

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

SCHEME OF TEACHING AND EXAMINATION

M. Tech. in Steel Technology

SECOND SEMESTER

S. No.	Board of Study	Subject Code	Subject	Periods Per Week			Scheme Of Exam			Total Marks	Credit [L + (T+P)] 2
				L	T	P	ESE	CT	TA		
1.	Metallurgical Engineering	456211 (38)	Basic Oxygen Steel Making and Continuous Casting Process	3	1	0	100	20	20	140	4
2.	Metallurgical Engineering	456212 (38)	Automation & Process Control in Steel Industry	3	1	0	100	20	20	140	4
3.	Metallurgical Engineering	456213 (38)	Refractory & Fuel	2	1	0	100	20	20	140	3
4.	Metallurgical Engineering	456214 (38)	Mechanical Working Testing and Joining of Metals	3	1	0	100	20	20	140	4
5.	Metallurgical Engineering	456215 (38)	Environment Management & Safety Engineering	2	1	0	100	20	20	140	3
6.	Metallurgical Engineering	456221 (38)	Process Control in Steel Making LAB	0	0	6	75	0	75	150	3
7.	Metallurgical Engineering	456222 (38)	Rolling & Mechanical Testing LAB	0	0	6	75	0	75	150	3
Total				13	5	12	650	100	275	1000	24

L – Lecture, T – Tutorial, P – Practical, ESE- End Semester Exam , CT- Class Test, TA – Teacher's Assessment

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL
UNIVERSITY, BHILAI**

Semester : **M. Tech.- II**

Branch : **M. Tech. Steel Technology**

Subject : **Basic Oxygen Steel Making &
Continuous Casting Process**

Code : **456211 (38)**

Total Theory Periods : **28**

Total Tutorial Periods : **10**

Total Marks in End Semester Examination : **100**

Minimum number of class tests to be conducted : **02**

UNIT-I

World & Indian steel scenario, Integrated vs mini steel plants. Historical perspective of different steel making processes.

UNIT-II

Physical chemistry of converter steel making involving carbon, silicon, manganese, phosphorus sulphur reactions, slag-metal, gas-metal & gas-slag reactions and de-oxidation practices.

UNIT-III

Role of residual elements in steel & their control. Development of Secondary steel making, VAD, RH, LF.

UNIT-IV

Evolution of continuous casting, different types of casters, Continuous casting, theory, practices & recent advances- EMS, mould level controller, near net casting.

UNIT-V

Actual heat making and casting & problems faced. Defects in concast products & remedial measures.

Recommended Books :

1. Physical Chemistry at Iron Steel – Bordsworth
2. Metallurgical Thermodynamics - Kawasaki
3. Physical Chemistry of Iron & Steel - R.G. Wards

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

Semester : **M. Tech.- II**

Branch : **M. Tech. Steel Technology**

Subject : **Automation & Process Control in
Steel Industries**

Code : **456212 (38)**

Total Theory Periods : **28**

Total Tutorial Periods : **10**

Total Marks in End Semester Examination : **100**

Minimum number of class tests to be conducted : **02**

UNIT-I

Basic concepts of Instrumentation :

Field Instruments (Temperature, Flow, Pressure & Level), Calibration, Panel Mounted Instruments (Indicators, Recorders, Annunciation system etc.), Analyser equipment (Oxygen, CO, CO₂, Vibration, pH, conductivity etc), Industrial weighing systems, use of ultrasonics and infra-red in measurements.

UNIT-II

An Introduction to Control System concepts :

Analog and Digital I/Os, PID, cascade, feed back & feed forward controls, Use of microprocessors, Single loop controllers, Programmable Logic Controllers, RTU, DCS.

UNIT-III

Supervisory Control System :

SCADA, Process Modeling in Iron Making, Steel Making and Rolling Mills

UNIT-IV

Computer fundamentals & Networking concepts ;

Introduction, Architecture of computers, Operating Systems, Programming Languages, Relational databases, Concepts of computer Networks.

UNIT-V

Advanced Control Systems :

Expert systems, Artificial Intelligence, Fuzzy Logic, Neural Networks, Robotics.

Recommended Reference Books :

1. Mechanical & Industrial Measurements by R.K. Jain
2. Control System Theory by Ogata
3. Chemical Process Control by George Stephanopoulos
4. Structured Computer Organization by Andrew S. Tanenbaum
5. Computer Networks by Andrew S. Tanenbaum

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

Semester : **M. Tech.- II**

Branch : **M. Tech. Steel Technology**

Subject : **Refractory & Fuels**

Code : **456213 (38)**

Total Theory Periods : **28**

Total Tutorial Periods : **10**

Total Marks in End Semester Examination : **100**

Minimum number of class tests to be conducted : **02**

UNIT-I

Definition & classification of Fuels-solid, liquid & gaseous. Energy resources in India

UNIT-II

Design of Furnaces & burners, insulation effect, heat recovery, flue gases, air blower. Heat transfer and thermal balance in furnaces.

UNIT-III

Combustion of fuels, stoichiometric combustion, flame temperature, energy efficient fuels, Safety in using gaseous fuels.

UNIT-IV

Refractory – Type & classification of refractory, specific use in a steel plant application in coke ovens, BF, SMS, Reheating furnaces. Properties of acid, basic & neutral refractory materials.

UNIT-V

Special & synthetic refractory, monolithic etc. Role of refractories in energy conservation. Testing of refractories.

Recommended Books :

1. Fuel, Furnaces & Refractory - J.D. Gilchrist
2. Steel Plant Refractories - Chester
3. Fuels, Furnaces and Refractories and Pyrometry – A V K Suryanarayan and Pyro

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL
UNIVERSITY, BHILAI**

Semester **M. Tech.- II**

Branch : **M. Tech. Steel Technology**

Subject : **Mechanical Working, Testing
& Joining of Metals**

Code : **456214 (38)**

Total Theory Periods : **28**

Total Tutorial Periods : **10**

Total Marks in End Semester Examination : **100**

Minimum number of class tests to be conducted : **02**

UNIT-I

Concept of stress & strain, theory of elasticity, theory of plasticity, flow characteristics, yield criterion, Fundamentals of metal working – classification of forming processes, cold & hot forming, micro-structures on working, residual stress.

UNIT-II

Metal working processes with emphasis on rolling. Rolling mill equipment. Thermo-mechanical rolling & accelerated cooling, Defects in finished products & remedial measures.

UNIT-III

Testing methods & equipment. Hardness, tension, fatigue, fracture and creep. Non-destructive testing-principles of ultrasonic, eddy-current & radiography.

UNIT-IV

Basic principles of welding. Welding equipment & arc physics. Different types of welding – principles of operation-fusion, gas, solid state, electron beam, laser, thermit welding.

UNIT-V

Welding of steel & cast iron, concept of weldability. Welding problems, defects in welding & remedial measures. Other joining techniques like soldering, brazing.

Recommended Books :

1. Mechanical Metallurgy – Dieter
2. Welding Technology – A. Davies
3. Testing of Metallic Materials – A V K Suryanarayan

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI

Semester : **M. Tech.- II**

Branch : **M. Tech. Steel Technology**

Subject : **Environment Management & Safety Engineering**

Code : **456215 (38)**

Total Theory Periods : **28**

Total Tutorial Periods : **10**

Total Marks in End Semester Examination : **100**

Minimum number of class tests to be conducted : **02**

UNIT-I

Global Environmental issues, Global Warming, Acid rain, Ozone layer depletion, Environmental issues in steel industry, Environmental monitoring, Environmental Laws, Climate change and CO₂ reduction in steel industry

UNIT-II

Air pollution control, Scrubbers, bag filters, ESP, water pollution control : Clarifiers, settling tanks, phenolic effluent treatment, Noise control, solid wastes, recycling and reuse of steel industry wastes, hazardous waste management, Operation and maintenance of pollution control systems

UNIT-III

Environment management systems, ISO 14001, Environment management information system, Life cycle assessment, environmental auditing, Gaussian air quality dispersion modeling, Streeter Phelps water quality modeling

UNIT-IV

Introduction to Factories Act 1948, various other acts which apply to Steel Plant like Pressure vessel Act, Boiler Act, Indian Electricity Act.

Safety Management - Broad Principals - Heinrich Domino theory, cause of Accidents and Prevention etc. Risk assessment - Exposures, Probability-Consequences, Hazop and Hazon, Management of Risks.

UNIT-V

Role and Responsibility of the line Manager, H.O.D, Supervisors etc. in Safety.

Machine Guarding

Various Gasses in Steel Plant, Precautions during gas jobs ,Furnace light up, Protocols Emergency Preparedness and Disaster Management, Importance of M.S.D.S.

Recommended Books :

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL
UNIVERSITY, BHILAI**

Semester : **M. Tech.- II**

Branch : **M. Tech. Steel Technology**

Subject : **Process Control in Steel Making Lab** Code : **456221 (38)**

Total Practical Periods : **14**

Total Marks in End Semester Examination : **50**

1. Identifying the control parameters in BOF & Twin-hearth steel making.
2. Process Control in BOF steel making.
3. Testing of steel & slag.
4. Process Control in continuous casting.
5. Report writing.

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL
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Semester : **M. Tech.- II**

Branch : **M. Tech. Steel Technology**

Subject : **Rolling & Mechanical Testing Lab**

Code : **456222 (38)**

Total Practical Periods : **14**

Total Marks in End Semester Examination : **50**

1. Soaking & rolling schedule of Flat & Long Products
2. Inspection including NDT of Rails
3. Inspection & NDT of flat products
4. Mechanical Testing- Tensile, Impact & Hardness Testing
5. Preparation of test certificates