

C-18 - Curriculum

Diploma in Metallurgical Engineering



**State Board of Technical Education & Training
Telangana, Hyderabad**

IV Semester

TEACHING AND EXAMINATION SCHEME

Sl No	Course Code	Course Name	Teaching Scheme					Examination Scheme						
			instruction peri ods per wee			Total Periods per semester	Credit s	Continuous internal evaluation			Semester end examination			
			L	T	P			mid sem 1	mid sem 2	internal evaluation	Max Marks Min Marks		total marks	Min marks for Passing including internal
1	18MET-401F	Advanced Engineering Mathematics	3	1	0	60	3	20	20	20	40	14	100	35
2	18MET-402C	Heat Treatment Technology	3	1	0	60	3	20	20	20	40	14	100	35
3	18MET-403F	Electrical Technology	3	1	0	60	3	20	20	20	40	14	100	35
4	18MET-404C	Material Testing	3	1	0	60	3	20	20	20	40	14	100	35
5	18MET-405C	Foundry Technology	3	1	0	60	3	20	20	20	40	14	100	35
6	18MET-406P	Material Testing Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
7	18MET-407P	Heat Treatment Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
8	18MET-408P	Foundry Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
9	18MET-409P	Basic Electrical Lab	1	0	2	45	1.5	20	20	20	40	20	100	50
10	18MET-410P	Advanced Communications and Life SkillsLab	1	0	2	45	1.5	20	20	20	40	20	100	50
11		Skill Upgradation	0	0	7	105	2.5	0	0	Rubrics			--	-
			20	5	17	630	25	200		200	40	170	100	425
	Activities: student performance is to be assessed through Rubrics													

ADVANCED ENGINEERING MATHEMATICS

Course Title	: Advanced Engineering Mathematics	Course Code	: 18FW-401F
Semester	: IV	Course Group	: Foundation
Teaching Scheme in periods (L : T :P)	: 45 : 15 : 0	Credits	: 3
Methodology	: Lecture + Tutorial	Total Contact Periods	: 60
CIE	: 60 Marks	SEE	: 40 Marks

Pre requisites

This course requires the knowledge of Engg. Mathematics at Diploma first year level and Applied Engg. Mathematics at Diploma 3rd Semester level.

Course Outcomes :

At the end of the course, the student will have the ability to:

CO 1	Solve simple Homogeneous Linear Differential Equations
CO 2	Solve simple Non-Homogeneous Linear Differential Equations
CO 3	Express $f(x)$ as a Fourier series in the given interval
CO 4	Express $f(x)$ as a Fourier Half-Range Cosine series and Sine series
CO 5	Find Laplace transforms of simple functions
CO 6	Find Inverse Laplace transforms of simple functions and solve Linear Differential Equations using Laplace Transformations.

Blue Print of Marks for SEE

Unit No	Unit Name	Periods	Questions to be set for SEE			
			R		U	A
1	Homogeneous Linear Differential equations with constant coefficients	05	Q4	Q1	Q9(a)	Q13(a)
2	Non-Homogeneous Linear Differential equations with constant coefficients	15				
3	Fourier series	10		Q2	Q10(a)	Q14(a)
4	Fourier Half-range series	05				
5	Laplace Transforms	10		Q3	Q5,Q6	Q9(b), Q11(a), Q11(b)
						Q13(b), Q15(a), Q15(b)

6	Inverse Laplace transforms	15			Q7,Q8	Q10(b), Q12(a), Q12(b)	Q14(b), Q16(a), Q16(b)
Total		60	8			8	8

Course Contents:

Unit – I

Duration: 05 Periods (L:3.0 – T:2.0)

Homogeneous Linear Differential equations with constant coefficients

Homogenous linear differential equations with constant coefficients of order two and higher with emphasis on second order.

Unit – II

Duration: 15 Periods (L:12.0 – T:3.0)

Non-Homogeneous Linear Differential equations with constant coefficients

Non-homogenous linear differential equations with constant coefficients of the form $f(D)y = X$, where X is in the form k (a constant), e^{ax} , $\sin ax$, $\cos ax$, x^n , ($n = 1, 2, 3$) Complimentary Function (CF), Particular Integral (PI) and General Solution (GS).

Unit-III

Duration: 10 Periods (L: 8.0 – T: 2.0)

Fourier series

Orthogonality of trigonometric functions, Representation of a function in Fourier series over the interval $(c, c + 2\pi)$, Euler's formulae, sufficient conditions for existence of Fourier series for a function. Even, Odd functions and Fourier series over the Interval $(0, 2\pi)$ and $(-\pi, \pi)$

Unit – IV

Duration: 05 Periods (L: 3.0 – T: 2.0)

Fourier Half-range series

Representation of a function as Fourier Half-range Sine series and Cosine series over the interval $(0, \pi)$

Unit – V

Duration: 10Periods (L: 7.0 – T:3.0)

Laplace Transformations:

Definition, sufficient conditions for existence of Laplace Transform, Laplace Transform of elementary functions, linearity property, Change of scale property, First shifting theorem ,

multiplication by t^n , division by t , Laplace Transform of derivatives and integrals, unit step function, Laplace Transform of second shifting theorem

Unit – VI

Duration: 15 Periods (L: 12.0 – T: 3.0)

Inverse Laplace transforms:

Inverse Laplace transforms- shifting theorems and change of scale property, multiplication by s^n and division by s –Inverse Laplace Transform using partial fractions – convolution theorem (no proof) – application of Laplace Transformations to solve ordinary differential equations of second order with initial conditions.

Recommended Books:

1. Higher Engineering Mathematics, B.S.Grewal .
2. Laplace Transforms - Murray R. Spiegel .
3. Ordinary Differential Equations – R. S. Aggarwal.
4. Fourier Series – A.R. Vasishtha and Gupta.

Suggested E-Learning references:

1. www.freebookcentre.net/mathematics/introductory-mathematics-books.html
2. E-books:www.mathebook.net

Suggested Learning Outcomes

Unit-I

1.0 Solve Homogeneous linear differential equations with constant coefficients in engineering situations

- 1.1 Solve Differential equations of the type $(aD^2 + bD + c)y = 0$ when the roots of the auxiliary equation are real and different, real and repeated, complex.
- 1.2 Solve the higher order homogeneous Linear differential equations with constant coefficients.

Unit-II

2.0 Solve Non Homogeneous linear differential equations with constant coefficients in engineering situations

- 2.1 Explain the concept of complementary function, particular Integral and general solution of a differential equation.
- 2.2 Solve n^{th} order differential equation of the type $f(D)y = X$ where $f(D)$ is a polynomial of second order and X is a function of the form $k, e^{ax}, \sin ax, \cos ax, x^n$.
- 2.3 Solve simple problems on the above types of 2.2

Unit-III

3.0 Understand the Fourier series expansion of functions

- 3.1 Define the orthogonality of functions in an interval.
- 3.2 Define Fourier series of a function on the interval $(C, C+2\pi)$ and write the Euler's formulae for determining the Fourier coefficients.
- 3.3 Write sufficient conditions for the existence of Fourier series for a function.
- 3.4 Write Fourier series of simple functions in the range $(0, 2\pi)$ and $(-\pi, \pi)$.
- 3.5 Write Fourier series for even and odd functions in the interval $(-\pi, \pi)$
- 3.6 Solve simple problems on even and odd functions in the interval. $(0, 2\pi)$ and $(-\pi, \pi)$

Unit- I

4.0 Understand the Half – Range Fourier series expansion of functions

- 4.1 Write Half – Range Cosine series of a function in the range $(0, \pi)$.
- 4.2 Write Half – Range Sine series of a function in the range $(0, \pi)$.
- 4.3 Solve simple problems on Half – Range Cosine and Sine series over the interval $(0, \pi)$

Unit-V

5.0 Understand Laplace transforms

- 5.1 Write the definition of Laplace Transform and Laplace transform of standard functions.
- 5.2 Explain the sufficient conditions of existence of Laplace Transform.

- 5.3 Write the properties of Laplace Transform – Linearity property, First shifting theorem, Change of Scale property.
- 5.4 Solve simple problems using the above properties.
- 5.5 Write formulae for Laplace transform of $t^n f(t)$, $\frac{f(t)}{t}$, $f^n(t)$, $\int_0^t f(u) du$ in terms of Laplace transform of $f(t)$
- 5.6 Solve simple problems using the above formulae.
- 5.7 Define unit step function and write the Laplace Transform of unit step function.
- 5.8 Write Second shifting theorem.

Unit-VI

6.0 Use Laplace transforms and Inverse Laplace transforms to solve differential equation in engineering problems

- 6.1 Define inverse Laplace Transform and write inverse Laplace Transforms of standard functions.
- 6.2 Solve simple problems on Inverse Laplace Transforms.
- 6.2 Write Shifting theorems and Change of scale property of inverse Laplace Transform.
- 6.3 Solve simple problems on 6.2
- 6.4 Write inverse Laplace Transforms corresponding to Laplace Transform of the functions $t^n f(t)$, $\frac{f(t)}{t}$, $f^n(t)$, $\int_0^t f(u) du$
- 6.5 Solve simple problems on 6.4
- 6.6 Define convolution of two functions and state convolution theorem.
- 6.7 Solve simple problems on Convolution theorem.
- 6.8 Use Laplace and inverse Laplace Transforms to solve simple differential equations of Second order.

Suggested Student Activities:

1. Student visits Library to refer Standard Books on Mathematics and collect related material.
2. Quiz
3. Group discussion
4. Surprise tests
5. Seminars
6. Home Assignments.

CO-PO Mapping Matrix

	Basic knowledge	Discipline Knowledge	Experiments and practice	Engineering Tools	Engineer and society	Environment & sustainability	Ethics	Individual and Team work	Communication	Lifelong learning	Linked PO
CO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	
CO1	3	2	2	1			1			3	1,2,3,4,7,10
CO2	3	2	2	1			1			3	1,2,3,4,7,10
CO3	3	2	2	1			1			3	1,2,3,4,7,10
CO4	3	2	2	1			1			3	1,2,3,4,7,10
CO5	3	2	2	1			1			3	1,2,3,4,7,10
CO6	3	2	2	1			1			3	1,2,3,4,7,10

Internal Evaluation

Test	Units	Marks
Mid Sem 1	1 and 2	20
Mid Sem 2	3 and 4	20
Slip Test 1	1 and 2	5
Slip Test 2	3 and 4	5
Assignments	-	5
Seminars	-	5
	Total	60

QUESTION PAPER PATTERN FOR MID SEMESTER EXAMS

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
01	Part-A	Remembering(R)	4	1	Nil	4 Marks
02	Part-B	Understanding(U)	4	3	2	6 Marks
03	Part-C	Application(A)	4	5	2	10 Marks
Total Marks						20 Marks

MID SEM-I EXAM

S.No	Unit No	R	U	A	Remarks
1	Unit-I	1,2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-II	3,4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

MID SEM-II EXAM

S.No	Unit No	R	U	A	Remarks
1	Unit-III	1,2	5(a)	7(a)	
			5(b)	7(b)	
2	Unit-IV	3,4	6(a)	8(a)	
			6(b)	8(b)	
Total Questions		4	4	4	

The length of answer for each question framed in respect of Part-A, B&C shall not exceed $\frac{1}{4}$ of a page, 1page and 2 pages respectively

QUESTION PAPER PATTERN FOR SEMESTER END EXAM

Sl.No	Description	Level	No of Questions	Marks for each question	Choice	Total Marks
01	Part-A	Remembering(R)	8	1	Nil	8 Marks
02	Part-B	Understanding(U)	8	3	4	12 Marks
03	Part-C	Application(A)	8	5	4	20 Marks
Total Marks						40 Marks

Unit No	Questions to be set for SEE				
	R		U		A
I	Q4	Q1		Q9(a)	Q13(a)
II					
III		Q2		Q10(a)	Q14(a)
IV					
V		Q3	Q5,Q6	Q9(b), Q11(a), Q11(b)	Q13(b), Q15(a), Q15(b)
VI			Q7,Q8	Q10(b), Q12(a), Q12(b)	Q14(b), Q16(a), Q16(b)
Total Questions	8		8		8

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
BOARD DIPLOMA EXAMINATIONS
MID SEM –I, MODEL PAPER, IV SEMESTER
ADVANCED ENGINEERING MATHEMATICS

TIME: 1: 00 Hours

Max. Marks: 20

PART-A

Instructions:

1. Answer **ALL** questions

04 X 01 = 04

2 Each question carries **ONE** mark

1. Write the General solution of $(aD^2+bD+c)y = 0$, whose roots of auxiliary equation are real and distinct.
2. Find the roots of auxiliary equation of the differential equation $(D^2 + 2D + 1)y = 0$
3. Find the Particular Integral of $(D^2 - 4D + 1)y = e^{3x}$
4. Find the P.I of $(D^2 - 16)y = \sin 4x$

PART-B

Instructions:

1. Answer any **TWO** questions

02 X 03 = 06

2. Each question carries **THREE** marks

5 a) Solve: $(D^2 + 3D - 54)y = 0$

Or

5 b) Solve : $(D^2 + 16)y = 0$

6 a) Solve : $(D^2 + 4D + 4)y = e^{2x}$

Or

6 b) Find P.I of $(D^3 + D)y = \sin 2x$

PART C

Instructions:

1. Answer **ALL** questions

02 X 05 = 10

2. Each question carries **FIVE** marks

7 a) Solve : $(D^3 - 2D^2 - 4D + 8)y = 0$

Or

7 b) Solve : $(D^3 - D^2 - D + 1)y = 0$

8 a) Solve : $(D^2 + 36)y = \sin^2 x$

Or

8 b). Solve : $(D^2 + 3D + 2)y = x^2$

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Code: 18FW-401F

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA
BOARD DIPLOMA EXAMINATIONS
MID SEM –II, MODEL PAPER, IV SEMESTER
ADVANCED ENGINEERING MATHEMATICS

TIME: 1: 00 Hours

Max. Marks: 20

PART-A

Instructions:

1. Answer **ALL** questions

04 X 01 = 04

2 Each question carries **ONE** mark

1. Define periodic function and give one example
2. Define Fourier series of the function $f(x)$ in the interval $(0, 2\pi)$
3. Write Half-range sine series of $f(x)$ in the interval $(0, \pi)$
4. Find a_0 for $f(x) = e^x$ in $0 < x < \pi$

PART-B

Instructions:

1. Answer any **TWO** questions

02 X 03 = 06

2. Each question carries **THREE** marks

5 a). If $f(x) = x^2$ in $(0, 2\pi)$, then find the value of a_n in Fourier series of $f(x)$

Or

5 b) If $f(x) = |x|$ in $(-\pi, \pi)$, then find the value of a_1 in Fourier series of $f(x)$

6 a). Find the value of a_n in half-range Cosine series for the function $f(x) = e^x$ in $(0, \pi)$

Or

6 b). Obtain the Fourier Half – Range Sine series for $f(x) = (\pi - x)$ in the interval $(0, \pi)$

PART C

Instructions:

1. Answer any **TWO** questions

02 X 05 = 10

2. Each question carries **FIVE** marks

7 a). Obtain the Fourier series for $f(x) = x$ in the interval $0 < x < 2\pi$

Or

7 b). Find the Fourier series for $f(x) = (x - x^2)$ in the interval $(-\pi, \pi)$. Hence show that

$$\frac{1}{1^2} - \frac{1}{2^2} + \frac{1}{3^2} - \frac{1}{4^2} + \dots = \frac{\pi^2}{12}$$

8 a) Express $f(x) = \pi x - x^2$ as a half-range Sine series in $(0, \pi)$

Or

8 b). Find the half –range cosine series for the function $f(x) = x^2$ in the interval $(0, \pi)$

18FW-401F

BOARD DIPLOMA EXAMINATION, (C-18)
SEMESTER END EXAM MODEL PAPER
IV SEMESTER EXAMINATION
ADVANCED ENGINEERING MATHEMATICS

Time: 2 hours

[Total Marks: 40]

PART-A

Instructions:

1. Answer **ALL** questions

08 X 01 = 08

2 Each question carries **ONE** mark

1. Find the roots of auxiliary equation of the differential equation $(D^2 + 4D)y = 0$.
2. Define Fourier Series for the function $f(x)$ in the interval $(c, c+2\pi)$
3. Find the Particular Integral of $(D^2 - 4D + 1)y = e^x$
4. Find $L(e^{2t} + \cos 3t)$
5. Find $L(t + 5 \cosh t)$
6. State the First Shifting theorem of Laplace Transforms.
7. Find $L^{-1}\left(\frac{1}{s-3} + \frac{s}{s^2+4}\right)$
8. Find $L^{-1}\left(\frac{1}{2s+5}\right)$

PART-B

Instructions:

1. Answer any **FOUR** questions

04 X 03 = 12

2. Each question carries **THREE** marks

9. a) Solve: $(D^2 + D + 1)y = 4e^{3x}$

Or

9 b) Find $L(t\cos 3t)$

10 a) Find Half Range Sine Series of $f(x) = x$ in $(0, \pi)$

Or

10 b) Find $L^{-1}\left(\frac{s+1}{s^2+6s-7}\right)$

11 a) If $L\{f(t)\} = \frac{20-4s}{s^2-4s+20}$, find $L\{f(3t)\}$

Or

11 b) Find $\int_0^\infty t \cdot e^{-2t} \sin 3t dt$ using Laplace Transform Technique

12 a) Show that $L^{-1}\left(\frac{1}{s(s^2+a^2)}\right) = \frac{1-\cos at}{a^2}$

12 b) Find $L^{-1}\left(\frac{s}{(s+2)^2+4}\right)$

PART C

Instructions: 1. Answer any **FOUR** questions

04 X 05 = 20

2. Each question carries **FIVE** marks

13. a) Solve : Solve: $(D^2 + D - 2)y = x + \sin x$

Or

13 b) Find $L[te^t \sin 3t]$

14 a) Expand $f(x) = x^2$ as a Fourier series in the interval $(-\pi, \pi)$

Or

14 b) Find $L^{-1}\left(\frac{s}{(s+1)^2(s^2+1)}\right)$

15 a) Find $L\left(\frac{\sin 3t \cdot \cos t}{t}\right)$

Or

15 b) Evaluate $L\left\{\int_0^t \frac{\sin t}{t} dt\right\}$

16 a) Find $L^{-1}\left(\frac{1}{(s+1)(s+2)}\right)$ using Convolution theorem .

Or

16 b). Solve the differential equation $y'' - 2y' - 8y = \sin t$, when $y(0) = 3$, $y'(0) = 6$ by

Laplace Transform method.

HEAT TREATMENT TECHNOLOGY

Course title:	HEAT TREATMENT TECHNOLOGY	Course Code:	18MET402C
Semester:	IV	Course group:	Core
Teaching scheme in Hrs. (LTP):	30:15:0	Credits:	3
Type of course:	Lecturer+ Assignment:	Total contact Periods. :	45 Hrs./60 periods
CIE:	60 Marks	SEE:	40 Marks

Prerequisites: knowledge of iron-carbon equilibrium diagram and micro constituents in steel

Course Outcomes COs

At the end of the course, the student will have the ability to:

CO1: Explain the different methods of heat treatment process for steels.

CO2: Explain the concept of hardenability.

CO3: Explain the principles of heat treatment

CO4: Explain the different heat treatment methods for Non ferrous metals and alloys.

CO5: Identify the types of alloy steels and Tool steels and their heat treatment process.

CO6: Explain the chemical heat treatment and surface hardening of the steel.

COURSE CONTENTS

1.0 Heat Treatment process for Steels:

Duration: 8 Periods

Introduction, Stress relieving, Annealing -Full annealing, Isothermal annealing, Diffusion annealing, Partial annealing, Recrystallization annealing, Process annealing, Spheroidizing; Normalizing - process, Normalizing versus annealing; Hardening -process ,Factors affecting hardening process, Hardening methods, Removal of heat during quenching ; Tempering –process ,Structural changes during tempering, Austempering (in brief), Mar tempering (in brief), Sub-zero treatment

2.0 Hardenability and grain size:

Duration: 10 Periods

Definition, difference between hardness and harden ability, critical & ideal critical diameter, calculation of ideal critical diameter, jominy end quench test process and its uses, Effect of grain size

on properties of steel, Grain size determination by. Carburizing method, ASTM Comparative Method, Heyn's intercept method, Jefferies planimetric method.

3.0 PRINCIPLES OF HEAT TREATMENT OF STEELS: Duration: 8 Periods

Introduction, Formation of austenite on heating, kinetics formation of austenite, The construction of Time Temperature Transformation curve, Effect of alloying elements on TTT diagram, Continuous cooling transformation (CCT diagram for eutectoid steel), Bainitic transformation, Martensitic transformation.

4.0 Heat treatment of Non-ferrous Metals:

Duration: 12 Periods

Introduction, Precipitation hardening of Al-Cu alloys. Heat treatment of Brasses and Bronzes.

5.0 Alloy Steels & their Heat treatment:

Duration: 9 Periods

Definition, Purpose of alloying, Effect of alloying elements on Fe - C diagram. Classification of alloying elements, Nickel steels, Manganese steels, Chromium steels, Stainless steels, Tool steels heat treatment, properties and uses. Maraging steels.

6.0 Special heat - treatment techniques and defects in heat treated products: Duration: 13 Periods

Introduction, Chemical heat treatments -Carburizing, Nitriding, Cyaniding. Surface hardening treatments-Flame and Induction hardening. Defects in the Heat treatment.

COURSE LEARNING OBJECTIVES

After the completion, of course the student will be able to

1.0 Heat treatment of steels:

1.1 Define Heat Treatment.

1.2 Explain the objectives & purposes of Heat Treatment.

1.3 List the Heat treatment processes. a) Annealing b) Normalizing c) Hardening.

1.4 List out the types of annealing process:

Stress relieving, annealing -Full annealing, Isothermal annealing,

Diffusion annealing, partial annealing, Recrystallization annealing,

Process annealing, Spheroidizing.

1.5 Draw the microstructures at various temperatures of annealing.

1.6 Explain the normalizing process and Draw the normalized microstructure.

1.7 Compare annealing & normalizing.

1.8 Explain hardening process (in brief)

1.9 Mention the stages of quenching.

1.10 Define & state the purpose of Tempering

- 1.11 Explain the Tempering process (in brief).
- 1.12 Explain the effect of Tempering on microstructure and mechanical properties.
- 1.13 Austempering, Martempering and sub zero treatment (in brief).

2.0 Hardenability and grain size:

- 2.1 Define hardenability
- 2.2 Differentiate Hardness and Hardenability.
- 2.3 Distinguish different Quenching Media.
- 2.4 Define the cooling power of Quenching Media.
- 2.5 Define critical diameter & ideal critical diameter.
- 2.6 Explain the Jominy end - quench test and its uses.
- 2.7 Define grain size.
- 2.8 Determine the grain size by carburizing method and ASTM comparative Method.
- 2.9 Determine the measurement of Austenite grain size by Heyn's intercept method and Jefferies planimetric method.

3.0 PRINCIPLES OF HEAT TREATMENT OF STEELS:

- 3.1 Know about the phase transformations on heating of steels.
- 3.2 Know about the decomposition of austenite on cooling.
- 3.3 Define isothermal transformation.
- 3.4 Explain the construction of Time Temperature Transformation Diagrams.
- 3.5 Explain the factors affecting position of TTT curve.
- 3.6 Define Critical cooling rate.
- 3.7 Explain the superimposition of continuous cooling curves.
- 3.8 Define a) Pearlite b) Bainite & c) Martensite
- 3.9 Explain the mechanism of austenite to
 - a. Pearlitic transformation b. Bainitic transformation c. Martensitic transformation.

4.0 Heat treatment of Non-ferrous Metals

- 4.1 Know about the Heat treatment of Al-Cu alloy.
- 4.2 Explain solution treatment with the help of Al - Cu phase diagram
- 4.3 Explain precipitation hardening.
- 4.4 Explain the theory of Age-hardening.
- 4.5 List the Al - alloys responds to precipitation hardening
- 4.6 Explain the Heat treatment process for Brass and Bronzes

5.0 Heat Treatment of Alloy steels

- 5.1 Explain the purpose of alloying.
- 5.2 Mention the effect of alloying elements on the Fe-Carbide diagram.
- 5.3 Classify the alloying elements which tend to
 - A. form carbides.
 - B. graphitize the carbides
 - C. stabilize the austenite
 - D. stabilize the Ferrite
- 5.4 Give the composition, properties & applications of Manganese steels
- 5.5 Define stainless steels.
- 5.6 Classify the stainless steels.
- 5.7 Explain the composition, properties and applications of
 - a. Ferritic b. Austenitic c. Martensitic stainless steels.
- 5.8 Explain the heat treatment process for ferritic, austenitic and Martensitic stainless steels.
- 5.9 Know about sensitization & stabilization.
- 5.10 List the causes and remedies of sensitization.
- 5.11 Know about composition, properties and applications of Maraging steels.
- 5.12 Define tool steels.
- 5.13 Give the composition of
 - a) Water hardening steels b) High-speed tool steels.
- 5.14 List the properties of high-speed tool steels.
- 5.15 Give the heat treatment procedure for tool steels
- 5.16 Explain the heat treatment cycle for high-speed steels.

6.0 Special heat treatment techniques

- 6.1 Define case hardening.
- 6.2 Know the case hardening techniques.
- 6.3 Define a) carburizing b) Nitriding c) Cyaniding d) Flame Hardening e) Induction Hardening
- 6.4 List the types of carburizing Techniques.
- 6.5 Explain a) Pack carburizing, b) Gas carburizing.
- 6.6 List the applications of carburized steels
- 6.7 Explain the post carburizing heat treatment.
- 6.8 Explain the nitriding process.
- 6.9 Know about white layer.

- 6.10 Explain the cyaniding process.
- 6.11 Explain the flame hardening process.
- 6.12 Explain the induction hardening process.
- 6.13 Know about defects in heat treated products.
- 6.14 Mention the causes and remedies of low hardness, soft spots, Oxidation, Decarburization, overheating, burning, quenches, Cracks, distortion and warping.

Suggested Student Activities

- 1. Student inspects the available equipment in the Lab to identify the various furnaces.
- 2. Visit nearby Industry to familiarize with Heat treatment lab equipment like Muffle furnace, salt bath furnace and jominy end quench test. Gas carburizing and surface Hardening.
- 3. Quiz
- 4. Group discussion
- 5. Surprise test
- 6. Seminars.

REFERENCE BOOKS:

- 1. Heat Treatment Principles and Techniques - by T.V. Rajan Shirma, Ashok Sharma.
- 2. Engineering metallurgy Part I - by Raymond Higgins
- 3. Metallurgy for Engineers - by E.C. Rollason ELBS.
- 4. Physical metallurgy and Heat Treatment – by Lakhtin
- 5. Introduction to physical metallurgy - Sydney H. Avener
- 6. Physical metallurgy for engineers – Clark & Warney
- 7. Materials science and Metallurgy - kodigere.

LIST OF LEARNING WEBSITES

<http://www.nptel.ac.in/course.php>
<https://www.msm.cam.ac.uk/ug-study/part-ia>
<https://www.phase-trans.msm.cam.ac.uk/teaching.html>

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	Mapped POs
CO1	2	2	3	2	2				2	2	1,2,5,6,10
CO2	2	2	3						2	2	1,2,3.
CO3	2	2	3	2					2	2	1,2,3,10
CO4	3	3	3						2	2	1,2,5,10.
CO5	3	3	3	3					2	2	1,2,5,6,9,10
CO6	3	3	3	2		2			2	2	1,2,3,6,9,10

MID SEM-I EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

MID SEM –II EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

Semester End Examination

Sl No	Unit No.	Questions to be set for SEE				Remarks	
		R		U	A		
1	I	4	1		9(a)	13(a)	
2	II						
3	III		2		10(a)	14(a)	
4	IV						
5	V		3	5, 6	9(b)	13(b)	
					11(a)	15(a)	
				11(b)	15(b)		
6	VI		7,8	10(b)	14(b)		
				12(a)	16(a)		
				12(b)	16(b)		
Total Questions		8		8	8		

Legend:	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

MODEL QUESTION PAPER
BOARD DIPLOMA MID SEMESTER EXAMINATIONS (C-18)
D.MET.E IV SEMESTER EXAMINATION
18 MET-402C HEAT TREATMENT TECHNOLOGY

Time: 1 Hours

Maximum Marks: 20Marks

PART-A

Answer **ALL** questions. Each question carries **ONE** mark

4X1 =4

1. State the purpose of heat treatment.
2. Define Isothermal annealing.
3. Define Hardenability.
4. Define grain size.

PART-B

Answer **ALL** questions. Each question carries **THREE** marks

2X3 =6

- 5(a). Explain Spherodizing annealing.
(OR)
- 5(b). Explain the martempering process.
- 6(a). Determine the measurement of grain size by ASTM method.
(OR)
- 6(b). Explain the Jominy End Quench Test.

PART-C

Answer **ALL** questions. Each question carries **FIVE** marks

2X5 =10

- 7(a). Explain tempering process.
(OR)
- 7(b). Explain the effect of tempering and microstructure and mechanical properties.
- 8(a). Determine measurement of Austenite Grain Size by Heyn's Intercept Method.
(OR)
- 8(b). Determine measurement of Austenite Grain Size by Jefferies Planimetric Method.

MODEL QUESTION PAPER
BOARD DIPLOMA SEMESTER END EXAMINATIONS (C-18)
D.MET.E IV SEMESTER EXAMINATION
18 MET-402C HEAT TREATMENT TECHNOLOGY

Time: 2 Hours

Maximum Marks: 40Marks

PART-A

Answer **ALL** questions. Each question carries **ONE** mark

8X1 =8

1. Define Heat treatment.
2. Define Isothermal transformation.
3. Classify stainless steels.
4. Mention the stages of quenching
5. Define tool steels.
6. Mention the composition of high-speed tool steels.
7. Define case hardening.
8. Mention about “White Layer”.

PART-B

Answer **ALL** questions. Each question carries **THREE** marks.

4x 3 = 12

- 9(a). Compare Annealing and Normalizing.
(OR)
- 9(b). What is Sensitization and Stabilization.
- 10(a). What is Critical Cooling Rate
(OR)
- 10(b). Define Carburizing and List the Carburizing Techniques.
- 11(a). Mention the purpose of Alloying.
(OR)
- 11(b). Classify the Alloying elements which tend to stabilize the Ferrite and Austenite.
- 12(a). Compare Pack Carburizing and Gas Carburizing.
(OR)
- 12(b). List out the defects in heat treated products.

PART-C

Answer **ALL** questions. Each question carries **FIVE** marks

4x5=20

- 13(a). Explain the Tempering Process in brief.
(OR)
- 13(b). Explain the Heat Treatment Procedure for Tool Steels.
- 14(a). Explain the construction of Time Temperature Transformation diagrams.
(OR)

14(b). Explain the Nitriding Process.

15(a). Explain the effect of Alloying elements on Fe-Fe₃C diagram.

(OR)

15(b). Explain the heat treatment process for Martensitic Stainless Steels.

16(a). Explain the Post Carburizing heat Treatment.

(OR)

16(b). Explain the Induction Hardening Process.

Electrical Technology

Course title:	Electrical Technology	Course Code:	18MET403F
Semester:	IV	Course group:	F
Teaching scheme in Hrs. (LTP):	30:15:0	Credits:	3
Type of course:	Lecturer+ Assignment:	Total contact Periods. :	45 Hrs./60 periods
CIE:	60 Marks	SEE:	40 Marks

Prerequisites: Basic knowledge of Electricity, Physics and Mathematics

Course Outcomes COs

At the end of the course, the student will have the ability to:

CO1: Solve D.C. circuits and Choose proper measuring instruments depending on the purpose.

CO2: Know the working and construction of D.C. Generators.

CO3: Summarize the characteristics of a.c. waveforms, interpret and solve their effects in 1-phase and 3-phase circuits.

CO4: Relate the concepts of Electromagnetism to explain the concepts of Induced E.M.F...

CO5: Know the principle and construction of A.C. motors and alternators.

CO6: Correlate the induced E.M.F. concepts to explain the construction and working of D.C. machines and A.C. machines.

COURSE CONTENTS

Unit 1.0 D.C. circuits and Measuring instruments Duration: 10 periods

1. Solutions of D.C. series, parallel circuits- Kirchoff's laws - Electrical Instruments- ammeter, voltmeter, Megger, multi meter and energy meter (single phase).

Unit 2.0 D.C. Generators Duration: 10 periods

D.C. generators – working & construction - types of generators - E.M.F. equation-classification.

Unit 3.0 D.C. Motors Duration: 10 periods

D.C. motors- working & construction - types of motors – applications - back E.M.F, torque equation - 3point starter - speed control.

Unit 4.0 A.C. Circuits Duration: 10 periods

Single phase circuits – Sinusoidal E.M.F.- wave form - values of A.C. - phase and phase difference, power factor, equation for power - 3 phases E.M. F. - star and delta connected system - Balanced loads.

Unit 5.0 Transformers**Duration: 10 periods**

Electro Magnetism - Electromagnetic induction - Self and Mutual inductances. Transformers construction & working – Step up, Step down - single phase and 3-phase transformers - Auto transformer.

Unit 6.0 A.C. Machines**Duration: 10 periods**

Induction Motors, Classification – Constructional details & Principles of operation – Torque, slip – Starters, Types of Three phase & Single phase motors- Applications- Constructional details of alternators and Principle of Operation Alternator.

COURSE LEARNING OBJECTIVES

On completion of this subject, the student should be able to

Unit – 1**1.0 Solve D.C. Series – parallel circuits and know the use of measuring instruments**

- 1.1 Calculate equivalent resistance of series – parallel circuits
- 1.2 To solve problems on series - parallel circuits
- 1.3 State and explain Kirchhoff's laws
- 1.4 State the use of M.C. and M.I. Ammeter and Voltmeter.
- 1.5 State the use of Megger, Multi meter and Energy meter in electrical measurements.

Unit – 2**2.0 Understand working of D.C. Generators**

- 2.1 Explain working principle of D.C. generators
- 2.2 List the parts of D.C. generators and materials used
- 2.3 State functions of each part of D.C. generator.
- 2.4 State E.M.F equation
- 2.5 Solve formula substitution problems on E.M. F. equation.
- 2.6 Classify D.C. Generators and indicate current directions.

Unit – 3**3.0 Understand working of D.C. Motors**

- 3.1 Explain principle of working of D.C. motors
- 3.2 Classify D.C. motors and indicate current directions.
- 3.3 State back E.M.F. (no derivation)
- 3.4 Write formula for speed of D.C. motor in terms of supply voltage current and flux.
- 3.5 State Torque equation (no derivation).
- 3.6 Explain necessity of starter.

- 3.7 Explain the working of 3-point starter.
- 3.8 Explain speed control of D.C. shunt motor by Armature control and Field control
- 3.9 State applications of D.C. motors.

Unit – 4

4.0 Understand Single and Three phase systems

- 4.1 Define: waveform, cycle, time, period, frequency, instantaneous value, maximum value, average value and R.M.S. value.
- 4.2 State expression for average and R.M.S. values in terms of maximum value.
- 4.3 Explain instantaneous value in terms of maximum value.
- 4.4 Explain phase and phase difference (with graph only), and power factor.
- 4.5 State equation for power in single-phase circuits..
- 4.6 State phase and line voltage & currents and their relationships in star and delta connections.
- 4.7 State the expression for power in a 3-phase circuit.
- 4.8 Work problems on balanced star and delta connected loads.

Unit – 5

5.0 Know working of Single and 3 phase Transformers

- 5.1 State Faraday's Laws of Electro – Magnetic Induction
- 5.2 State Lenz's Law
- 5.3 Explain self induced e.m.f and mutually induced e.m.f
- 5.4 State expression for self-inductance and mutual inductance (No derivation)
- 5.5 Explain working principle of transformers.
- 5.6 Explain construction of a transformer.
- 5.7 Classify transformers based on types of core
- 5.8 State step up and step down transformers.
- 5.9 State autotransformer and its uses.
- 5.10 Comprehend the construction and working of 3 phase transformers

Unit – 6

6.0 Explain the working of Induction Motors and Alternators

- 6.1 Describe the constructional details of an induction motor.
- 6.2 Explain the principle of operation of induction motors.
- 6.3 Define Torque and Slip in Induction motors.
- 6.4 Explain the methods of starting of induction motors.
- 6.5 Classify the Three Phase and Single Phase induction motors.
- 6.6 State the applications of induction motors.
- 6.7 Describe the constructional details of an alternator.
- 6.8 Explain the principle of operation of alternator

Reference Books

- | | | |
|---------------------------------------|----|--------------------------|
| 1. Electrical Technology | by | B.L. Theraja |
| 2. Advanced Electrical Technology | by | H. Cotton |
| 3. Electrical Technology | by | Huges |
| 4. Electrical technology | by | V.K. Mehta. |
| 5. Electrical Engineering | by | M.S.Naidu & S.Kamakshiah |
| 6. Non-conventional energy guidelines | by | NEDCAP |
| 7. Solar energy utilisation | by | G.D. |

LIST OF LEARNING WEBSITES

1. <http://nptel.ac.in>
 2. <https://ocw.mit.edu/courses/materials-science-and-engineering>
 3. <http://khansacademy.org>
- CO-PO Mapping Matrix**

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	Mapped POs
CO1	2	2	3	2	2				2	2	1,2,5,6,10
CO2	2	2	3						2	2	1,2,3.
CO3	2	2	3	2					2	2	1,2,3,10
CO4	3	3	3						2	2	1,2,5,10.
CO5	3	3	3	3					2	2	1,2,5,6,9,10
CO6	3	3	3	2		2			2	2	1,2,3,6,9,10

MID SEM-I EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

MID SEM –II EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

Semester End Examination

Sl No	Unit No.	Questions to be set for SEE				Remarks	
		R		U	A		
1	I	4	1		9(a)	13(a)	
2	II						
3	III		2		10(a)	14(a)	
4	IV						
5	V		3	5, 6	9(b)	13(b)	
					11(a)	15(a)	
					11(b)	15(b)	
6	VI			7,8	10(b)	14(b)	
		12(a)			16(a)		
		12(b)			16(b)		
Total Questions		8		8	8		

Legend:	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

Material Testing

Course title:	Material Testing	Course Code:	18MET404C
Semester:	IV	Course group:	Core
Teaching scheme in Hrs. (LTP):	30:15:0	Credits:	3
Type of course:	Lecturer+ Assignment:	Total contact Periods. :	45 Hrs./60 periods
CIE:	60 Marks	SEE:	40 Marks

Prerequisites: knowledge of physics, maths and physical metallurgy.

Course Outcomes (Cos)

At the end of the course, the student will have the ability to:

CO1: Analyze the various metallurgical factors affecting mechanical properties of different metals and alloys

CO2: Explain the tensile test and calculate various mechanical properties from test data

CO3: Describe basic mechanisms of fatigue and creep behavior of engineering materials and their importance in materials design

CO4: Explain impact test, toughness and types of fracture of metals

CO5: Explain how to select and conduct a hardness test to determine the hardness of a given material

CO6: Differentiate various defect types and describe the main criteria to select the appropriate NDT methods for the product

COURSE CONTENTS

Unit 1.0 Tension test

Duration: 08 periods

Introduction. Stress strain diagram and its salient features. Tensile Properties and their calculation from test data, solving numerical problems, effect of temperature on tensile properties

Unit 2.0 Creep test

Duration: 10 periods

Definition, importance, salient features of creep curve and mechanisms of creep

Unit 3.0 Impact test and Fracture

Duration: 08 periods

Impact test - Test specimens, principles and procedures of conducting the tests. Notch sensitivity, Notch toughness, transition temperature. Definition, ductile and brittle fracture, cohesive strength Equation, Griffith theory of brittle fracture

Unit 4.0 Fatigue test**Duration: 12 periods**

Importance, different cycles, S-N Curve, endurance limit, Fatigue failures, effect of various factors on fatigue.

Unit 5.0 Hardness test**Duration: 09 periods**

Definition of hardness, classification, various hardness tests Brinell, Rockwell, Vickers and Shore Scleroscope – principles and procedure relevant derivations

6.0 Non - Destructive testing**Duration: 13 periods**

Importance of Nondestructive testing, various non-Destructive tests, - Visual, Dye penetrant, Magnetic particle, Radiography and Ultrasonic test.

COURSE LEARNING OUTCOMES

On completion of this subject, the student should be able to

- 1.1 Explain the importance of tension test in industrial application.
- 1.2 Define stress & strain
- 1.3 Plot the Engineering stress - strain curve from the data.
- 1.4 Explain the salient features of the stress - strain curve.
- 1.5 Identify the specifications of test samples for tension test
- 1.6 Define the important tensile properties viz., UTS, YS. Proof stress, percentage elongation, percentage reduction in area, resilience and toughness
- 1.7 Calculate the above properties from the test data.
- 1.8 solve numerical problems on tensile data
- 1.9 Draw the stress - strain curve for ductile and brittle materials.
- 1.10 Explain the effect of temperature on tensile properties
- 2.1 Define creep.
- 2.2 Explain equicohesive temperature
- 2.3 Explain the importance of creep test.
- 2.4 Explain the procedure of creep test.
- 2.5 Explain the creep curve and its regions.
- 2.6 Explain the mechanism of creep.
- 3.1 Explain the principle involved in Izod and Charpy impact tests.
- 3.2 Identify the specifications of test samples for conducting Izod and Charpy tests.
- 3.3 Explain the procedure to conduct the Izod and Charpy tests
- 3.4 Define notch toughness and notch sensitivity
- 3.5 Define Ductile Brittle Transition Temperature (DBTT).
- 3.6 Explain the factors, which effect transition temperature (i.e. DBTT)
- 3.7 Explain what fracture is

- 3.8 Differentiate the ductile and brittle fracture.
- 3.9 Derive the equation for theoretical cohesive strength.
- 3.10 Explain the Griffith theory of brittle fracture.
- 4.1 Define fatigue and know the importance of the fatigue test.
- 4.2 Explain the different cycles of stress Alternating, Repeating & fluctuating.
- 4.3 Explain fatigue test procedure and plot the S-N curve from the test data and identify the endurance limit or fatigue strength
- 4.4 Explain typical fatigue failure.
- 4.5 Explain the effect of stress concentration on fatigue.
- 4.6 Explain the effect on surface roughness on fatigue.
- 4.7 Explain the effect of surface residual stress on fatigue.
- 4.8 Explain the effect of corrosion on fatigue properties.
- 4.9 Explain the effect of metallurgical variables on fatigue properties.
- 4.10 Explain the effect of temperature on fatigue properties.
- 5.1 Explain the importance of hardness test.
- 5.2 Define hardness & Classify hardness tests.
- 5.3 Explain the scratch hardness & name different minerals in Moh's scale of hardness
- 5.4 Explain the principle of Brinell hardness test.
- 5.5 Explain different Indentors and loads used for different materials.
- 5.6 Explain the test procedure of Brinell hardness test
- 5.7 Derive BHN formula.
- 5.8 Calculate the hardness number using BHN formula.
- 5.9 Know the principle of Vickers hardness test.
- 5.10 Explain the Indentors and loads used.
- 5.11 Explain the test procedure of Vickers hardness test.
- 5.12 Derive VHN (or DPH) formula
- 5.13 Calculate the hardness number using VHN formula.
- 5.14 Explain the principle of Rockwell hardness test.
- 5.15 List different scales
- 5.16 Identify different combinations of Indentors and loads used
- 5.17 Explain the scale laws and combinations of loads and indenters used in most commonly used scales (i.e. A, B and C scales).
- 5.18 Explain the procedure of Rockwell hardness test
- 5.19 Explain the principle and importance of Rockwell superficial hardness test.
- 5.20 Explain the different Indentors and the loads used in Rockwell superficial hardness test.
- 5.21 Explain the procedure of Rockwell superficial hardness test
- 5.22 Explain the principle and importance of Rebound hardness test.
- 5.23 Explain the procedure of Rebound hardness test using Shore Scleroscope
- 6.1 Define Non – Destructive Testing.
- 6.2 Explain the importance of Non- destructive test.
- 6.3 Explain Visual examination.
- 6.4 Explain the principle and the steps involved in dye penetrant test.
- 6.5 Explain the principle of magnetic particle test.
- 6.6 Explain longitudinal magnetization

- 6.7 Explain circular magnetization
- 6.8 Explain the Magnetic Particle test
- 6.9 Explain the de-magnetisation methods
- 6.10 Explain the principle of radiography
- 6.11 Interpret the radiographs
- 6.12 List the safety precautions while carrying out radiography test.
- 6.13 Explain the importance of ultrasonic test.
- 6.14 Explain the principle of ultrasonic test.
- 6.15 Explain the test procedure for ultrasonic test.

Suggested Student Activities

- 1. Student inspects the available equipment in the Lab to identify the components
- 2. Visit nearby Industry to familiarize with Material testing equipment like UTM, Brinell, Rockwell and Vickers hardness testers and various NDT equipment
- 3. Quiz
- 4. Group discussion
- 5. Surprise test
- 6. Seminars

TEXT BOOKS

- 1. The testing of metallic Materials - by A.V.K. Suryanarayana

REFERENCE BOOKS

- 1. Mechanical metallurgy by G.E. Dieter
- 2. Non-destructive testing by Barry Hull and Vernon John, ELBS.
- 3. Principles of metallographic Laboratory Practice by Kehl
- 4. Practical Non - Destructive Testing by Baldevraj, Jayakumar T, Thavasimuthu. M

LIST OF LEARNING WEBSITES

- 1. <https://www.mtu.edu/materials/k12/experiments/tensile/>
- 2. <https://www.mtu.edu/materials/k12/experiments/creep/>
- 3. <https://www.youtube.com/watch?v=93I6Wk7GZhI>
- 4. <http://sm-nitk.vlabs.ac.in/exp10/index.html#>
- 5. <http://sm-nitk.vlabs.ac.in/index.html#>

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	Mapped POs
CO1	2	2	3	2	2				2	2	1,2,3,4,5,9,10
CO2	2	2	3						2	2	1,2,3,9,10
CO3	2	2	3	2					2	2	1,2,3,4,9,10
CO4	3	3	3						2	2	1,2,3,9,10
CO5	3	3	3	3					2	2	1,2,3,4,9,10
CO6	3	3	3	2		2			2	2	1,2,3,4,6,9,10

MID SEM-I EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	
MID SEM –II EXAM					
S.No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

Semester End Examination

Sl No	Unit No.	Questions to be set for SEE				Remarks	
		R		U	A		
1	I	4	1		9(a)	13(a)	
2	II						
3	III		2		10(a)	14(a)	
4	IV						
5	V		3	5, 6	9(b)	13(b)	
					11(a)	15(a)	
		11(b)		15(b)			
6	VI		7,8	10(b)	14(b)		
				12(a)	16(a)		
				12(b)	16(b)		
Total Questions		8		8	8		

Legend:	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

MODEL QUESTION PAPER
BOARD DIPLOMA MID – SEMESTER EXAMINATIONS (C-18)
D MET E IV SEMESTER EXAMINATION
18MET404C – MATERIAL TESTING

Part A

Note: Answer **ALL** question each question carries **ONE** mark

MARKS: 4X1 =4

1. Define stress and strain.
2. Write importance of tension test.
3. Define creep
4. Define equi-cohesive temperature

Part B

Answer **ALL** questions Each Question carries **THREE** marks

MARKS: 2X3 = 6

5. (a) Explain Resilience and toughness.

Or

(b) In a tensile test the load applied on the specimen is 100 N. Calculate the stress acting on the specimen if the diameter is 10 mm.

6. (a) Write the importance of creep test.

Or

(b) Explain the mechanism of creep.

Part C

Answer **ALL** questions Each Question carries **FIVE** marks

MARKS: 2X5 = 10

7. (a) Explain the salient features of stress-strain curve

Or

(b) Explain Ductility and brittleness and draw the stress-strain curve for ductile and brittle materials.

8. (a) Explain creep curve and its regions.

Or

(b) Explain the procedure to conduct the creep test.

MODEL QUESTION PAPER
BOARD DIPLOMA SEMESTER EXAMINATIONS (C-18)
D MET E IV SEMESTER EXAMINATION
18MET404C – MATERIAL TESTING

Part A

Note: Answer **ALL** question each question carries **ONE** mark

MARKS: 8X1 =8

1. Define Engineering stress and Engineering strain.
2. Define creep.
3. Define Hardness.
4. Define non destructive testing.
5. Define scratch hardness.
6. Define the principle used in Rockwell hardness.
7. Define principle involved in magnetic particle test.
8. Define principle involved in dye penetrant test.

Part B

Answer **ALL** questions Each Question carries **THREE** marks

MARKS: 4X3 = 12

9. (a) Explain a) Percentage elongation b) percentage reduction in area.
Or
(b) Write the names of different minerals in mohs scale of hardness.
10. (a) Explain notch toughness and notch sensitivity.
Or
(b) Explain visual examination.
11. (a) Write the loads and indentors used in Rockwell B and C scales.
Or
(b) Explain the principle involved in Vickers hardness test and write the formula for VHN.
12. (a) Explain Longitudinal magnetization in magnetic particle test.
Or
(b) Explain circular magnetization in magnetic test.

Part C

Answer **ALL** questions Each Question carries **FIVE** marks

MARKS: 4X5 = 20

13. (a) Explain salient features of stress strain diagram.
Or
(b) Derive BHN formula
14. (a) Explain metallurgical variables on fatigue.
Or
(b) Explain dye penetrant test with neat sketches.
15. (a) Explain the procedure of micro hardness test.
Or
(b) Explain the procedure of Rockwell superficial hardness test.
16. (a) Explain the procedure of conducting ultrasonic test w.r.t. through transmission method and pulse echo method.
Or
(b) Explain Eddy current test

Foundry Technology

Course title:	Foundry Technology	Course Code:	18MET405C
Semester:	IV	Course group:	Core
Teaching scheme in Hrs. (LTP):	30:15:0	Credits:	3
Type of course:	Lecturer+ Assignment:	Total contact Periods. :	45 Hrs./60 periods
CIE:	60 Marks	SEE:	40 Marks

Prerequisites:

Knowledge of Maths, Physics and physical metallurgy.

Course outcomes

At the end of the course the student will have the ability to:

CO1 :	Explain foundry and pattern materials
CO2 :	Explain mould and core sand properties
CO3 :	Explain various hand mould tools used in moulding
CO4 :	Explain various machine moulding equipments used for making of mould and core
CO5 :	Explain various moulding methods used for making of moulds
CO6:	Explain the solidification of casting and study the defects

Course Contents:

UNIT-1: Foundry and patterns

Duration: 10 Periods

Foundry as a production process, advantages and limitation of foundry. Type of foundries, Basic steps involved in a sand casting process such as pattern making, core making, moulding, melting, pouring and cleaning-Pattern and its function in a foundry, Pattern making materials, Their relative advantages and limitations, Types of patterns, Pattern allowances, Pattern colour codes: Machined, unmachined, core prints, loose piece, parting line

UNIT-2: Mould and core sands

Duration: 10 Periods

Green and dry sand moulds, Properties of sand, shatter Index value, sand testing methods, Ingredients of a moulding sand, Sand grains, Effect of clay on strength, expansion, permeability and water content. Sand conditioning its effect on mould, Additives, Types of sands -Function of cores, core sands, core ingredients, core oils, core binders, Properties of core sands, Core making. Finishing of core & sizing core assembly, use of chaplets.

UNIT-3: Hand mould tools and equipments**Duration: 8 Periods**

Mould boxes, peen and butt rammers cleaner, riddle, gate cutter, swab, bellows, draw spike, vent wire, mould board, trowel,

UNIT- 4: Machine moulding equipments**Duration: 10 Periods**

Description and application of jolt squeezer, sand slinger roll over moulding machines, mould or core blower.

UNIT- 5: Moulding processes**Duration: 12 Periods**

Sand moulding : Green sand, dry sand, core sand moulds, loam moulds, pit and floor moulding, skin dried molds, Special casting processes, applications, advantages and limitations, High pressure molding, hot box process.

UNIT- 6: Feeding of castings and their defects**Duration: 10 Periods**

Pouring, filling the mould. Factors involved, Shrinkage, solidification characteristics freezing temperature range & fluidity, Feeding system, Sprue design, Runners, eliminating slag and dross, Types of Gates, Their applications. Design of gate, Risers: Function, factors involved in the design and their importance, Moulding of riser, Chevinrou's rule & Caine's method, Factors effecting riser efficiency, Chills, their use, simple Progressive and directional solidification, Fluidity – factors- Moulding defects, - shifts, blow holes, pin holes, shrinkage cavity, porosity, metal penetration and rough surface, cabs, hot tears, cold shuts and misrun, warpage of casting, swell, slag holes.

Course Learning Outcomes

Student will be able to

- 1.1 Define Foundry, Casting, Pattern.
- 1.2 Classify Foundries and Listing the Steps Involved in Pattern & Core making.
- 1.3 List different Pattern Making Materials and Understanding Advantages, Disadvantages.
- 1.4 Mention the types of Patterns.
- 1.5 Define Pattern Allowances and Explain different Allowances.
- 1.6 Identify the Importance of Color Coding Used on Pattern
- 2.1 List the basic ingredients of moulding Sand.
- 2.2 Classify Different types of Sands used in Foundry.
- 2.3 Explain the Properties of good moulding sand.
- 2.4 Define Clay, Natural sand, Synthetic Sand.
- 2.5 Know the Composition of Different sands.
- 2.6 Define of Sand Additive, Core & Its functions.

- 2.7 Explain the Steps involved in making the Core.
- 3.1 Draw different hand moulding tools.
- 3.2 List the Uses of Different moulding tools.
- 4.1 Mention the Merits of Machine moulding.
- 4.2 Explain different Moulding machines with sketches.
- 5.1 Explain the Process, Demerits and Applications of moulding sands.
- 5.2 Compare between Green & Dry sand moulding Process.
- 5.3 Explain of Different casting process with their applications & Demerits.
- 5.4 Differentiate between hot chamber & Cold Chamber.
- 5.5 Differentiate between true Centrifugal & Semi Centrifugal Casting.
- 5.6 Explain the different special casting process like Shell moulding,
Investment casting – Lost wax process, Carbon dioxide process and Hot box process
- 5.7 Know the Importance of Mould and Core Coatings.
- 6.1 Draw Diagram for feeding system of a casting.
- 6.2 Explain the function of Pouring basin, Sprue, Runner, Gate, and Riser.
- 6.3 Explain Gating Ratio, Pressurized & Unpressurised gating Systems.
- 6.4 Explain factors affecting directional solidification
- 6.5 List out Different types of Gating Systems.
- 6.6 Know the Function of Riser & State its Functions?
- 6.7 List out various Casting Defects.

Suggested Student Activities

- 1. Student inspects the available equipment in the Lab to identify the components
- 2. Quiz
- 3. Group discussion
- 4. Surprise test
- 5. Seminars

Recommended Books

- 1. Principles of metal casting -by Heine and Rosenthal
- 2. Foundry Technology -by P.K Jain
- 3. Foundry Technology -by M. Lalkhanna Publishers
- 4. Modern foundry Practice -by Hayward

Suggested E-Learning references

1. https://www.youtube.com/watch?v=jWyBtF5si_4
2. <https://www.youtube.com/watch?v=J2mOuK5qksA>
3. <https://www.youtube.com/watch?v=fvJ-pMXP2sY>
4. <https://www.youtube.com/watch?v=EbZ9VnaZ-Xs>

CO-PO Mapping Matrix

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	Mapped POs
CO1	3	3	2	2	1	2		2		2	1,2,3,4,5,6,8,10
CO2	3	3	1	2	1	2		2		1	1,2,3,4,5,6,8,10
CO3	3	3	3	3	2	2		2		3	1,2,3,4,5,6,8,10
CO4	3	3		3	1	1		1		2	1,2,4,5,6,8,10
CO5	3	3	3	1	1	1		1		2	1,2,3,4,5,6,8,10
CO6	3	3	3	3	1	1		1		2	1,2,3,4,5,6,8,10

MID SEM-I EXAM

S.No	Unit Name	R	U	A	Remarks
1	Unit-I	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-II	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	
MID SEM –II EXAM					
S.No	Unit Name	R	U	A	Remarks
1	Unit-III	1, 2	5(a) 5(b)	7(a) 7(b)	
2	Unit-IV	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

Semester End Examination

Sl No	Unit No.	Questions to be set for SEE				Remarks	
		R		U	A		
1	I	4	1		9(a)	13(a)	
2	II						
3	III		2		10(a)	14(a)	
4	IV						
5	V		3	5, 6	9(b)	13(b)	
					11(a)	15(a)	
11(b)	15(b)						
6	VI	7,8		10(b)	14(b)		
			12(a)	16(a)			
			12(b)	16(b)			
Total Questions		8		8	8		

Legend:	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

MODEL QUESTION PAPER
BOARD DIPLOMA MID – SEMESTER EXAMINATIONS (C-18)
D MET E IV SEMESTER EXAMINATION
18MET405C – FOUNDRY TECHNOLOGY

Part A

Note: Answer **ALL** question each question carries **ONE** mark

MARKS: 4X1 =4

1. Define casting
2. Define pattern
3. Define clay
4. Define core

Part B

Answer **ALL** questions Each Question carries **THREE** marks

MARKS: 2X3 = 6

5(a) Classify foundries

Or

5(b) List different pattern making materials

6(a) List the ingredients of moulding sands

Or

6(b) List additives of moulding sand

Part C

Answer **ALL** questions Each Question carries **FIVE** marks

MARKS: 2X5 = 10

7(a) Explain various steps involved in pattern and core making

Or

7(b) Explain various pattern allowances

8(a) Explain the properties of moulding sand

Or

8(b) Explain different types of sands used in foundry

MODEL QUESTION PAPER
BOARD DIPLOMA SEMESTER EXAMINATIONS (C-18)
D MET E IV SEMESTER EXAMINATION
18MET405C – FOUNDRY TECHNOLOGY

Part A

Note: Answer **ALL** question each question carries **ONE** mark

MARKS: 8X1 =8

1. Define foundry
2. Mention the advantage of machine moulding
3. Define riser
4. Define fluidity
5. What are the advantages of green sand moulding?
6. Define loam mould
7. Define runner
8. Define sprue

Part B

Answer **ALL** questions Each Question carries **THREE** marks

MARKS: 4X3 = 12

9(a) List the types of foundries

Or

9(b) List the special casting processes

10(a) List out mould making tools

Or

10(b) Explain shrinkage

11(a) Explain dry sand moulding

Or

11(b) Explain core sand moulding

12(a) Explain the functions of a riser

Or

12(b) Explain gating ratio

Part C

Answer **ALL** questions Each Question carries **FIVE** marks

MARKS: 4X5 = 20

13(a) Explain properties of moulding sand

Or

13(b) Explain skin dried moulds

14(a) Explain jolt –squeeze moulding machine

Or

14(b) Explain the directional solidification

15(a) Explain hot chamber die casting

Or

15(b) Explain shell moulding process

16(a) Explain the gating system with neat sketch

Or

16(b) Explain about pressurized gating system and unpressurized gating system

18MET406P: Material Testing Lab

Course Title :	Material Testing lab	Course Code	18MET-406P
Semester	IV	Course Group	:Core
Teaching Scheme in Periods(L:T:P)	7.5:00:37.5	Credits	: 3
Methodology	Lecture + Practical	Total Contact Periods :	: 45
CIE	60 Marks	SEE	40 Marks

Pre requisites

Basic awareness of safety precautions of a laboratory

Course Outcomes

At the end of the course, the student will have the ability to:

Course Outcome		Linked PO
CO1	Conduct the Tensile test on the given metallic material using UTM and determine the tensile properties	1,2,3,4,5,8,9,10
CO2	Operate the Brinell hardness tester and can conduct the hardness test to determine the hardness of the given metallic material	1,2,3,4,9,10
CO3	Operate the Rockwell hardness tester and can conduct the hardness test to determine the hardness of the given metallic material	1,2,3,4,9,10
CO4	Operate the Rockwell superficial hardness tester and can conduct the hardness test to determine the hardness of the given metallic sample	1,2,3,4,9,10
CO5	Operate the impact tester and can conduct the test to determine the toughness and impact strength of the given metallic material	1,2,3,4,9,10

Course Contents

1. Tensile test

Preparation of standard specimen – identifying all the parts of U T M – operation instructions of U T M_ conducting tensile test using U T M - Recording load, elongation and diameter without error - Plotting the graph stress vs strain - Calculation of various engineering properties - Elastic limit, Yield strength, Ultimate Tensile strength, Fracture strength, % elongation, % area reduction, Resilience, Toughness.

2. Brinell Hardness test

Preparation of specimen – Identifying the parts of Brinell hardness testing machine – Different loads and indenters - Conducting Brinell hardness test on samples of ferrous and non-ferrous materials – recording the hardness values – comparing the hardness of different materials

3. Rockwell hardness test

Preparation of specimens – Identifying different scales, indenters and loads - Conducting Rockwell hardness test on ferrous and non-ferrous materials recording the hardness values – comparing the hardness of different materials

4. Rockwell superficial hardness test

Preparation of specimens – Identifying different scales, indenters and loads - Conducting Rockwell superficial hardness test on ferrous and non-ferrous materials of thin specimens - recording the hardness values – comparing the hardness of different materials

5. Charpy Impact Test

Preparation of standard specimen – Identifying parts of the impact tester – operation of Impact tester – positioning of specimen in the machine - Conducting Charpy test to determine the toughness and impact strength of different materials - comparison of toughness of different materials

6. Izod Impact Test

Preparation of standard specimen – Identifying parts of the impact tester – operation of Impact tester – positioning of specimen in the machine - Conducting Izod test to determine the toughness and impact strength of different materials - comparison of toughness of different materials

List of learning websites

1. <https://www.youtube.com/watch?v=D8U4G5kcpcM>
2. <https://www.youtube.com/watch?v=RJXJpeH78iU>
3. <https://www.youtube.com/watch?v=jIsEKtA323A&spfreload=10>

State Board of Technical Education and Training, Telangana

Mid Semester - 1 Examination Model Question paper

D MET E IV semester practical Examination

Corse Code: 18MET406P

Duration: 3 hours

Course Name: Material Testing Lab

Max.Marks:20

Instructions to the Candidate:

(i)Answer any One of the following Questions.

(ii)Record the results on a graph sheet if required, and conclude your observation of the experiment

1. Write the procedure of conducting the tensile test and determine the tensile properties of the material of the given specimen by conducting tensile test using U T M
2. Write the principle and procedure involved in the Brinell hardness test and determine the hardness of the material of the given specimens using Brinell hardness tester
3. Write the principle and procedure involved in the Rockwell hardness test and determine the hardness of the material of the given specimens using Rockwell hardness tester

State Board of Technical Education and Training, Telangana

Mid Semester - 2 Examination Model Question paper

D MET E IV semester practical Examination

Corse Code: 18MET406P

Duration: 3 hours

Course Name: Material Testing Lab

Max.Marks:20

Instructions to the Candidate:

(i)Answer any One of the following Questions.

(ii)Record the results on a graph sheet if required, and conclude your observation of the experiment

1. Write the principle and procedure involved in the Rockwell superficial hardness test and determine the hardness of the material of the given specimens using Rockwell superficial hardness tester
2. Write the principle and procedure involved in the impact test and determine the toughness and impact strength of the material of the given specimen by conducting Charpy Impact test
3. Write the principle and procedure involved in the impact test and determine the toughness and impact strength of the material of the given specimen by conducting Izod Impact test

State Board of Technical Education and Training, Telangana
Semester End Examination Model Question paper
D MET E IV semester practical Examination

Corse Code: 18MET406P

Duration: 3 hours

Course Name: Material Testing Lab

Max.Marks:40

Instructions to the Candidate:

(i)Answer any One of the following Questions.

(ii)Record the results on a graph sheet if required, and conclude your observation of the experiment

1. Write the procedure of conducting the tensile test and determine the tensile properties of the material of the given specimen by conducting tensile test using U T M
2. Write the principle and procedure involved in the Brinell hardness test and determine the hardness of the material of the given specimens using Brinell hardness tester
3. Write the principle and procedure involved in the Rockwell hardness test and determine the hardness of the material of the given specimens using Rockwell hardness tester
4. Write the principle and procedure involved in the Rockwell superficial hardness test and determine the hardness of the material of the given specimens using Rockwell superficial hardness tester
5. Write the principle and procedure involved in the impact test and determine the toughness and impact strength of the material of the given specimen by conducting Charpy Impact test
6. Write the principle and procedure involved in the impact test and determine the toughness and impact strength of the material of the given specimen by conducting Izod Impact test

HEAT TREATMENT Lab

Course Title :	HEAT TREATMENT LAB	Course Code	18MET-407P
Semester	IV	Course Group	: P
Teaching Scheme in Periods(L:T:P)	7.5:00:37.5	Credits	: 1.5
Methodology	Lecture + Practical	Total Contact Periods :	:45
CIE	60 Marks	SEE	40 Marks

Pre requisites

This course requires the basic skills of handling.

Course Outcomes

		Linked PO	Teaching Hours
CO1	Conduct the annealing process and study the properties of a given sample of steel	1,2,3,4,9	1 ½ hr
CO2	Conduct the hardening process and study the properties of a given sample of steel	1,2,3,4,9	1 ½ hr
CO3	Conduct the normalizing process and study the properties of a given sample of steel	1,2,3,4,9	1 ½ hr
CO4	Conduct the tempering process and study the properties of a given sample of steel	1,2,3,4,9	1 ½ hr
CO5	Conduct the jominey end quench test and study the properties of a given sample of steel	1,2,3,4,9	1 hr

1.0 Annealing

Conducting different annealing treatments on the given steel specimens – operating the muffle furnace - observing and manipulating of furnace temperature - cooling of specimen in the furnace – observing microstructure of annealed specimens - drawing the microstructure of annealed steel samples and interpreting the changes in mechanical properties based on the microstructure

2.0 Hardening

Identifying different parts of muffle furnace – operating the muffle furnace – calibrating the temperature of the furnace - handling the specimen before quenching by using fixtures – identifying different quenching media – conducting hardening treatment on the given steel samples in different quenching media – preparing the samples for metallographic observation – observing the microstructures for different phases - drawing the microstructures – determining the hardness of specimens after hardening - recording the hardness values before hardening and after Hardening

3.0 Normalizing

Identifying different parts of muffle furnace – operating the muffle furnace – calibrating the temperature of the furnace - need of normalizing of annealed specimens - recording of normalizing temperature – conducting the normalizing treatment on the given steel samples - preparing the samples for metallographic observation – observing the microstructures for different phases - drawing the microstructures – determining the hardness of specimens after normalising - recording the hardness values

4.0 Tempering

Identifying different parts of muffle furnace – operating the muffle furnace – calibrating the temperature of the furnace - need of tempering after hardening treatment – types of tempering processes – conducting tempering process on the given steel samples - preparing the samples for metallographic observation – observing the microstructures for different phases - drawing the microstructures – determining the hardness of specimens after tempering - recording the hardness values.

5.0 Hardenability - Jominy-end quench test

Identifying dimensions of specimen for Jominy end quench test – handling equipment – maintaining optimum pressure and temperature - maintaining of correct distance between orifice and end of Steel bar – conducting Jominy end quench test on the given steel sample – determining the Hardenability of the steel specimen in terms of critical diameter - .

State Board of Technical Education and Training, Telangana

Mid Semester – 1 Examination Model Question paper

D.MET.E IV semester practical Examination

Corse Code: 18MET 407P

Duration: 3 hours

Course Name: HEAT TREAT MNET Lab

Max.Marks:20

Instructions to the Candidate:

(i) Answer any One of the following Questions.

(ii) Record the results on a graph sheet if required, and conclude your observation of the experiment

1. Write the procedure of annealing process of a medium carbon steel and conduct the annealing treatment on the given medium carbon steel specimen then draw the microstructure and find the hardness before and after the treatment
2. Write the procedure of annealing process of a high carbon steel and conduct the annealing treatment on the given high carbon steel specimen then draw the microstructure and find the hardness before and after the treatment
3. Write the procedure of hardening of a medium carbon steel and conduct the hardening treatment on the given medium carbon steel specimen then draw the microstructure and find the hardness before and after the treatment
4. Write the procedure of hardening process of a high carbon steel and conduct the hardening treatment on the given high carbon steel specimen then draw the microstructure and find the hardness before and after the treatment

State Board of Technical Education and Training, Telangana

Mid Semester – 1 Examination Model Question paper

D.MET.E IV semester practical Examination

Corse Code: 18MET 407P

Duration: 3 hours

Course Name: HEAT TREAT MNET Lab

Max.Marks:20

Instructions to the Candidate:

(i) Answer any One of the following Question

(ii) Record the results on a graph sheet if required, and conclude your observation of the experiment

1. Write the procedure of normalizing process of a medium carbon steel and conduct the normalizing treatment on the given medium carbon steel specimen then draw the microstructure and find the hardness before and after the treatment
2. Write the procedure of normalizing process of a high carbon steel and conduct the annealing treatment on the given high carbon steel specimen then draw the microstructure and find the hardness before and after the treatment
3. Write the procedure of tempering and conduct the tempering process and draw the microstructure and determine the hardness of a given sample of steel before and after the treatment
4. Write the procedure and conduct the Jominey end quench test and determine the hardenability of a given sample of steel

State Board of Technical Education and Training, Telangana
Semester End Examination Model Question paper
D.MET.E IV semester practical Examination

Corse Code: 18MET 407P

Duration: 3 hours

Course Name: HEAT TREAT MNET Lab

Max.Marks:40

- 1 Write the procedure of annealing process of a medium carbon steel and conduct the annealing treatment on the given medium carbon steel specimen then draw the microstructure and find the hardness before and after the treatment
- 2 Write the procedure of annealing process of a high carbon steel and conduct the annealing treatment on the given high carbon steel specimen then draw the microstructure and find the hardness before and after the treatment
- 3 Write the procedure of hardening of a medium carbon steel and conduct the hardening treatment on the given medium carbon steel specimen then draw the microstructure and find the hardness before and after the treatment
- 4 Write the procedure of hardening process of a high carbon steel and conduct the hardening treatment on the given high carbon steel specimen then draw the microstructure and find the hardness before and after the treatment
- 5 Write the procedure of normalizing process of a medium carbon steel and conduct the normalizing treatment on the given medium carbon steel specimen then draw the microstructure and find the hardness before and after the treatment
- 6 Write the procedure of normalizing process of a high carbon steel and conduct the annealing treatment on the given high carbon steel specimen then draw the microstructure and find the hardness before and after the treatment
- 7 Write the procedure of tempering and conduct the tempering process and draw the microstructure and determine the hardness of a given sample of steel before and after the treatment
- 8 Write the procedure and conduct the Jominey end quench test and determine the hardenability of a given sample of steel

18MET408P: Foundry Lab

Course Title :	Foundry lab	Course Code	18MET-408P
Semester	IV	Course Group	:Core
Teaching Scheme in Periods(L:T:P)	7.5:00:37.5	Credits	: 3
Methodology	Lecture + Practical	Total Contact Periods :	: 45
CIE	60 Marks	SEE	40 Marks

Pre requisites

Basic awareness of safety precautions of a laboratory

Corse Outcomes

At the end of the course, the student will have the ability to:

Course Outcome		Linked PO
CO1	Prepare the standard sand specimen and Determine the Green Compression, Green Shear, Dry Compression & Dry Shear strength	1,2,3,4,8,9,10
CO2	Determine the AFS Grain Fineness number	1,2,3,4,9,10
CO3	Determine Hardness of the moulding sand	1,2,3,4,9,10
CO4	Determine Moisture content of the moulding sand	1,2,3,4,9,10
CO5	Determine permeability of moulding sand	1,2,3,4,9,10
CO6	Determine clay content of moulding sand	

Course Contents

1.Green Compression & Green Shear, Dry Compression & Dry Shear strength

Preparation of standard sand specimen - identify the compressive & shear heads – Operating the Universal sand Testing machine – conducting the tests - Recording the results

2.AFS Grain Fineness number

Identifying different sets of sieves basing on ISI and BS – Identify different parts of Rotap sieve shaker – Conduct the sieve analysis – determination of AFS fineness number

3.Hardness of the sand mould

Preparation of the sand mould – determination of horizontal and vertical hardness of the prepared sand mould by using hardness tester

4. Moisture content determination

Collection of sample of the moulding sand – Determining the moisture content by using rapid moisture teller - Observe and record the reading

5. Determination of Permeability of sand mould

Preparation of standard sand specimen – Determination of the permeability by using permeability tester

6. Determination of clay content of moulding sand

Collection of sample of moulding sand – Determination of clay content of the moulding sand by AFS method

List of learning websites

1. https://www.youtube.com/watch?v=Rs6usD_Od-Q
2. https://en.wikipedia.org/wiki/Foundry_sand_testing

State Board of Technical Education and Training, Telangana

Mid Semester -1 Examination Model Question paper

D MET E IV semester practical Examination

Corse Code: 18MET408P

Duration: 3 hours

Course Name: Foundry Lab

Max.Marks:20

Instructions to the Candidate:

(i)Answer any One of the following Questions.

(ii)Record the results on a graph sheet if required, and conclude your observation of the experiment

- 1 Write the procedure of preparation of standard sand specimen and determine the Green Compression and Green Shear strength by using the universal sand testing machine
- 2 Write the procedure of preparation of standard sand specimen and determine the Dry Compression & Dry Shear strength by using the universal sand testing machine
- 3 Write the procedure to determine the moisture content of the moulding sand and determine moisture content of the given sample of moulding sand

State Board of Technical Education and Training, Telangana
Mid Semester -2 Examination Model Question paper
D MET E IV semester practical Examination

Corse Code: 18MET408P

Duration: 3 hours

Course Name: Foundry Lab

Max.Marks:20

Instructions to the Candidate:

(i)Answer any One of the following Questions.

(ii)Record the results on a graph sheet if required, and conclude your observation of the experiment

1. Write the procedure for finding AFS grain fineness number by sieve analysis and determine the AFS fineness number of the given sample of sand
2. Write the procedure to find the permeability of moulding sand and determine the permeability for the given moulding sand
3. Write the procedure to find the clay content of moulding sand and determine the clay content in the given moulding sand

State Board of Technical Education and Training, Telangana
Semester End Examination Model Question paper
D MET E IV semester practical Examination

Corse Code: 18MET408P

Duration: 3 hours

Course Name: Foundry Lab

Max.Marks:40

Instructions to the Candidate:

(i)Answer any One of the following Questions.

(ii)Record the results on a graph sheet if required, and conclude your observation of the experiment

1. Write the procedure of preparation of standard sand specimen and determine the Green Compression and Green Shear strength by using the universal sand testing machine
2. Write the procedure of preparation of standard sand specimen and determine the Dry Compression & Dry Shear strength by using the universal sand testing machine
3. Write the procedure to determine the moisture content of the moulding sand and determine moisture content of the given sample of moulding sand
4. Write the procedure for finding AFS grain fineness number by sieve analysis and determine the AFS fineness number of the given sample of sand
5. Write the procedure to find the permeability of moulding sand and determine the permeability for the given moulding sand
6. Write the procedure to find the clay content of moulding sand and determine the clay content in the given moulding sand

18MET409P: Basic Electrical Lab

Course Title :	Basic Electrical lab	Course Code	18MET-409P
Semester	IV	Course Group	:F
Teaching Scheme in Periods(L:T:P)	7.5:00:37.5	Credits	: 3
Methodology	Lecture + Practical	Total Contact Periods :	:45
CIE	60 Marks	SEE	40 Marks

Pre requisites :

Basic awareness of safety precautions of a laboratory and also with Electrical equipment.

Course Outcomes :

At the end of the course, the student will have the ability to:

Course Outcome		Linked PO
CO1	Use measuring instruments to Test electrical circuits to verify and understand different laws	1,2,3,4,8,9,10
CO2	Operate and Test a D.C.Shunt Generator to measure its V,I distribution and Power delivered	1,2,3,4,8,9,10
CO3	Experiment on D.C.Shunt motors to Interpret Speed control aspects	1,2,3,4,8,9,10
CO4	Experiment with 3-Ø balanced circuits to compare their characteristics	1,2,3,4,8,9,10
CO5	Experiment with single phase transformer with step up and step down operation with resistive load	1,2,3,4,8,9,10
CO6	Conduct load test on Split-phase Induction motors to interpret its performance	1,2,3,4,8,9,10

Course Contents**1 Verification of Kirchhoff's laws**

- 1.1 Fetch proper tools, instruments and machinery as per the experiment
- 1.2 Connect the circuit as per the requirement
- 1.3 Conduct the experiment and tabulate the readings
- 1.4 Repeat the procedure and tabulate the readings
- 1.5 From the readings calculate required parameters to verify and compare

2. Speed control a D.C.Shunt motor by Armature control

- 2.1 Fetch proper tools, instruments and machinery as per the experiment
- 2.2 Connect the circuit as per the requirement
- 2.3 Conduct the experiment and tabulate the readings
- 2.4 Draw the concerned graph and analyze

- 3 Speed control a D.C.Shunt motor by Field control
 - 3.1 Fetch proper tools, instruments and machinery as per the experiment
 - 3.2 Connect the circuit as per the requirement
 - 3.3 Conduct the experiment and tabulate the readings
 - 3.4 Draw the concerned graph and analyse
- 4 Measurement of power consumed by a 3-Ø balanced Resistive load
 - 4.1 Fetch proper tools, instruments and machinery as per the experiment
 - 4.2 Connect the circuit as per the requirement
 - 4.3 Conduct the experiment and tabulate the readings
 - 4.4 Calculate the power delivered from the readings and interpret
- 5 Test a 1-Ø transformer for Step-up and Step-down operation with a Resistive load
 - 5.1 Fetch proper tools, instruments and machinery as per the experiment
 - 5.2 Connect the circuit as per the requirement
 - 5.3 Conduct the experiment and tabulate the readings
 - 5.4 Calculate the power delivered from the readings and interpret
- 6 Conduct brake test on a Split-phase Induction motor
 - 6.1 Fetch proper tools, instruments and machinery as per the experiment
 - 6.2 Connect the circuit as per the requirement
 - 6.3 Conduct the experiment and tabulate the readings
 - 6.4 Draw the concerned graph and analyse

List of learning websites

- 1 <https://www.youtube.com>
2. <https://www.khanacademy.org>

Advanced Communication Skills and Life Skills

Course Title	Advanced Communication Skills and Life Skills	Course Code	18 Common 410 P
Semester	IV	Course Group	Foundation
Teaching Scheme in Periods- L:T:P	15:0:30	Credits	1.5
Methodology	Lecture + Practical	Total Contact Hours	45 Periods (3 Periods per Week)
CIE	60 Marks	SEE	40 Marks

Rationale:

This course is designed to impart writing skills and employability skills to the students of diploma which will help them in obtaining and maintaining the employment.

Prerequisites:

This course requires the basic knowledge of vocabulary, grammar and four language learning skills, viz. Listening, Speaking, Reading and Writing.

Course Outcomes:

Modules	At the end of the course the students will have the ability to:
Presentation Skills	Prepare a presentation. Use presentation aids effectively. Develop public speaking skills. Learn to make PowerPoint Presentations effectively. Present a Paper using appropriate body language.

Writing Reports	Learn kinds of reports. Learn the format of a report. Organise ideas. Develop essential vocabulary useful to write scientific and technical reports.
Interview Skills	Learn the techniques to face an interview. Learn the etiquette to communicate with employers. Learn the dos and don'ts of an interview. Learn the frequently asked questions in interviews. Use appropriate body language. Learn to face interviews telephonically. Gain the confidence to face an interview by attending mock interview.
Group Discussion	Learn the dos and don'ts of a Group Discussion. Participate in a Group Discussion in a healthy manner. Use effective non-verbal communication. Use appropriate phrases and expressions useful in a group discussion.

Workplace Awareness	Learn workplace etiquette. Identify the knowledge, skills and attributes useful at workplace. Build strong workplace relationships. Learn professional ethics. Understand gender equality at the workplace Develop a sense of responsibility towards the society.
Writing Skills Useful at Workplace	Learn various writing formats useful at workplace. Develop an ability to apply technical information in documentation. Revise and edit written documents effectively. Develop corresponding skills - learn the kinds of business letters - the format of a business letter. Learn effective e-mail writing skills. Learn Business Memos. Learn Notes and Narratives.

	Learn Forms and Applications. Prepare templates for different purposes. Prepare an agenda of a meeting. Prepare the minutes of a meeting. Prepare Notices / Circulars for various purposes. Prepare Press release.
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CO-PO Matrix

	Course Outcome		Linked PO
CO 1	Making effective presentations	R/U/A	1, 2, 3,4, 5,6,7,8,9,10
CO 2	Writing scientific and technical reports	R/U/A	1,2,3,4, 5,6,7,8,9,10
CO 3	Learn to face oral and telephonic interviews	R/U/A	1,2,3,4, 7,9,
CO 4	Learn to face group discussion	R/U/A	1,2,3,7,8,9
CO 5	Learn to write various formats useful at workplace	R/U/A	1,2,3,5,7,8,9,10
CO6	Learn workplace etiquette and ethics	R/U/A	1,2,3,7,8,9,10

Course Contents:

I. Presentation Skills periods	Duration: 6
II. Writing Reports periods	Duration: 9
III. Interview Skills periods	Duration: 9
IV. Group Discussion periods	Duration: 6
V. Workplace Awareness periods	Duration: 6
VI. Writing Skills Useful at Workplace periods	Duration: 9

Suggested Student Activities:

- Paper Presentations
- Seminars
- Mock Interviews
- Telephonic Interviews
- Group Discussions
- Role Plays
- Creating advertisements
- Five-minute activities
- Creating a model of workplace

Evaluation Pattern:

I. Continuous Internal Examination: 60 Marks

- a. **Mid Sem - I** 20 marks
Syllabus:
 - i. Presentation Skills
 - ii. Writing Reports
- b. **Mid – II:** 20 Marks
Syllabus:
 - i. Interview Skills
 - ii. Group Discussion
- c. **Internal assessment:** 20 marks
 - i. Seminars: 10 marks
 - ii. Assignments: 5 marks
 - iii. Lab record submission: 5 marks

II. Semester End Examination : 40 Marks

- a. Write an essay on a given topic or participate in an activity: 15 Marks
- b. Interview or Group Discussion: 15 Marks
- c. *Viva Voce* 10 marks

References:

- Adair, John. *Effective Communication*. London: Pan Macmillan Ltd., 2003.
- Ajmani, J. C. *Good English: Getting it Right*. New Delhi: Rupa Publications, 2012.
- Amos, Julie-Ann. *Handling Tough Job Interviews*. Mumbai: Jaico Publishing, 2004.
- Collins, Patrick. *Speak with Power and Confidence*. New York: Sterling, 2009.
- Fensterheim, Herbert and Jean Baer. *Don't Say Yes When You Want To Say No*. New York: D

Raman, Meenakshi & Sangeeta Sharma. *Technical Communication: Principles and Practice*. Second Edition. New Delhi: Oxford University Press, 2011

E-Learning Resources:

<http://www.dailywritingtips.com/>

<http://www.englishdaily626.com/c-errors.php>

<http://www.owl.net.rice.edu/~cainproj/>

<http://www.thehumorsource.com/>

<http://www.indiabix.com/group-discussion/topics-with-answers/>

<http://networketiquette.net/>

<https://public.wsu.edu/~brians/errors>

<http://www.bbc.co.uk/worldservice/learningenglish/radio/specials/15>

BOARD DIPLOMA EXAMINATION (C-18)
FOURTH SEMESTER COMMON-410P
ADVANCED COMMUNICATION SKILLS AND LIFE SKILLS

MID SEM - I

Time : 1 Hour

Total Marks: 20 Marks

Part – A

10 marks

Instruction: Answer any one of the following questions.

1. Write the guidelines for preparing a PowerPoint presentation.
2. How do you prepare yourself for presenting a technical paper?
3. Mention a few presentation aids and how do you use them effectively?

Part – B

10 marks

Instruction: Answer any one of the following questions.

4. Write the format of a report and describe it.
5. Write a report on the accident you have seen recently.
6. Give the outline of a project report and describe it.

BOARD DIPLOMA EXAMINATION (C-18)
FOURTH SEMESTER COMMON-410P
ADVANCED COMMUNICATION SKILLS AND LIFE SKILLS

MID SEM - II

Time : 1 Hour

Total Marks: 20 Marks

Part – A

10 marks

Instruction: Answer any one of the following questions.

1. What are the dos and don'ts for a formal interview?
2. What at least ten frequently asked questions in a formal interview?
3. How do you prepare for a telephonic interview?

Part – B

10 marks

Instruction: Answer any one of the following questions.

4. What are the dos and don'ts of a group discussion?
5. Mention some phrases and expressions commonly used in a group discussion.
6. Write a short paragraph on the steps you take while participating in a group discussion.

BOARD DIPLOMA EXAMINATION (C-18)
FOURTH SEMESTER 18 COMMON-410P
ADVANCED COMMUNICATION SKILLS AND LIFE SKILLS
SEMESTER END EXAM

Time : 3 Hours

Total Marks: 40 Marks

Part – A

10 marks

Instruction: Pick any one question from the given lot.

1. Prepare the outline of a project report and describe it.
2. Write the guidelines for preparing the slides of a PowerPoint presentation.
3. Write the minutes of the meeting conducted at the Principal's chamber to conduct the annual day celebrations. Prepare the agenda of the annual day celebrations.
4. Describe the workplace etiquette.
5. Prepare a press note for the '*Job Mela*' which is going to be conducted at your institute.

Part – B

15 marks

6. Interview / Group Discussion

Part – C

15 marks

7. *Viva Voce*

State Board of Technical Education and Training, Telangana
Model question Paper
Advanced Communication Skills
Mid Semester I

Time: 1 ½ hours

Max. Marks: 40

Instruction: Answer any one of the following questions.

7. Write the guidelines for preparing a PowerPoint presentation.
8. Write the format of a report and describe it.
9. Write a report on the accident you have seen.
10. Give the outline of a project report and describe it.
11. How do you prepare yourself for presenting a technical paper?

State Board of Technical Education and Training, Telangana
Model question Paper
Advanced Communication Skills
Mid Semester II

Time: 1 ½ hours

Max. Marks: 40

Part – A

20 marks

7. Every student has to be interviewed individually.

Part – B

20 marks

8. Conduct Group Discussion.
(Six to eight candidates in each group)

State Board of Technical Education and Training, Telangana

Model question Paper

Advanced Communication Skills

Semester End Examination

Time: 3 hours

Max. Marks: 40

Part – A

15 marks

Instruction: Pick any one question from the given lot.

8. Prepare the outline of a project report and describe it.
9. Write the guidelines for preparing the slides of a PowerPoint presentation.
10. Write the minutes of the meeting conducted at the Principal's chamber to conduct the annual day celebrations. Prepare the agenda of the annual day celebrations.
11. Describe the workplace etiquette.
12. Prepare a press note for the '*Job Mela*' which is going to be conducted at your institute.

Part – B

15 marks

13. Interview / Group Discussion

Part – C

10 marks

14. *Viva Voce*

SKILL UPGRADATION (RUBRICS)

- Study the changes in properties of given metal or alloy due to change in cooling rates
- Download a research paper on heat treatment and explain
- Study the importance of electrical energy in metallurgical industries
- Download a research paper on foundry and explain
- Identify the casting defects in given casting
- Download a research paper related to mechanical working process and explain
- Perform cold rolling process using rolling mill
- Compare the mechanical properties of two , three different metals or alloys after conducting the tensile test
- Preparation of standard test samples of Izod,Charpy and tensile test
- Study the variation in hardness of an age hardenable alloy with change in aging time
- Write a C-programme to generate the cooling curve of a pure metal and alloy
- Attending yoga classes
- Clean and green activities to protect the environment in the institute and near by places
- Attending motivational classes given by experts
Visiting nearby public places and extending help to the needs as the part of social responsibility
- Guiding junior students in academic affairs.
- Must register and study the courses offered by NPTEL/Swayam/MOOCs