METALLURGICAL ENGINEERING

DETAILED SYLLABUS FOR PART – 2 (2nd. YEAR) : THIRD SEMESTER

	WEST BENGAL STATE COUNCIL OF TECHNICAL EDUCATION									
	TEACHING AND EXAMINATION SCHEME FOR DIPLOMA IN ENGINEERING COURSES									
	DURATION OF COURSE: 6 SEMESTERS									
	SEMESTER: THIRD									
	BRANCH: METALLURGICAL ENGINEERING									
SR. NO.	SUBJECT	CREDITS	PERIODS			EVALUATION SCHEME					
			L	TU	PR	INTERNAL			ESE	PR	Total Marks
						TA	CT	Total			
1	FUNDAMENTALS OF ELECTRONICS	3	2	-	2	5	10	15	35	50	100
2	FUNDAMENTALS OF METALLURGY	4	4	-	3	10	20	30	70	50	150
3	METALLURGICAL THERMODYNAMICS	4	4	-	-	10	20	30	70	-	100
4	MECHANICAL TESTING OF METALS	4	4	-	4	10	20	30	70	10	200
5	MECHANICAL ENGINEERING	3	2	-	2	5	10	15	35	50	100
6	WORKSHOP PRACTICE	4	-	-	3	-	-	-	-	100	100
7	PROFESSIONAL PRACTICE - I	3	-	-	3	-	-	-	-	50	50
	Total:	25	16	0	17	35	70	105	245	400	800
	STUDENT CONTACT HOURS PER WEEK: 33 hrs , DURATION : 15 WEEKS / SEMESTER Theory and Practical Period of 60 Minutes each. L- Lecture, TU- Tutorials, PR- Practical, TA- Teachers Assessment, CT- Class Test, ESE- End Semester Exam.										

FUNDAMENTALS OF ELECTRONICS

Subject Code MET / S3 / TI / FOE	Course offered in Part – II , 3RD. Semester	Course Duration 15 weeks	2 lecture contact periods (@ 60 Minutes) per week	Full Marks 35

O B J E C T I V E : This subject is introduced to make the students familiar with basic electrical and electronic components and also with some basic measuring instruments. Upon successful completion of this course the students will be able to: —

1. List out the classes of resistors, capacitors and inductors;
2. Be familiar with transformer, relays, switches and connectors,
3. Understand the basic functions of zener diode, transistors, thyristor and simple opto-electronics devices.

M O D U L A R   D I V I S I O N   O F   T H E   S Y L L A B U S

GROUP	MODULE	TOPIC	CONTACT PERIODS
A	1	PASSIVE & ACTIVE CIRCUIT ELEMENTS	5
	2	TRANSFORMER	2
	3	RELAYS, SWITCHES, CABLES AND CONNECTORS	3
B	4	SEMICONDUCTOR , JUNCTION DIODE , ZENER DIODE	5
	5	BIPOLAR TRANSISTOR	3
	6	FIELD EFFECT TRANSISTOR	3
C	7	UNIJUNCTION TRANSISTOR	2
	8	THYRISTOR	3
	9	OPTOELECTRONICS	2
	10	INTEGRATED CIRCUITS	2
			TOTAL PERIODS: 30

M O D U L A R   D I V I S I O N   O F   T H E   S Y L L A B U S   &   E X A M I N A T I O N   S C H E M E

Group	MODULE	Objective Question				Subjective Question			
		No. of questions to be set	No of questions to be answered	Marks for each question	Total Marks	No. of questions to be set	No of questions to be answered	Marks for each questions	Total marks
A	1,2.,3	4	ANY 10	1	10	3	ANY 5	5	25
B	4,5,6.	4				3			
C	7,8,9,10.	4				3			

R E F E R E N C E   B O O K S

1. Electronic Principle / A.P. Malvino / Tata McGraw-Hill
2. Electronic Devices & Circuits / Millman & Halkias / Tata McGraw-Hill
3. Basic Electronics & Linear Circuits / Bhargava / Tata McGraw-Hill
4. Electronic devices & Circuit Theory / Boylestad & Nashalsky / Prentice Hall of India, N. Delhi
5. Electronic Fundamentals & Applications / D. Chattopadhyay & P.C. Rakhshit / New Age International
6. Electronic Components and Materials / Madhuri A Joshi / Wheeler Publishers
7. Electronic Component / Padmanaban
8. Electronic Component / Ramchander
9. Electronic Measurement and system / R.G. Gupta / Tata McGraw-Hill

DETAIL COURSE CONTENT

G R O U P – A   **10 PERIODS**

1.0 PASSIVE & ACTIVE CIRCUIT ELEMENTS   **5**

1.1   Familiarity with the following components: — RESISTORS **:** Fixed and variable , Carbon & wire wound .(colour coding, power rating, accuracy and effect on temperatures, uses of resistors .

1.2   Fuses**:** Ordinary fuses (specifications) , Capacitors , Fixed & Variable capacitors – Colour coding – Rating and uses of capacitors

1.3   INDUCTOR**:** Ferrite core – Pot core – Air core – Fixed, tapped and variable inductors – Factors affecting inductance and uses of Inductors .

2.0 TRANSFORMER   **2**

2.1 Elementary idea of transformer, Features and specifications of wideband transformer — RF and AF transformer .

3.0 RELAYS, SWITCHES, CABLES AND CONNECTORS   **3**

3.1   Familiarity with following components: — RELAY**:** Reed relay & solid state relays – Their characteristics, specifications and Applications.

3.2   CABLES **:** RF cables – High temperature cables – Low impedance cables – TV and telephone line cables – Their characteristics and specifications .

3.3   MANUALLY OPERATED SWITCHES**:** Toggle switch – Keyboard switch – Push-button switch – Rotary switch – Thumb-wheel switch – Cross-bar multi switch – Their features and applications .

3.4   CONNECTORS**:** Plugs and sockets – RF connectors – Edge connectors for PCB – Rating and specifications of connectors – Factors affecting choice of connectors – Choice of connectors for different applications

G R O U P – B   **11 PERIODS**

4.0 SEMICONDUCTOR , JUNCTION DIODE , ZENER DIODE   **5**

4.1   Idea of semiconductor , P – type semiconductor , N - type semiconductor , Construction and operation of P.N.Junction Diode . Forward and reverse bias characteristics of P-N junction diode .

4.2   Construction and operation of Zener diode , Zener breakdown and avalanche breakdown .

4.3   Use of P-N junction diode as rectifier and zener diode as voltage regulator.

5.0 BIPOLAR TRANSISTOR   **3**

5.1   Construction and operation of NPN and PNP transistors-V-I characteristics, transistor in active, saturation and cut-off-CE, CB, CC configuration and their differences, definitions of current gains and their relationship .

5.2   Transistor as simple amplifier & oscillator and their simple application

6.0 FIELD EFFECT TRANSISTOR   **3**

6.1 Construction, operation and VI characteristics of JFET, pinch-off voltage, drain résistance, transconductance, amplification factor and their relationship .

G R O U P – C   **9 PERIODS**

7.0 UNIJUNCTION TRANSISTOR   **2**

7.1   Construction, operation and characteristics of UJT – Equivalent circuit – UJT as relaxation oscillator – Field of applications.

8.0 THYRISTOR   **3**

8.1   Construction, operation and characteristics of SCR , DIAC, TRIAC and their uses.

9.0 OPTOELECTRONICS   **2**

9.1   Elementary ideas of LED, LCD, photodiode and solar cell and their applications

10.0 INTEGRATED CIRCUITS   **2**

10.1 Basic idea of Ics – Classifications: linear and digital Ics, SSI, MSI, LSI and VLSI – field of applications

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Subject Code MET/ S3 / P1 / FOE	Course offered in Part – II , 3RD. Semester	Course Duration 15 weeks	2 lecture contact periods (@ 60 Minutes) per week	Full Marks 50

PRACTICAL : LABORATORY EXPERIMENTS :

SL. NO.	NAME OF EXPERIMENT
1	To be familiar with the common assembly tools.
2	To be able to identify the following passive and active circuit elements**: —** Resistor, capacitor, inductor, transformer, relay, switches, batteries/cells, diode, transistors, SCR, DIAC, TRIAC, LED, LCD, photodiode, phototransistors, Ics etc.
3	To be familiar with the following basic instruments **: —** Multimeter, oscilloscope, power supply and function generator.
4	To practice soldering and de-soldering.
5	To construct & test a battery eliminator and simple amplifier circuit on a Bread Board and Vero Board.

E X A M I N A T I O N   S C H E M E

1. Continuous Internal Assessment of 25 marks is to be carried out by the teachers throughout the Third Semester.
2. Distribution of marks : Performance of Job – 15, Notebook – 10.
3. External Assessment of 25 marks shall be held at the end of the Third Semester on the entire syllabus.
4. Distribution of marks for External Assessment : On spot job – 10, Viva-voce – 15

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FUNDAMENTALS OF METALLURGY

Subject Code MET/S3 / T2 / FOM	Course offered in Part - II , 3rd. Semester	Duration 15 weeks	4 lecture contact periods (@ 60 Minutes) per week	Full Marks 70

O B J E C T I V E : Under stand about

1. Introduction about the subject metallurgy
2. Define properties of metals;
3. Crystal structure of metals;
4. Phase diagram, Iron Carbon equilibrium diagram.
4. Metallurgical microscope

M O D U L A R   D I V I S I O N   O F   T H E   S Y L L A B U S

GROUP	MODULE	TOPIC	CONTACT PERIODS
A	1	INTRODUCTION	2
	2	PROPERTIES OF METALLIC MATERIALS	4
	3	CRYSTAL STRUCTURE OF Metals	9
B	4	IRON CARBON DIAGRAM & ITS DESCRIPTION	15
C	5	MICROSCROPY & METALLOGRAPHY	20
	6	PYROMETRY	10
			TOTAL PERIODS: 60

E X A M I N A T I O N   S C H E M E

GROUP	MODULE	OBJECTIVE QUESTIONS				SUBJECTIVE QUESTIONS			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
A	1, 2, 3	7	ANY TWENTY	1	20	FOUR	THREE	5	50
B	4	8				FIVE	FOUR		
C	5, 6	8				FOUR	THREE		

R E F E R E N C E   B O O K S

1. Engineering Physical Metallurgy --- Y. Lakhtin .
2. Introduction to Physical Metallurgy --- S.H.Avner .
3. Physical Metallurgy for Engineers --- Clark & Varney .
4. Principles of Metallographic Laboratory Practice . --- G.L.Khel .

DETAIL COURSE CONTENT

G R O U P – A   **15 PERIODS**

1.0 INTRODUCTION   **2**

1.1 Outline of metallurgy, its importance, past history, present scenario and future.
1.2 Description about course contents, books, future studies, metallurgy as carrier.

2.0 Properties of Metallic Materials   **4**

2.1 Metallic bonding in metals; typical tensile & hardness properties of important metals .
2.2 Common ferrous materials – cast irons; plain carbon and alloy steels – brief description
2.3 Common non-ferrous metals and alloys

3.0 CRYSTAL STRUCTURE OF METALS   **9**

3.1 Crystal structure of metals, miller indices , atomic arrangement, lattice parameter, packing factor, co-ordination number.

3.2   Allotropy & Anisotropy.

3.3 Diagram of different crystal structures of metals - Miller indices; planes and directions .

G R O U P – B   **15 PERIODS**

4.0 IRON CARBON DIAGRAM & ITS DESCRIPTION   **15**

4.1   Idea of equilibrium, phase, components, degrees of freedom.
4.2   Phase rule, mono-variant, di-variant, non-variant system.
4.3   Description of Iron Carbon diagram, eutectic, eutectoid, peritectic reaction.
4.4   Calculation of different phases, lever rule.
4.5   Brief idea about microstructure.

G R O U P – C   **30 PERIODS**

5.0 MICROSCOPY & METALLOGRAPHY   **20**
5.1   Metallurgical Microscope.
5.2   Magnification & Resolving power.
5.3   Numerical Aperture.
5.4   Dark field, Bright field illumination,
5.5   Depth of focus.
5.6   Polishing techniques – manual & electro polishing ..
5.7   Abrasive powders.
5.8   Etching.
5.9   Mounting.

6.0 PYROMETRY   **10**
6.1   Definiton.
6.2   Different types , uses .
6.3   Thermoelectric Pyrometers.
6.4   Calibration of thermocouples.
6.5   Basic theory of optical, radiation & resistance pyrometers.

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Subject Code	Course offered in	Duration	3 Practical contact periods	Full Marks
MET/ S3 / P2 / FOM	Part - II , 3rd. Semester	15 weeks	(@ 60 Minutes) per week	50

PRACTICAL : LABORATORY EXPERIMENTS :

SL. NO.	NAME OF EXPERIMENT
1.0	**CRYSTAL STRUCTURE OF METALS**
1.1	Drawing of BCC , FCC , HCP crystal structure .
1.2	Model Making of BCC , FCC , HCP crystal structure .
2.0	**Study of Microscope & its accessories.**
2.1	Different parts of Metallurgical microscope.
2.2	Sketch of Metallurgical microscope & labelling of its different parts.
2.3	Handling & focusing of microscope.
2.4	Photographic attachment.
3.0	**Polishing & etching of metals .**
3.1	Practicing of grinding.
3.2	Polishing by papers & final polisihing by cloths
3.3	Etching technique & practice.

E X A M I N A T I O N   S C H E M E

1. Continuous Internal Assessment of 25 marks is to be carried out by the teachers throughout the Third Semester.
2. Distribution of marks : Performance of Job – 15, Notebook – 10.
3. External Assessment of 25 marks shall be held at the end of the Third Semester on the entire syllabus.
4. Distribution of marks for External Assessment : On spot job – 10, Viva-voce – 15

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METALLURGICAL THERMODYNAMICS

Subject Code	Course offered in	Duration	4 lecture contact periods	Full Marks
MET/ S3 / T3 / MT	Part - II , 3rd. Semester	15 weeks	(@ 60 Minutes) per week	100

O B J E C T I V E : Under stand about

1. Introduction about the basic principle of thermo-dynamics.
2. Application of basic thermo-dynamics in metallurgy.
3. Importance of thermo-dynamics in metallurgy.
4. Simple mathematical problems on thermo-dynamics related with metallurgy.

M O D U L A R   D I V I S I O N   O F   T H E   S Y L L A B U S

GROUP	MODULE	TOPIC	CONTACT PERIODS
A	1	INTRODUCTION	10
	2	Energy & First law of thermodynamics	12
	3	Second law of thermodynamics	12
B	4	Free Energy & Third law of thermodynamics	12
	5	Ellingham Diagram	14
			TOTAL PERIODS: 60

E X A M I N A T I O N   S C H E M E

GROUP	MODULE	OBJECTIVE QUESTIONS				SUBJECTIVE QUESTIONS			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
A	1 , 2 , 3	12	ANY TWENTY	1	20	SEVEN	FIVE	5	50
B	4 , 5	11				SEVEN	FIVE		

R E F E R E N C E   B O O K S

1) Text book of Materials and Metallurgical Thermodynamics, A. Ghosh, PHI.
3) Physical Chemistry of Metals, L. S. Darken and R. W. Gurry, CBS .
4) Metallurgical Thermodynamics Kinetics And Numericals , Dr. S.K.Dutta and Prof. A.B.Lele .

1.0 Introduction

1.1 Definition of thermodynamics , Applications of thermodynamics in metallurgy , usefulness , limitations , meaning of metallurgical thermodynamics.

1.2 Laws of thermodynamics – 1st. law , 2nd. Law , 3rd. law , Zeroth Law .

1.3 Basic terms used in thermodynamics - Entropy , Reactor, Reaction mixture , system & surrounding , Concept of system (isolated , closed , open) , Homogeneous and heterogeneous systems, State of system , Equation of state , properties of a system (extensive , intensive) .

1.4 Reversible & Irreversible Changes , Equilibrium , types of Equilibrium , meaning of thermodynamic equilibrium .

1.5 Isothermal & Adiabatic changes .

2.0 Energy & First law of thermodynamics .

2.1 Definition of energy , different form of energy , Internal energy, energy as a state property .

2.2 Mathematical deduction & statement of First law of thermodynamics , its significance , measurement of energy change . energy change in terms of partial derivations .

2.3 Heat capacity, differential statement of Heat capacity at constant volume and pressure , relation between them , dependence of heat capacity on temperature , importance of Cp and Cv , Enthalpy, 1st. law in terms of enthalpy , enthalpy change at constant pressure , enthalpy change with temperature, enthalpy change due to chemical reaction - heat of reaction, heat of formation, heat of combustion, latent heat , Heat of solution .

2.4 Simple numerical problems on enthalpy change , heat of reaction , heat of formation .

3.0 Second law of thermodynamics.

3.1 Entropy , Statement of Second law of thermodynamics in terms of entropy , entropy change for a reversible and irreversible process,

3.2 Combined statements of 1st and 2nd laws .

3.3 Simple numerical problems .

4.0 Free Energy & Third law of thermodynamics .

4.1 Helmholtz free energy , Gibbs free energy , free energy of a state , free energy of a substance , free energy as criteria of equilibrium.

4.2 Statement of third law of thermodynamics .

4.3 Simple numerical problems on calculation of change in free energy , feasibility of a reaction to occure .

4.4 Concept of fugacity , activity , standard state , equilibrium constant & its importance , Lechatelier Principle .

4.5 Simple numerical problems on calculation of equilibrium constant , feasibility of a reaction , Gibbs free energy .

5.0 Ellingham Diagram .

5.1 Ellingham Diagram for oxides , important features , characteristics of different curves and explanations.

5.2 Simple numerical problems on Ellingham Diagram .

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MECHANICAL TESTING OF METALS

Subject Code MET/ S3 / T4 / MTOM	Course offered in Part – II 3rd. Semester	Course Duration 15 weeks	4 lecture contact periods (@ 60 Minutes) per week	Full Marks 70

OBJECTIVE

Upon successful completion of this course the students will be able to: —

1. Understand about tensile properties and testing procedure;
2. Understand about impact value and its testing procedure;
3. Know about different hardness value and their testing procedure;
4. Know about definition of fatigue and its properties;
5. Know and explain about various non-destructive testing processes;
6. Know about creep and its measuring parameters.

MODULAR DIVISION OF THE SYLLABUS

GROUP	MODULE	TOPIC	CONTACT PERIODS
A	1	INTRODUCTION	2
	2	TENSILE PROPERTY & TESTING PROCEDURE	10
	3	IMPACT : VALUE & TESTING PROCEDURE	8
B	4	HARDNESS : VALUE & TESTING PROCEDURE	12
	5	FATIGUE & FATIGUE PROPERTY	8
C	6	NON-DESTRUCTIVE TESTING	12
	7	CREEP : PHENOMENON & MEASURING PARAMETERS	8

TOTAL PERIODS: 60

EXAMINATION SCHEME

GROUP	MODULE	OBJECTIVE QUESTIONS				SUBJECTIVE QUESTIONS			
		TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS	TO BE SET	TO BE ANSWERED	MARKS PER QUESTION	TOTAL MARKS
A	1 , 2 , 3 .	8	ANY 20	1	1 x 20 = 20	FIVE	ANY TEN	5	10 X 5 = 50
B	4 , 5	8				FOUR			
C	6 , 7	7				FOUR			

REFERENCE BOOKS :

1. Mechanical Metallurgy -- G.E. Dieter
2. Testing of Metallic Materials -- A.V.K. Suranarayan
3. Mechanical Testing of Metallic Materials -- E.N. Simon

G R O U P – A   **20 PERIODS**

1.0 INTRODUCTION   **2**
1.1 Importance of mechanical testing of metallic materials
1.2 Various testing such as Tension, Compression, Impact, Fatigue, hardness testing etc.

2.0 TENSILE PROPERTY & TESTING PROCEDURE   **10**
2.1 Stress - strain diagram, proof - stress, yield - stress, ductility, & True stress, True strain
2.2 Brief description of Tensile testing machine, actual testing, measurements

3.0 IMPACT : VALUE & TESTING PROCEDURE   **8**
3.1 Definition
3.2 Izod test
3.3 Charpy test
3.4 Effect of variables on Impact test, Transition temp, Blue – Brittleness, Temper- embrittlement

GROUP – B   **20 PERIODS**

4.0 HARDNESS : VALUE & TESTING PROCEDURE   **12**
4.1 Definition
4.2 Brinell hardness test, its description
4.3 Rockwell hardness test, its description
4.4 Vickers hardness test, its description
4.5 Comparison of Brinell & Vickers hardness values
4.6 Rockwell Superficial hardness test, brief idea
4.7 Rebound hardness test, brief idea
4.8 Hot hardness test, brief idea

5.0 FATIGUE & FATIGUE PROPERTY   **8**
5.1   Definition, unit
5.2   Specimen size & shape
5.3   Test procedure, Endurance Limit, application
5.4   Fatigue failure fracture
5.5   Effect of different variables on Fatigue- properties

GROUP – C   **20 PERIODS**

6.0 NON-DESTRUCTIVE TESTING   **12**
6.1 Definition
6.2 Visual examination
6.3 Leakage testing
6.4 Penetrant method
6.5 Magnetic method
6.6 Acoustic method (ultrasonic testing)
6.7 Radiography

7.0 CREEP : PHENOMENON & MEASURING PARAMETERS   **8**
7.1 Importance of Creep, application area
7.2 Stages of Creep, minimum creep rate
7.3 Homologous Temperature
7.4 Stress- rupture test, application area
7.5 Comparison of creep Vs Stress – rupture
7.6 Statistical Creep data

Subject Code	Course offered in	Duration	4 Practical contact periods	Full Marks
MET/ S3 / P4 / MTOM	Part - II , 3rd. Semester	15 weeks	(@ 60 Minutes) per week	100

PRACTICAL : LABORATORY EXPERIMENTS :

SL. NO.	NAME OF EXPERIMENT
1	Rockwell Hardness Testing
2	Brinell Hardness Testing
3	Izod Impact Testing
4	Charpy Impact Testing
5	To study the UTM and Perform The Tensile Testing .
6	Non - Destructive Testing -- Dye Penetrate / Liquid Penetrate Method.
7	Non - Destructive Testing -- Magnetic Particle Crack Detection.
8	Non - Destructive Testing -- Ultrasonic Testing

Requirement of Equipments / Machineries / Ancillaries :

1. Universal tensile testing machine.
2. Rockwell hardness machine.
3. Brinell hardness testing machine.
4. Poldi hardness testing machine.
5. Impact testing machine .
6. Magna check tester.
7. Ultra sonic tester.
8. D.P. test accessories.
9. Different ferrous & non-ferrous samples.

E X A M I N A T I O N   S C H E M E

1. Continuous Internal Assessment of 50 marks is to be carried out by the teachers throughout the Third Semester.
2. Distribution of marks : Performance of Job – 25, Notebook – 25.
3. External Assessment of 50 marks shall be held at the end of the Third Semester on the entire syllabus.
4. Distribution of marks for External Assessment : On spot job – 25 , Viva-voce – 25 .

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Subject Code	Course offered in	Duration	2 lecture contact periods	Full Marks
MET / S3 / T5 / ME	Part - II 3RD. Semester	15 weeks	(@ 60 Minutes) per week	50

O B J E C T I V E :

Metallurgical Engineers while working in industries , he have to deal with operation & maintenance of mechanical machines & equipments , they are also to be conversant with fundamentals of material science, properties of steam, use of steam table and fluid mechanics. There fore, to enable the diploma holders in Metallurgical Engineering to acquire fair knowledge in the above topics the subject Mechanical Engg has been included in the course of studies . After completion of this subject , students will be able to :

1. State and explain properties of steam, Solve the problems of dry, wet and superheated steam.
2. Define the different terminology used in connection with fluid mechanics , State & explain Bernoulli's theorem and its application.
3. State & explain the flow of fluid through notches and discharge through them, Solve simple numerical problems on discharge.

M O D U L A R   D I V I S I O N   O F   T H E   S Y L L A B U S

GROUP	MODULE	TOPIC	CONTACT PERIODS
A	1	MECHANICAL POWER TRANSMISSION	8
	2	BOILER	7
B	3	FLUID – MECHANICS	15

TOTAL PERIODS : 30

E X A M I N A T I O N   S C H E M E

Group	Module	Objective Questions				Subjective Questions			
		To Be Set	To Be Answered	Marks Per Questions	Total Marks	To Be Set	To Be Answered	Marks Per Questions	Total Marks
A	1,2	6	5	1	10	FIVE	THREE	5	5 X 5= 25
B	3	6	5			THREE	TWO		

D E T A I L   C O U R S E   C O N T E N T

G R O U P - A .   **15 PERIODS**

1.0   MECHANICAL POWER TRANSMISSION   **8**

1.1   Types of pulleys , types of gear – spur , helical , bevel gears .
1.2   Joint – couplings – universal joint , types of bearings – applications , chain drive – types of application.

2.0 BOILER   7

2.2   Functions of boilers and their classification, brief description and working principles only of the following boilers – Babcock Wilcox & Fluidized Bed Combustion Boiler .

2.3   Locations & functions only of the following boiler mountings and accessories – water level indicator, fusible plug, pressure gauge , stop valve, safety valve, economiser, superheater, air preheater and feed pump.

G R O U P - B

3.0 FLUID – MECHANICS   15   PERIODS

3.1   Properties of fluid, types of flow – laminar & turbulent flow , pressure of fluid, pressure head of liquid, absolute & vacuum pressure gauge, equation of continuity of flow, Bernoulli' s theorem (proof not required), venturimeter - Simple numerical problems.

3.2   Itroduction with sketch & working principle of fluid power control . Different types of pumps – gear , spiral vane & piston pump .

3.3   Flow of liquid through notches – definition of notch, types of notch, types of notch types of notch - rectangular notch, triangular notch. Formula of discharge through notches (proof not required). Simple numerical problems on discharge

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Subject Code	Course offered in	Duration	2 Practical contact periods	Full Marks
MET/ S3 / P5 / ME	Part - II , 3rd. Semester	15 weeks	(@ 60 Minutes) per week	50

PRACTICAL : LABORATORY EXPERIMENTS :

SL. NO.	NAME OF EXPERIMENT
1	Study & sketch of Lancashire, Cochran, Babcock & Wilcox boiler .
2	Study & sketch of boiler mountings & accessories.
3	Measurement of flow through orifices, notches, pipes .
4	Verification of Bernoulli's theorem .

E X A M I N A T I O N   S C H E M E

1. Continuous Internal Assessment of 25 marks is to be carried out by the teachers throughout the Third Semester.
2. Distribution of marks : Performance of Job – 15, Notebook – 10.
3. External Assessment of 25 marks shall be held at the end of the Third Semester on the entire syllabus.
4. Distribution of marks for External Assessment : On spot job – 10 , Viva-voce – 15 .

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Subject Code	Course offered in	Duration	3 Practical contact periods	Full Marks
MET / S 3 / P5 / WP	Part - II , 3RD. Semester	15 weeks	(@ 60 Minutes) per week	100

PRACTICAL : LABORATORY EXPERIMENTS :

SL. No.	NAME OF EXPERIMENT
1.0	**PATTERN MAKING** **20 PERIODS**
1.1	Study of pattern materials , types of patterns & pattern allowances .
1.2	Contraction and shrinkage allowance for various metals, their influence on pattern making .
1.3	Core box and core print .
1.4	Laying-out of pattern according to drawing and selecting timber for pattern.
1.5	Preparing patterns and making required core boxes for them.
1.6	Making simple patterns from drawing , such as shaft, coupling, bushing and piston etc.
2.0	**MOULDING & CASTING** **25 PERIODS**
2.1	Identify sand, binders and additives used as foundry materials.Composition of Green , Dry sand .
2.2	Describe the mold making processes (ramming, venting, gating, coating, drying, etc.)
2.3	Methods used to prepare simple green mould using single piece and split patterns.
2.4	Preparation of foundry sand .
2.5	Preparation of different types of moulds using single piece, spit or any available pattern - at least 2 moulds should be prepared by each student .

E X A M I N A T I O N   S C H E M E

1. Continuous Internal Assessment of 50 marks is to be carried out by the teachers throughout the Third Semester.
2. Distribution of marks : Performance of Job – 35 , Notebook – 15.
3. External Assessment of 50 marks shall be held at the end of the Third Semester on the entire syllabus.
4. Distribution of marks for External Assessment : On spot job – 25 , Viva-voce – 25 .

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Subject Code	Course offered in	Duration	2 Practical contact periods	Full Marks
MET / S3 / P 6 / PPI	Part - II 3RD. Semester	15 weeks	(@ 60 Minutes) per week	50

Objective : The Student will be able to :

1. Acquire information from different sources.
2. Prepare notes for given topic.
3. Present given topic in a seminar.
4. Interact with peers to share thoughts.
5. Prepare a report on industrial visit, expert lecture

1. Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form part of the term work.

8 Periods

Visits to any two of the following :
i) Nearby Petrol Pump (fuel, oil, product specifications) .
ii) Automobile Service Station (Observation of Components / aggregates)
iii) Engineering Workshop (Layout, Machines)
iv) Dairy Plant / Water Treatment Plant

2. Lectures by Professional / Industrial Expert / Student Seminars based on information . **6 Periods**
Search to be organized from any THREE of the following areas :
i) Pollution control.
ii) Non destructive testing.
iii) Acoustics.
iv) Illumination / Lighting system.
v) Fire Fighting / Safety Precautions and First aids.
vi) Computer Networking and Security.
vii) Topics related to Social Awareness such as – Traffic Control System, Career opportunities, Communication in Industry, Yoga Meditation, Aids awareness and health awareness.

3. Group Discussion : The students should discuss in a group of six to eight students and write a brief report on the same as a part of term work. **8 Periods**

Two topics for group discussions may be selected by the faculty members. Some of the suggested topics are –
i) Sports
ii) Current news items
iii) Discipline and House Keeping
iv) Current topics related to metallurgical engineering field.

4. Student Activities : **8 Periods**

The students in a group of 3 to 4 will perform **any one** of the following activities (others similar activities may be considered) .

i) Collect and study IS code for Engineering Drawing..
ii) Collecting information from Market: Nomenclatures and specifications of engineering materials.
Iii) Specifications of Lubricants.
iv) Draw orthographic projections of a given simple machine element using CAD software .

E X A M I N A T I O N   S C H E M E

1. Continuous Internal Assessment of 25 marks is to be carried out by the teachers throughout the Third Semester.
2. External Assessment of 25 marks shall be held at the end of the Third Semester on the entire syllabus.

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