
- Institutional support at National level
- Institutional support at State level
- Commercial banks and financial institutions

Chapter – 4 Planning a SSI:

- What is planning?
- Types of planning
- Importance of planning
- Steps in planning
- Steps in planning a SSI
- Technical dimensions for setting up an enterprise

Chapter-5 Management of Small Business Firm:

- Functional areas of small business firm
- Fundamentals of Management

- Managerial effectiveness
- Essential data for effective control of small business
- Resource management
- Office management
- Employees Welfare & safety
- Factory rules and Labour Laws related to SSIs
- Sales Tax and Income Tax laws related to SSIs

Chapter-6 Project Selection, Formulation & Appraisal:

- Project selection & formulation
- Scope of project report
- Content & Format of Project report
- Need of Project Appraisal
- Steps of Project Appraisal

Chapter-7 Problems Of Small Industries:

- Power shortages
- Project planning
- Finance
- Raw material
- Production constraints
- Marketing
- Personal constraints
- Regulations

Chapter-8 Entrepreneurial Motivation Training:

- Achievement Motivation
- Creative thinking
- Risk taking abilities

I) SUGGESTED INSTRUCTIONAL STRATEGIES:

- **Lecture Method.**
- **Industrial visits.**
- **Simulation**
- **Role play**
- **Interaction with successful entrepreneurs**

▪ **Demonstration.**

▪ **Games**

J) SUGGESTED LEARNING RESOURCES:

(a) Reference Books :

Sl. No.	Title	Author, Publisher, Edition & Year
1	Starting your own Business, A step-by-step Blue print for the First-time Entrepreneur	Stephen C. Harper, Mc Craw-Hill
2	Harvard Business Review on Entrepreneurship	Harvard Business School Press
3	Entrepreneurship Development in small scale	Patel V.G. proceedings of National Seminar, DCSSI, New Delhi
4	Entrepreneurship : Strategies & Resources	Abrams Grant Pass, Oregon: Oasis Press
5	The Business Planning Guide	David H. Bangs Upstart Publishing Company, In Chicago
6	Entrepreneurship development in India	Dr. C.B. Gupta Dr. N.P. Srinivasan Sultan Chand & Sons

LIST OF TEAM WORK

Team Work will consist of collecting following information by the students:

1. Collect State industrial policy
2. Report of interaction with successful entrepreneurs/industrial visits
3. Prepare list of opportunities for business, service and industrial ventures
4. Whom to approach for What?
5. Facilities and incentives available from various support agencies

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,
BHILAI**

- A) **SEMESTER** : **VI**
 B) **COURSE TITLE** : **PROJECT**
 C) **CODE** : **238624 (38)**
 D) **BRANCH/DISCIPLINE** : **METALLURGICAL ENGINEERING**
 E) **RATIONALE** :

Every diploma engineer should work on project, which will be useful for him for actual industrial applications. This course helps the student to study various applications of metallurgical engineering such as Steel making, Heat treatment, Iron making, Foundry techniques, Continuous casting, sponge Iron production, etc. Also the students are exposed to corrosion, prevention techniques, safety aspects, Mechanical working of metals and maintenance, etc.

F) TEACHING AND EXMINATION SCHEME:

Course Code	Periods/Week (In Hours)			Scheme of Examination						Credit L+(T+P)/2
	L	T	P	Theory			Practical		Total Marks	
				ESE	CT	TA	ESE	TA		
238624 (38)	-	-	4	-	-	-	80	20	100	2

DETAILED COURSE CONTENTS:

The student will undertake one project which will consist of problem related to design and fabrication, repair and maintenance, fault finding of actual situations and there by plan organize and execute the project actually.

BASICS OF PROJECT:

The project shall be executed in the following basic steps

- Project idea generation.
- Literature survey for project.
- Model preparation & Process characterization.
- Working & result analysis.

The student should use following listed areas as the guidelines for basic project idea generation

- Study of existing technique & effect of modernization.
- Study of process modification techniques for process optimization..

- Comparative studies of various Steel & Iron making processes.
- Comparative studies of Heat treatment furnaces.
- Study the effect of various heat treatment processes on mechanical properties & Microstructure.
- Study of Organizational structure and Industrial management pertaining to metallurgical industries.
- Study of Layout of a plant for optimization of cost & time involved in material handling.
- Study of Non destructive testing techniques adopted in foundry & forming.
- Study & observation of different parameters involved in mechanical testing of metals and alloys
- Studies related to existing Material handling equipment and further modifications.

Suggested Implementation Strategy

- The student should review various literature and various industrial situations and applications before starting the project in order to generate the ideas.
- Following modus operandi is to be used for execution of project.
- In the first two weeks the students are given the idea about the project work that they will do along with the observations of other things mentioned in the syllabus.
- The students will be going to such industries where they will get exposure to almost all contents in the syllabus. He will work simultaneously on his project selected by him. The student and institute should try to get permission/ sponsorship to enable students to work in the industry.
- For one month i.e. 4 weeks he will spend in industry and in the remaining weeks, he will work on his selected project work may be in industry or in the institute work shop.

SUGGESTED LEARNING RESOURCES:

Reference Books

Sl. No.	Title
1.	Metal News, Magazine
2.	Steel scenario, Magazine
3.	Steel times Magazine
4.	Invention Intelligence Magazine
5.	Internet sites
6.	ASM Metal handbooks Volume 1to 22
7.	Other books prescribed in the curriculum of different subjects
