

اسلامیات / مطالعہ پاکستان

GEN 211

مضب (اسل دوئم)

حصہ اول اسلامیات

حصہ دوم مطالعہ پاکستان

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کل وقت: 20 گھنٹے

موضوعات

- 1- سورۃ المؤمنین آیت تا آیہ آیات کا معنی
- 2- دنِ نخبیہ احادیث مع زیر و تفریح
- 3- خیارِ کم من تعظیم القرآن و علمہ
- 4- لا ایمان لمن لا امانۃ لہ ولا دین لمن لا عہدہ
- 5- ویاکم واطنن ان اظنن اگر ب احادیث
- 6- من احث فی امرنا بقناہ لیس متہ فہو رد
- 7- من حمل علیہ السلاح فلیس منا
- 8- لہو کافل البیتیم فی الجنۃ
- 9- لا ضرر ولا ضرار فی السلام
- 10- کلکم راع وکلکم راع وکلکم مسؤول عن رعیتہ
- 11- میرزا طیب
- 12- مکی زندگی - دارتہ - اجتہاد - اجرت
- 13- خلی زلزلہ - مہاقتہ - مشق ہدیہ - فتح کہ (اسباب و نتائج)
- 14- حضور ﷺ بحیثیت
- 15- خطبہ جمعہ الموانع
- 16- اہم کل امر ہو لو خاندان
- 17- اسلامی معاشرہ
- 18- کلام تعلیم اور ان کے مقصد، عدس و اہلقب امر بالمعروف نہی عن المنکر
- 19- جلا - کسب طائل - سچا الہیت (تعلیمات)
- 20- انڈی ریاست کی تعریف - انڈی ریاست کی خصوصیات - انڈی حکومت کے فرائض - اسلامی طرز حکومت

اسلامیات

تدریس مقاصد

عمومی مقاصد بطالعلم یہ جان سکے کہ آیات قرآنی کی روشنی میں مومن کے اوصاف کیا ہیں

قرآن مجید
مختب آیات قرآنی

مخصوصی مقاصد:

☆ قرآنی آیات کا ترجمہ بیان کر سکے

☆ قرآنی آیات کی تشریح کر سکے

☆ قرآنی آیات کی روشنی میں ایک مومن کے اوصاف بیان کر سکے

☆ قرآنی آیات میں بیان کردہ مومن کے اوصاف اپنے اندر پیدا کر سکے

اخلاصٹ نمونہ

☆ عمومی مقصد اخلاصٹ کی روشنی میں اسلامی اخلاقی اقدار (انفرادی و اجتماعی) سے آگاہ ہو سکے

مخصوصی مقاصد:

☆ اخلاصٹ کا ترجمہ بیان کر سکے

☆ اخلاصٹ کی تشریح کر سکے

☆ اخلاصٹ کی روشنی میں اسلام کی اخلاقی اقدار کی وضاحت کر سکے

☆ لبن اخلاصٹ کی دی گئی تعییمات کے مطابق اپنی زندگی گزار سکے

سیرت طیبہ

☆ عمومی مقصد: حضور ﷺ کی سیرت طیبہ کے بارے میں جان سکے

مخصوصی مقاصد:

☆ حضور ﷺ کی ابتدائی زندگی انحصار کے ساتھ بیان کر سکے

☆ حضور ﷺ کی ہجرت کا واقعہ بیان کر سکے

☆ حضور ﷺ کی مدنی زندگی انحصار سے بیان کر سکے

☆ حضور ﷺ کی بطور معلم خصوصیات بیان کر سکے

- ۵۴ حضور ﷺ کی بطور سربراہ خاندان بیان کر سکے
- اسلامی معاشرہ
- عمومی مقصد: اسلامی معاشرہ کی خصوصیات سے آگاہی حاصل کر سکے
- خصوصی مقاصد:
- ۵۵ اسلامی معاشرہ کا معنی و مفہوم بیان کر سکے
- ۵۶ اسلامی معاشرہ کی امتیازی خصوصیات بیان کر سکے
- ۵۷ اسلامی معاشرہ میں عدل و احسان کی اہمیت بیان کر سکے
- ۵۸ تبلیغ کے لغوی معنی بیان کر سکے
- ۵۹ تبلیغ کی اہمیت و ضرورت بیان کر سکے
- ۶۰ جہاد کے لفظی و اصطلاحی معنی بیان کر سکے
- ۶۱ جہاد کی اہمیت بیان کر سکے
- ۶۲ جہاد اور فتنہ میں فرق بیان کر سکے
- ۶۳ جہاد کی مختلف اقسام بیان کر سکے
- ۶۴ اقطار مسجد کی تعریف کر سکے
- مسجد کی سابقہ حیثیت کو بحال کرنے کے بارہ میں اقدامات کو بیان کر سکے

اسلامی ریاست

- عمومی مقاصد: اسلامی ریاست کی خصوصیات بیان کر سکے
- خصوصی مقاصد:
- ۶۵ ریاست کی تعریف بیان کر سکے
- ۶۶ اسلامی ریاست میں طرز حکومت سے آگاہی حاصل کر سکے
- ۶۷ اسلامی ریاست کی خصوصیات بیان کر سکے
- ۶۸ اسلامی ریاست کے اغراض و مقاصد بیان کر سکے
- ۶۹ اسلامی ریاست کے قیام کیلئے جدوجہد کر سکے

نصاب مطالعہ پاکستان

ٹی بی سی
101
کل وقت: 2 بجے 1 گھنٹے

سہ ماہی	☆
حصہ دوم	☆
موضوعات	
۱۰ قومی نظریہ	☆
تحریک پاکستان	☆
انجمن کانگریس	☆
مسٹر ایب	☆
تفسیر بنگلہ	☆
بیتن کسٹمر	☆
تحریک خلافت	☆
سندھ تحریک	☆
تجلیج رسمی	☆
سورہ رپورٹ	☆
قائمہ اعظم کے چودہ نکات	☆
خلیفہ آلہ آبد	☆
انتخابات 1938 اور انتخابی اجراء	☆
قانون دلو پاکستان	☆

حصہ دوم
مخارج پاکستان

تدوین مقاصد

تحریک پاکستان

عمومی مقصد: قیام پاکستان کے سبب و محرکات کو بیان کر کے
خصوصی مقاصد:

- ☆ قومیت کے مضموم کو بیان کر کے
- ☆ دو قومی نظریہ کی تعریف و توضیح کر کے
- ☆ دو قومی نظریہ اہمیت بیان کر کے
- ☆ ہندوستانی مسلمانوں کی محرومیوں کو بیان کر کے
- ☆ قومی تشخص کو بحال رکھنے کے لئے مسلمان ہند کی مساوی بیان کر کے
- ☆ آزادی ہند اور قیام پاکستان علامہ اقبال اور قائد اعظم کی مساوی بیان کر کے
- ☆ قیام پاکستان سے مستقبل اسلامی مملکت کے قیام کے لئے مسلم عوام کی کوششوں کو بیان کر کے
- ☆ مسلم لیگ کے قیام پاکستان کے لئے جدوجہد بیان کر کے

غیر مسلم طلباء کے لئے

نی بی سی
101
کل وقت: 20 منٹ

تعلیم اعلیٰ قیادت
سال دوم

موضوعات

سماجی ترقی، ترقی، قوم، قومی سطح، شہری سطح، صنعتی اربوں کی سطح، ضروریات، درجہ

۱۰۰ حقوق و فرائض

۱۰۱ قوت و برکت

۱۰۲ قوت اربوں

۱۰۳ نکتہ و جذبہ

۱۰۴ وسیع نظری

۱۰۵ بے غرضی

۱۰۶ مسائل و سہولت

۱۰۷ خدائی شعور

۱۰۸ پاس آزمائی

۱۰۹ کل اگلی

۱۱۰ تعمیرات کو قبول کرنا

۱۱۱ خود شناسی

نسب اخلاقیات

سال ۲۰۰۳

تدریس مقاصد

عمومی مقاصد:

طالب علم: اخلاقیات کی اہمیت و ضرورت سے سمجھ ہو سکے اور بیان کر سکے

خصوصی مقاصد: طالب علم اس قتل ہو کہ

موضوعات کا مطلب بیان کر سکے

عملی زندگی سے مثالوں کی نشاندہی کر سکے

اپنی شخصیت اور معاشرے پر موضوعات کے متعلق مثبت اثرات پیدا کرنے کے طریقے بیان کر سکے

اعلیٰ بنیادی قواعد میں سے

توت برداشت۔ قوت ارادی۔ مکن جذبہ۔ وسیع انگری۔ بے غرض۔ انسانی دوستی خالص۔ شعور۔ پس نزاری۔

کمال اگلی اور ذوا شناسی کی اہمیت بیان کر سکے

اخلاقیات سے شغف ہو کر قومی خدمت بہتر طور پر انجام دے سکے

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۶۲
۶۳
۶۴
۶۵

Phy-212 APPLIED MECHANICS

Total Contact Hours			T	P
C				
Theory	32 Hours	1	3	2
Practical	96 Hours			

- AIMS**
1. Apply the concepts of Applied Physics to understand Mechanics
 2. Apply laws and principles of Mechanics in solving technological problems
 3. Use the knowledge of App. Mechanics in learning advance technical courses.
 4. Demonstrate efficient skill of practical work in Mechanics Lab.

COURSE CONTENTS

- 1. MEASUREMENTS** **2 Hours**
 - 1.1 Review: Dimensional formula of Equations of Motion
 - 1.2 Review: Systems of measurement, S.I. Units, conversion
 - 1.3 Significant Figures
 - 1.4 Degree of accuracy
- 2. EQUILIBRIUM OF CON-CURRENT FORCES** **4 Hours**
 - 2.1 Concurrent forces
 - 2.2 Addition and Resolution of Vectors
 - 2.3 Toggle Joint, Hanging Chains
 - 2.4 Roof Trusses, Cranes.
 - 2.5 Framed structures
- 3. MOMENTS AND COUPLES:** **3 Hours**
 - 3.1 Principle of Moments - Review
 - 3.2 Levers
 - 3.3 Safety valve
 - 3.4 Steel yard
 - 3.5 Parallel forces, couple
 - 3.6 Torque
- 4. EQUILIBRIUM OF NON CONCURRENT FORCES:** **4 Hours**
 - 4.1 Non-concurrent forces
 - 4.2 Free body diagram
 - 4.3 Varignon's theorem
 - 4.4 Conditions of total Equilibibrium (Rewish)
 - 4.5 Ladders
- 5. MOMENT OF INERTIA:** **4 Hours**
 - 5.1 Review: Rotational Inertia
 - 5.2 Moment of Inertia, Theorems
 - 5.3 Moment of Inertia of symmetrical bodies

5.4	M.I. of Fly wheel with applications	
5.5	Energy stored by Fly wheel	
6.	FRICITION:	4 Hours
6.1	Review: Laws of friction	
6.2	Motion of body along an inclined plane (up & down)	
6.3	Rolling friction & Ball Bearings	
6.4	Fluid Friction, Stokes' Law	
7.	WORK, ENERGY AND POWER	3 Hours
7.1	Review work,power+energy	
7.2	Work-Energy relationship	
7.3	Work done by variable force.	
7.4	Power	
7.5	I.H.P, B.H.P and Efficiency	
7.6	Dynamometer.	
8.	MACHINES:	3 Hours
8.1	Efficiency of machines	
8.2	Inclined plane - Review	
8.3	Reversibility of machines	
8.4	Single purchase crab	
8.5	Double purchase crab.	
8.6	Worm and worm wheel.	
8.7	Differential Screw Jack.	
8.8	Differential Pulley, Wheel and Axle	
9.	VIBRATORY MOTION:	2 Hours
9.1	S.H.M. - Review	
9.2	Pendulums	
9.3	Helical spring.	
9.4	Quick return motion	
10.	ELASTICITY:	3 Hours
10.1	Three Modulii of Elasticity	
10.2	Loaded Beams, Types of Beam & Loads	
10.3	Bending Stress	
10.4	S.F & B.M diagram	
10.5	Torsion and Torsional Stresses	

Phy 212 APPLIED MECHANICS

INSTRUCTIONAL OBJECTIVES

- 1. USE THE CONCEPTS OF MEASUREMENT IN PRACTICAL SITUATIONS/PROBLEMS**
 - 1.1 Explain Dimensional formula
 - 1.2 Explain systems of measurement
 - 1.3 Use concept of significant figures and degree of accuracy to solve problems

- 2. USE THE CONCEPT OF ADDITION AND RESOLUTION OF VECTORS TO PROBLEMS ON EQUILIBRIUM INVOLVING CONCURRENT FORCES**
 - 2.1 Describe concurrent forces
 - 2.2 Explain resolution of vectors
 - 2.3 Use the analytical method of addition of vectors for solving problems.
 - 2.4 Use the graphical method of addition of vectors for solving problems.
 - 2.5 Solve problems on forces with emphasis on roof trusses, cranes simple frames and framed structures.

- 3. USE THE PRINCIPLE OF MOMENTS AND CONCEPT OF COUPLE TO SOLVE PROBLEMS.**
 - 3.1 Describe the principle of moments.
 - 3.2 Use the principle of moments to solve problems on compound levers, safety valve, steel-yard.
 - 3.3 Describe couple and torque.
 - 3.4 Use the concept to solve problems on torque.

- 4. USE THE LAWS OF TOTAL EQUILIBRIUM OF FORCES TO SOLVE PROBLEMS INVOLVING FORCES IN EQUILIBRIUM.**
 - 4.1 Distinguish between concurrent and non-concurrent forces.
 - 4.2 Prepare a free body diagram of an object or a structure.
 - 4.3 Explain Varignon's theorem.
 - 4.4 Use laws of total equilibrium to solve problems on forces involving framed structure and ladders.

- 5. USE CONCEPTS OF MOMENT OF INERTIA TO PRACTICAL SITUATIONS AND PROBLEMS.**
 - 5.1 Explain moment of inertia.
 - 5.2 Explain the theorems of Parallel and perpendicular Axis.
 - 5.3 Describe the M.I. of regular bodies
 - 5.4 Explain M.I. of Fly wheel
 - 5.5 Explain Energy stored by Fly Wheel
 - 5.6 Use these concepts to solve simple problems.

- 6. UNDERSTAND THE CONCEPTS AND LAWS OF SOLID AND FLUID FRICTION.**
 - 6.1 Define Coefficient of friction between a body placed on an inclined plane

- and the surface.
- 6.2 Explain motion of a body placed on an inclined plane
 - 6.3 Calculate the force needed to move a body up and down an inclined plane.
 - 6.4 Explain rolling friction and use of ball bearings.
 - 6.5 Describe fluid friction and Stoke's law.
- 7. UNDERSTAND WORK, ENERGY AND POWER.**
- 7.1 Derive work-energy relationship
 - 7.2 Use formulae for work done by a variable force to solve problems.
 - 7.3 Explain Power, I.H.P, B.H.P and efficiency.
 - 7.4 Describe dynamometers.
 - 7.5 Use the concepts to solve problems on power and work-energy
- 8. USE THE CONCEPTS OF MACHINES TO PRACTICAL SITUATIONS.**
- 8.1 Explain theoretical, actual mechanical advantage and efficiency of simple machines.
 - 8.2 Use the concept to calculate efficiency of an inclined plane.
 - 8.3 Describe reversibility of machines.
 - 8.4 Calculate the efficiency of:
 - i. Single purchase crab.
 - ii. Double purchase crab.
 - iii. Worm and worm wheel.
 - iv. Differential screw jack, Diff. Pulley, Wheel and Axle.
 - 8.5 Use the formulae to solve the problems involving efficiency, M.A of the above machines.
- 9. USE THE CONCEPTS OF VIBRATORY MOTION TO PRACTICAL SITUATIONS.**
- 9.1 Define vibratory motion giving examples.
 - 9.2 Describe circular motion and its projection on diameter of the circular path.
 - 9.3 Relate rotatory motion to simple vibratory motion.
 - 9.4 State examples of conversion of rotatory motion to vibratory motion and vice versa.
 - 9.5 Derive formulae for position, velocity and acceleration of a body executing S.H.M.
 - 9.6 Use the concept of S.H.M to helical springs.
 - 9.7 Use the concept S.H.M to solve problems on pendulum.
- 10. UNDERSTAND BENDING MOMENTS AND SHEARING FORCES.**
- 10.1 Define three types of stresses and moduli of elasticity.
 - 10.2 Describe types of beams and loads.
 - 10.3 Explain shearing force and bending moment.
 - 10.4 Use these concepts to calculate S.F and B.M in a given practical situation for point loads, uniformly distributed loads.
 - 10.5 Prepare S.F and B.M diagram for loaded cantilever and simply supported beams.
 - 10.6 Describe torsion and torsional stresses giving formula

LIST OF EXPERIMENTS

1. Find the weight of the given body using Law is theorem.
2. Find unknown forces in a given set of concurrent forces in equilibrium using Grave-sands apparatus
3. Set a jib crane and analyse forces in its members
4. Set a Derrick Crane and analyse forces in its members
5. Study forces shared by each member of a Toggle Joint
6. Set a Roof Truss and find forces in its members
7. Verify Principle of Moments in a compound lever
8. Calibrate a steelyard
9. Find the Reactions at the ends of a loaded beam
10. Find the Moment of Inertia of a Flywheel
11. Find the angle of reaction for a wooden block placed on an inclined plane
12. Find the B.H.P. of a motor
13. Find M.A. and Efficiency of worm and worm wheel
14. Find M.A. and efficiency of differential wheel and axle
15. Find the efficiency of a screw
16. Find the efficiency of a differential pulley
17. Verify Hooke's Law using Helical Spring
18. Find the coefficient of Rigidity of a wire using Maxwell's needle
19. Determine S.F. and B.M. in a loaded canti-lever (Point Loads)
20. Determine S.F. and B.M. in a simply supported Beam (Point Loads)
21. Determine S.F. and B.M. in a simply supported Beam (Point loads and uniformly distributed load)
22. Determine S.F. and B.M. in a simply supported Beam (Point loads and uniformly distributed)
23. Study working and function of link mechanism of different types

BOOKS RECOMMENDED:

1. Applied Mechanics by R.S. Khurmi
2. Applied Mechanics by A.P.S Sahihney & Prakash D. Manikpyny.
3. Applied Mechanics by Inchley and Morley
4. Theories of Machines by R.S. Khurmi and J.K. Gupta.
5. Applied Mechanics by Junarker.
6. Engineering Science Vol-I by Brown and Bryant
7. Practical Physics by Mehboob Ilahi Malik & Ikram-ul-Haq
8. Experimental Physics Note Book by M. Aslam Khan & M. Akram Sandhu
9. Experimental Mechanics (Urdu Process) by M. Akram Sandhu

MATHS-213 Applied Mathematics-II

Total Contact Hrs:	T	P	C
Theory: 96 Hrs.	3	0	3
Practical: 0			

Aims & Objectives:

After completing the course the students will be able to:

Solve the problems of calculus and analytical Geometry.

Course Contents:

1. FUNCTIONS & LIMITS. 8 Hours
 - 1.1 Constants and variables
 - 1.2 Functions & their types
 - 1.3 The concept of limit
 - 1.4 Limit of a function
 - 1.5 Fundamental theorems on limit
 - 1.6 Some important limits
 - 1.7 Continuous function
 - 1.8 Problems

2. DIFFERENTIATION. 23 Hours
 - 2.1 Derivative of a function.
 - 2.2 Geometrical interpretation of differentiation.
 - 2.3 Differentiation by first principle.
 - 2.4 Rules for differentiation.
 - 2.5 Differentiation of algebraic functions.
 - 2.6 Differentiation of trigonometric and inverse trigonometric functions.
 - 2.7 Differentiation of logarithmic and exponential functions.
 - 2.8 Problems.

3. HIGHER DERIVATIVES AND APPLICATION OF DIFFERENTIAL CALCULUS. 9 Hours
 - 3.1 Second derivative of a function.
 - 3.2 3rd derivative of a function.
 - 3.3 Increasing and decreasing function.
 - 3.4 Maximum and minimum values.
 - 3.5 Criteria for maximum and minimum values.
 - 3.6 Methods of finding maxima and minima.
 - 3.7 Problems.

4. INTEGRATION. 10 Hours
 - 4.1 Basic concepts of integration.
 - 4.2 Fundamental formulae & important rules.

- 4.3 Integration by substitution.
 - 4.4 Integration by trigonometric substitution.
 - 4.5 Integration by parts.
 - 4.6 Definite integrals and its applications.
5. INTEGRATION BY USING PARTIAL FRACTIONS. 15 Hours
- 5.1 Introduction to partial fractions.
 - 5.2 Linear distinct factors case-I
 - 5.3 Linear repeated factors case-II
 - 5.4 Quadratic distinct factors case-III
 - 5.5 Quadratic repeated factors case-IV
 - 5.6 Integration of rational fractions.
 - 5.7 Problems.
6. DIFFERENTIAL EQUATIONS. 6 Hours
- 6.1 Introduction
 - 6.2 Differential equation of order-1
 - 6.3 Differential equation of order-2
 - 6.4 Solution of 1st and 2nd order differential equations
 - 6.5 Problems
7. FUNDAMENTALS OF PLANE ANALYTIC GEOMETRY AND STRAIGHT LINE. 10 Hours
- 7.1 Rectangular coordinate system.
 - 7.2 Distance formula.
 - 7.3 Ratio formula.
 - 7.4 Slope of a line.
 - 7.5 Slope formula and angle formula.
 - 7.6 Parallel and perpendicular lines.
 - 7.7 Equation of lines parallel to X-axis and Y-axis.
 - 7.8 Important forms of equation of the straight line.
 - 7.9 Intersection of two lines.
 - 7.10 Distance between a line and a point.
8. CONIC SECTIONS. 9 Hours
- 8.1 Circle
 - 8.2 Standard equation of a circle
 - 8.3 General equation of a circle
 - 8.4 Radius and coordinates of centre
 - 8.5 Parabola
 - 8.6 Standard equation of parabola
 - 8.7 Four forms of standard equation
 - 8.8 General equation of parabola
 - 8.9 Ellipse
 - 8.10 Standard equation and related definitions
 - 8.11 Hyperbola
 - 8.12 Standard equation and related definitions
 - 8.13 Problems.

9. STATISTICS.
9.1 Concept of mean, media and mode
9.2 Standard deviation
9.3 Laws of probability
9.4 Problems.

6 Hours

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Mgm-211 BUSINESS COMMUNICATION

T	P	C
1	0	1

Total contact hours

Theory 32 Hrs.

Prerequisites: The students shall already be familiar with the language concerned.

AIMS The course has been designed to enable the students to.

1. Develop communication skills.
2. Understand basic principles of good and effective business writing in commercial and industrial fields.
3. Develop knowledge and skill to write technical report with confidence and accuracy.

COURSE CONTENTS

- 1. COMMUNICATION PROCESS. 6 Hours**
 - 1.1 Purposes of communication
 - 1.2 Communication process
 - 1.3 Distortions in communication
 - 1.4 Consolidation of communique
 - 1.5 Communication flow
 - 1.6 Communication for self development
- 2. ORAL COMMUNICATION SKILLS. 6 Hours**
 - 2.1 Significance of speaking.
 - 2.2 Verbal and non-verbal messages.
 - 2.3 Strategic steps of speaking.
 - 2.4 Characteristics of effective oral messages.
 - 2.5 Communication Trafficking.
 - 2.6 Oral presentation.
- 3. QUESTIONING SKILLS. 3 Hours**
 - 3.1 Nature of question.
 - 3.2 Types of questions.
 - 3.3 Characteristics of a good question.
 - 3.4 Questioning strategy
- 4. LISTENING SKILLS. 5 Hours**
 - 4.1 Principles of active listening.
 - 4.2 Skills of active listening.
 - 4.3 Barriers to listening.
 - 4.4 Reasons of poor listening.
 - 4.5 Giving Feedback.
- 5. INTERVIEWING SKILLS. 3 Hours**
 - 5.1 Significance of interviews.
 - 5.2 Characteristics of interviews.

- 5.3 Activities in an interviewing situation
- 5.4 Types of interviews.
- 5.5 Interviewing strategy.

- 6. REPORT WRITING. 3 Hours**
 - 6.1 Goals of report writing
 - 6.2 Report format.
 - 6.3 Types of reports.
 - 6.4 Report writing strategy.

- 7. READING COMPREHENSION. 2 Hours**
 - 7.1 Reading problems.
 - 7.2 Four Reading skills.

- 8. GROUP COMMUNICATION. 4 Hours**
 - 8.1 Purposes of conducting meetings.
 - 8.2 Planning a meeting.
 - 8.3 Types of meetings.
 - 8.4 Selection f a group for meeting.
 - 8.5 Group leadership skills.
 - 8.6 Running a successful meeting.
 - 8.7 Active participation techniques.

RECOMMENDED BOOKS

1. Sh. Ata-ur-Rehman Effective Business Communication & Report Writing.
2. Ulman J.N. Could JR. Technical Reporting.

Mgm-211 BUSINESS COMMUNICATION.

INSTRUCTIONAL OBJECTIVES

- 1. UNDERSTAND THE COMMUNICATION PROCESS.**
 - 1.1 State the benefits of two way communication.
 - 1.2 Describe a model of communication process.
 - 1.3 Explain the major communication methods used in organization.
 - 1.4 Identify the barriers to communication and methods of overcoming these barriers.
 - 1.5 Identify misconceptions about communication.

- 2. UNDERSTAND THE PROCESS OF ORAL.**
 - 2.1 Identify speaking situations with other peoples.
 - 2.2 Identify the strategy steps of speaking.
 - 2.3 Identify the characteristics of effective speaking.
 - 2.4 State the principles of one-way communication.
 - 2.5 State the principles of two-way communication.
 - 2.6 Identify the elements of oral presentation skills.
 - 2.7 Determine the impact of non-verbal communication on oral communication.

- 3. DETERMINE THE USES OF QUESTIONING SKILLS TO GATHER AND CLARIFY INFORMATION IN THE ORAL COMMUNICATION PROCESS.**
 - 3.1 Identify different types of questions.
 - 3.2 Determine the purpose of each type of question and its application.
 - 3.3 Identify the hazards to be avoided when asking questions.
 - 3.4 Demonstrate questioning skills.

- 4. DEMONSTRATE THE USE OF ACTIVE LISTENING SKILL IN THE ORAL COMMUNICATION PROCESS.**
 - 4.1 State the principles of active listening.
 - 4.2 Identify skills of active listening.
 - 4.3 Identify barriers to active listening.
 - 4.4 State the benefits of active listening.
 - 4.5 Demonstrate listening skills.
 - 4.6 Explain the importance of giving and receiving feed back.

- 5. Determine the appropriate interview type for the specific work-related situation and conduct a work-related interview.**
 - 5.1 State the significance of interviews.
 - 5.2 State the characteristics of interviews.
 - 5.3 Explain the activities in an interviewing situation.
 - 5.4 Describe the types of interviews.
 - 5.5 Explain the interviewing strategy.
 - 5.6 Prepare instrument for a structured interview.

- 6. PREPARE A REPORT OUT-LINE, BASED ON SUBJECT MATTER AND AUDIENCE.**

- 6.1 Identify the different types of reports.
 - 6.2 Determine when to use an informal or formal report presentation.
 - 6.3 Identify the stages of planning a report.
 - 6.4 Identify the parts of a report and choose the parts appropriate for each type of report.
 - 6.5 Draft a report outline.
- 7. DEMONSTRATE READING COMPREHENSION.**
- 7.1 Identify major reading problems.
 - 7.2 Identify basic reading skills.
 - 7.3 State methods of previewing written material.
 - 7.4 Identify methods of concentration when reading.
 - 7.5 Demonstrate reading comprehension.
- 8. UNDERSTAND THE PRINCIPLES OF GROUP COMMUNICATIONS.**
- 8.1 State the purpose and characteristics of major types of meeting.
 - 8.2 Explain responsibilities of a meeting/committee.
 - 8.3 Identify problems likely to be faced at meeting and means to overcome these problems.
 - 8.4 Distinguish between content and process at meetings.
 - 8.5 Explain the key characteristics of a good group facilitator.

Mgm 221 BUSINESS MANAGEMENT AND INDUSTRIAL ECONOMICS

Total Contact Hours

Theory	32	T	P	C
Practical	0	1	0	1

AIMS The students will be able to develop management skills, get acquainted the learner with the principles of management and economic relations and develop commercial/economic approach to solve the problems in the industrial set-up.

COURSE CONTENTS

- 1. ECONOMICS** **2 Hours**
 - 1.1 Definition: Adam Smith, Alfred Marshall, Prof. Robins.
 - 1.2 Nature and scope
 - 1.3 Importance for technicians.

- 2. BASIC CONCEPTS OF ECONOMICS** **1 Hour**
 - 2.1 Utility
 - 2.2 Income
 - 2.3 Wealth
 - 2.4 Saving
 - 2.5 Investment
 - 2.6 Value.

- 3. DEMAND AND SUPPLY.** **2 Hours**
 - 3.1 Definition of demand.
 - 3.2 Law of demand.
 - 3.3 Definition of supply.
 - 3.4 Law of supply.

- 4. FACTORS OF PRODUCTION.** **2 Hours**
 - 4.1 Land
 - 4.2 Labour
 - 4.3 Capital
 - 4.4 Organization.

- 5. BUSINESS ORGANIZATION.** **3 Hours**
 - 5.1 Sole proprietorship.
 - 5.2 Partnership
 - 5.3 Joint stock company.

- 6. ENTREPRENEURIAL SKILLS** **4 Hours**
 - 6.1 Preparing, planning, establishing, managing, operating and evaluating relevant resources in small business.
 - 6.2 Business opportunities, goal setting.
 - 6.3 Organizing, evaluating and analyzing opportunity and risk tasks.

7.	SCALE OF PRODUCTION.	2 Hours
	7.1 Meaning and its determination.	
	7.2 Large scale production.	
	7.3 Small scale production.	
8.	ECONOMIC SYSTEM	3 Hours
	8.1 Free economic system.	
	8.2 Centrally planned economy.	
	8.3 Mixed economic system.	
9.	MONEY.	1 Hour
	9.1 Barter system and its inconveniences.	
	9.2 Definition of money and its functions.	
10.	BANK.	1 Hour
	10.1 Definition	
	10.2 Functions of a commercial bank.	
	10.3 Central bank and its functions.	
11.	CHEQUE	1 Hour
	11.1 Definition	
	11.2 Characteristics and kinds of cheque.	
	11.3 Dishonour of cheque.	
12.	FINANCIAL INSTITUTIONS	2 Hours
	12.1 IMF	
	12.2 IDBP	
	12.3 PIDC	
13.	TRADE UNION	2 Hours
	13.1 Introduction and brief history.	
	13.2 Objectives, merits and demerits.	
	13.3 Problems of industrial labour.	
14.	INTERNATIONAL TRADE.	2 Hours
	14.1 Introduction	
	14.2 Advantages and disadvantages.	
15.	MANAGEMENT	1 Hour
	15.1 Meaning	
	15.2 Functions	
16.	ADVERTISEMENT	2 Hours
	16.1 The concept, benefits and draw-backs.	
	16.2 Principal media used in business world.	
17.	ECONOMY OF PAKISTAN	1 Hour
	17.1 Introduction	

17.2 Economic problems and remedies.

BOOKS RECOMMENDED

1. Nisar-ud-Din, Business Organization, Aziz Publisher, Lahore
2. M. Saeed Nasir, Introduction to Business, Ilmi Kitab Khana, Lahore.
3. S.M. Akhtar, An Introduction to Modern Economics, United Limited, Lahore.

INSTRUCTIONAL OBJECTIVES

- 1. UNDERSTAND THE IMPORTANCE OF ECONOMICS.**
 - 1.1 State definition of economics given by Adam Smith, Alfred Marshall and Professor Robins.
 - 1.2 Explain nature and scope of economics.
 - 1.3 Describe importance of study of economics for technicians.

- 2. UNDERSTAND BASIC TERMS USED IN ECONOMICS.**
 - 2.1 Define basic terms, utility, income, wealth, saving, investment and value.
 - 2.2 Explain the basic terms with examples

- 3. UNDERSTAND LAW OF DEMAND AND LAW OF SUPPLY.**
 - 3.1 Define Demand.
 - 3.2 Explain law of demand with the help of schedule and diagram.
 - 3.3 State assumptions and limitation of law of demand.
 - 3.4 Define Supply.
 - 3.5 Explain law of Supply with the help of schedule and diagram.
 - 3.6 State assumptions and limitation of law of supply.

- 4. UNDERSTAND THE FACTORS OF PRODUCTION**
 - 4.1 Define the four factors of production.
 - 4.2 Explain labour and its features.
 - 4.3 Describe capital and its peculiarities.

- 5. UNDERSTAND FORMS OF BUSINESS ORGANIZATION.**
 - 5.1 Describe sole proprietorship, its merits and demerits.
 - 5.2 Explain partnership, its advantages and disadvantages.
 - 5.3 Describe joint stock company, its merits and demerits.
 - 5.4 Distinguish public limited company and private limited company.

- 6. UNDERSTAND ENTREPRENEURIAL SKILLS**
 - 6.1 Explain preparing, planning, establishing and managing small business set up
 - 6.2 Explain evaluating all relevant resources
 - 6.3 Describe organizing analyzing and innovation of risk of task

- 7. UNDERSTAND SCALE OF PRODUCTION.**
 - 7.1 Explain scale of production and its determination.
 - 7.2 Describe large scale production and its merits.
 - 7.3 Explain small scale of production and its advantages and disadvantages.

- 8. UNDERSTAND DIFFERENT ECONOMIC SYSTEMS.**
 - 8.1 Describe free economic system and its characteristics.
 - 8.2 Explain centrally planned economic system, its merits and demerits.
 - 8.3 State mixed economic system and its features.

- 9. UNDERSTAND WHAT IS MONEY**
 - 9.1 Define money
 - 9.2 Explain barter system and its inconveniences.
 - 9.3 Explain functions of money.

- 10. UNDERSTAND BANK AND ITS FUNCTIONS.**
 - 10.1 Define bank.
 - 10.2 Describe commercial bank and its functions.
 - 10.3 State central bank and its functions.

- 11. UNDERSTAND CHEQUE AND DISHONOR OF CHEQUE.**
 - 11.1 Define cheque.
 - 11.2 Enlist the characteristics of cheque.
 - 11.3 Identify the kinds of cheque.
 - 11.4 Describe the causes of dishonor of a cheque.

- 12. UNDERSTAND FINANCIAL INSTITUTIONS.**
 - 12.1 Explain IMF and its objectives.
 - 12.2 Explain organisational set up and objectives of IDBP.
 - 12.3 Explain organisational set up and objectives of PIDC.

- 13. UNDERSTAND TRADE UNION, ITS BACKGROUND AND FUNCTIONS.**
 - 13.1 Describe brief history of trade union.
 - 13.2 State functions of trade union.
 - 13.3 Explain objectives, merits and demerits of trade unions.
 - 13.4 Enlist problems of industrial labour.

- 14. UNDERSTAND INTERNATIONAL TRADE.**
 - 14.1 Explain international trade.
 - 14.2 Enlist its merits and demerits.

- 15. UNDERSTAND MANAGEMENT**
 - 15.1 Explain meaning of management.
 - 15.2 Describe functions of management.
 - 15.3 Identify the problems of business management.

- 16. UNDERSTAND ADVERTISEMENT.**
 - 16.1 Explain the concept of advertisement.
 - 16.2 Enlist benefits and drawbacks of advertisement.
 - 16.3 Describe principal media of advertisement used in business world.

- 17. UNDERSTAND THE ECONOMIC PROBLEMS OF PAKISTAN.**
 - 17.1 Describe economy of Pakistan.
 - 17.2 Explain economic problems of Pakistan
 - 17.3 Explain remedial measures for economic problems of Pakistan.

ET-202

APPLIED ELECTRICITY AND ELECTRONICS

T	P	C
1	3	2

Total contact hrs.

Theory	32
Practicals	96

Pre-requisite: Engg. Physics 1st year

AIMS: This course enables the students to understand the fundamental of electricity, know the devices used for control of industrial equipments, their properties and uses. The course provide the knowledge of working principles and operation of A.C. and D.C. motors, transformers and generators, interpret connection diagrams of various electrical devices. Students will be able to observe safety rules and provide electric shock treatment.

COURSE CONTENTS

- 1. FUNDAMENTALS OF ELECTRICITY 3 Hours**
 - 1.1. Current, voltage and resistance, their units
 - 1.2. Ohms law, simple calculations
 - 1.3. Laws of resistance, simple calculations
 - 1.4. Combination of resistances, simple calculations
 - 1.5. Electrical and mechanical power, their conversion, units, horse power
 - 1.6. heating effect of current, joules law
 - 1.7. Electrical energy, units, energy bill
 - 1.8. Thermal relay

- 2. FUNDAMENTALS OF ELECTRO MAGNETISM 5 Hours**
 - 2.1. Magnetism, units, theory of magnetism
 - 2.2. Permeability, Ferro magnetic materials
 - 2.3. Electromagnetism, fields around current carrying - conductors, coils. Fleming's right hand rule
 - 2.4. Force on current-carrying conductor lying in magnetic field left hand rule
 - 2.5. Farady's laws of electro magnetic induction, basic AC generator
 - 2.6. Self and mutual induction, elementary transformer
 - 2.7. Magnetic relays and connectors

- 3. MOTORS, GENERATORS AND TRANSFORMERS 5 Hours**
 - 3.1. Construction and working of AC and DC generators
 - 3.2. Construction and working of transformers, emf and current equation types
 - 3.3. Welding transformers, ratings
 - 3.4. Types and working of AC motors
 - i. 1- Phase induction motor
 - ii. 3- Phase induction motors
 - 3.5. Principle of Induction heating, construction, ratings of induction furnaces

- 4. BATTERIES AND CELLS 2 Hours**

- 4.1. Types of cells, primary, secondary
 - 4.2. Types of secondary cells, voltage ratings
 - 4.3. Charging and discharging of lead acid battery
 - 4.4. Precautions in handling batteries
 - 4.5. Alkaline batteries, ratings
- 5. FUNDAMENTALS OF ELECTRONICS 4 Hours**
- 5.1 Semiconductor theory, doping, P & N type materials
 - 5.2 PN Junction diode, potential barrier, forward and reverse bias
 - 5.3 Use of PN Diode as rectifier
 - 5.4 Half-wave, full-wave and bridge rectifiers
 - 5.5 Filtering
- 6. TRANSISTORS 5 Hours**
- 6.1 PNP & NPN transistors, biasing, working
 - 6.2 Use of transistors as amplifiers, gains in CE, CB and CC amplifiers
 - 6.3 Field effect transistors, construction and uses
 - 6.4 Transistors as oscillators
- 7. SPECIAL PURPOSE DIODES AND DEVICES 5 Hours**
- 7.1 Zener diodes, uses, ratings
 - 7.2 Photodiodes, uses
 - 7.3 DIAC, uses
 - 7.4 TRIAC, uses
 - 7.5 Saturable core reactor
- 8. THYRISTORS 3 Hours**
- 8.1 UJT, working, uses as oscillators
 - 8.2 SCR, working, uses as control devices
 - 8.3 Phase control of SCR's

INSTRUCTIONAL OBJECTIVES**1. UNDERSTAND BASIC CONCEPTS AND LAWS OF ELECTRICITY.**

- 1.1 Define units of current, voltage and resistance
- 1.2 Explain Ohm's Law
- 1.3 Solve simple problems on Ohm's laws
- 1.4 Substitute two of the three variables to find the third unknown in equation $V=IR$
- 1.5 Calculate the equivalent resistances for resistors joined in series
- 1.6 Calculate electrical and mechanical power and the interrelation between the two systems
- 1.7 Calculate the electrical energy consumption in an installation and prepare the energy bill
- 1.8 State the action of different types of thermal relays

2. UNDERSTAND FUNDAMENTAL CONCEPT OF ELECTROMAGNETISM

- 2.1 State molecular theory of magnetism
- 2.2 Define various units involving magnetism
- 2.3 State the magnetic properties of materials and permeability
- 2.4 state the magnetism associated with current carrying conductors and coils
- 2.5 State Fleming's right hand rule
- 2.6 Explain the force experienced by the current carrying conductors in magnetic fields according to Fleming's right hand rule
- 2.7 State Faraday's laws of electro magnetic induction.
- 2.8 Explain the production of A.C. in a simple coil rotating in a uniform magnetic field
- 2.9 State the self induction in a coil and the mutually induced voltage in a nearby coil due to flux linkage
- 2.10 Explain the working of magnetic relays and contactors.

3. UNDERSTAND WORKING OF ELECTRIC MOTORS, AND GENERATORS AND TRANSFORMERS

- 3.1 State the main parts of D.C. Electric Motors and D.C. generator
- 3.2 State the construction of Alternator
- 3.3 State the construction of three phase induction motor and single phase induction motors
- 3.4 Explain the working principle of transformers
- 3.5 State various parts of a transformer
- 3.6 State the emf equation of transformer and transformation ratio equation
- 3.7 Explain the working of transformer specially designed for welding purpose and its settings.
- 3.8 Explain the working of different types of electric furnaces.
- 3.9 Explain the working of electric spot welding machine

- 4. UNDERSTAND THE ELECTRO CHEMICAL EFFECT AND ITS APPLICATION IN VARIOUS TYPES OF BATTERIES AND CELLS**
 - 4.1 Define the primary and secondary cells
 - 4.2 state different types of secondary cells and their voltage rating
 - 4.3 Explain the method of charging of a lead Acid battery
 - 4.4 Enlist the precautions in handling batteries
 - 4.5 State the construction of Alkaline Batteries and their ratings.

- 5. UNDERSTAND THE FUNDAMENTALS OF ELECTRONICS**
 - 5.1 State the Semi conductor theory
 - 5.2 State how type P type and N type material is produced
 - 5.3 State the action of potential barrier in a P.N junction and the effect of forward and reverse bias on the junction.
 - 5.4 Draw the circuit diagram for half wave and full wave rectifier
 - 5.5 Draw the Bridge Rectifier circuit with filter circuit

- 6. UNDERSTAND THE WORKING OF BIPOLAR JUNCTION TRANSISTOR AND F.E.T. TRANSISTOR**
 - 6.1 State the biasing working of N.P.N. and P.N.P. type of transistor
 - 6.2 Draw the circuit indicating the method of biasing the NPN and PNP transistors
 - 6.3 Draw the different types of amplifier connections (C.E., C.B. C.C.)
 - 6.4 State the working of field effect transistors
 - 6.5 Enlist the comparative properties and usage of two types of transistor (Bipolar verses F.E.T.)
 - 6.6 State the working of a transistor Oscillator and draw its circuit diagram.

- 7. UNDERSTAND THE WORKING OF SPECIAL PURPOSE DEVICES**
 - 7.1 State the working of zanier diode
 - 7.2 Draw the connection for a practical regulated power supply
 - 7.3 State the working of photodiode and its uses
 - 7.4 State the working of DIAC and its uses
 - 7.5 State the working of TRIAC and its uses
 - 7.6 State the working of saturable core reactor and its use

- 8. UNDERSTAND THE APPLICATION OF THYRISTORS IN CONTROL CIRCUITS**
 - 8.1 Explain the working of Unijunction transistor and its use as an Oscillator
 - 8.2 Draw circuit of a UJT relaxation oscillator
 - 8.3 Explain the working of silicon controlled rectifier and its use as a control device.
 - 8.4 Explain the phase control with the help of S.C.R. for A.c. Loads.
 - 8.5 Draw circuits using phase control by SCR's

LIST OF PRACTICAL**96 Hours**

1. Study of electrical measuring instruments, handling precautions, methods of connection
2. Verification; of Ohm's law
3. Verification of laws of combination; of resistance
4. Measurement of power by Volt-ammeter and wattmeter
5. Measurement of energy
6. Study of thermal and magnetic relays/contractors
7. Study of magnetic fields due to current-carrying conductors, coils
8. Verification of faraday's laws of electro-magnetic induction
9. Verification of self and mutual induction
10. Study of magnetic relays
11. Study of AC and DC generators, voltage build-up-Excitation
12. Study of transformers, determination of voltage ratio
13. Study of welding transformers
14. Starting single-phase induction motors, reversal
15. Starting 3-phase induction motors, reversal.
16. Connections of magnetic starters with motors
17. Connections of 30point (forward-stop-reverse) starters
18. Study of Induction furnaces, their controls.
19. Study of Primary and secondary cells.
20. Charging of lead Acid Batteries, safety precautions, preparation of electrolyte
21. Study and connections of PN diodes as rectifiers
22. Connecting PN Diode as half-wave and full-wave
23. Connecting PN Diode as bridge Rectifiers with filter
24. Study connections and biasing of PNP and NPN transistors
25. Determination of current and voltage gains of CE amplifier
26. Study and connections of zener diode as voltage regulator
27. Study and connections of Photodiode as light sensing device
28. Study and connections of DIAC's and TRIAC's as switch circuits
29. Determination of intrinsic stand-off ratio of UJT.
30. Connections of UJT as relaxation Oscillator
31. Study and connections of SCR as a power switch
32. Study of phase control of SCR's

RECOMMENDED BOOKS :

1. Examples of electrical Calculations, by Admiralty
2. Reed's Basic electro-technology for marine engineers, KRAAL
3. Electrical Technology, B.L. Theraja
4. AC & DC circuits B.Grob
5. Basic Electronics B. Grob

MT-212 METROLOGY

T P C
1 3 2

Total contact hrs.

Theory 32
Practicals 96

Pre-requisite: Workshop Practice-I

AIMS The subject is connected with the methods of measurements based on agreed International Standards and units. The practice in the subject requires the use of apparatus and equipment which include instruments necessary to adjust and permit the degree of accuracy required.

- 1. INTRODUCTION TO TECHNICAL MEASUREMENTS. 3 Hours**
 - 1.1 History of measurements
 - 1.2 Importance and purpose of measurements
 - 1.3 Systems of measurements
 - 1.3.1 English system
 - 1.3.2 Metric system
 - 1.3.3 ISO standards.
 - 1.3.4 Fits, Tolerance & Allowances.

- 2. TRANSFER TOOLS 3 Hours**
 - 2.1 Insides Calliper
 - 2.2 Outside Calliper
 - 2.3 Combination inside and out side

- 3. GRADUATED TOOLS. 1 Hours**
 - 3.1 Foot rules
 - 3.2 Steel Tapes

- 4. ADJUSTABLE MEASURING TOOLS 4 Hours**
 - 4.1 Vernier Caliper
 - 4.2 Micro meter
 - 4.3 Dial indicator
 - 4.4 Combination square

- 5. FIXED VALUE MEASURING TOOLS 3 Hours**
 - 5.1 Ring gauges
 - 5.2 Radius gauges
 - 5.3 Slip gauges. (Gauge blocks)
 - 5.4 Go-No-Go gauges

- 6. ANGLE MEASURING TOOLS 4 Hours**
 - 6.1 Fixed angle measuring tool
 - 6.1.1 Squares

- 6.1.2 Thread gauges
- 6.1.3 Grinding gauges.
- 6.1.4 Dial gauges.
- 6.1.5 Wire gauges

- 6.2 Adjustable angle measuring tools
 - 6.2.1 With out graduations.
 - 6.2.2 With graduations.

- 7. ACCURACY IN MEASUREMENTS 3 Hours**
 - 7.1 Five basic Metrology Elements.
 - 7.2 Classification of Errors.
 - 7.2.1 Controllable errors.
 - 7.2.2 Random errors.
 - 7.3 Calibration
 - 7.4 Repeatability.

- 8. LINER MEASUREMENTS 8 Hours**
 - 8.1 Non precision measurements
 - 8.1.1 Plates
 - (a) Surface plates
 - (b) Tool makers flats & high precision surface plates
 - (c) Glass surface plates
 - (d) Angle plates
 - 8.1.2 Cast iron cubes.
 - 8.1.3 Vee blocks.
 - 8.1.4 Straight edges.
 - 8.1.5 Spirit levels.
 - 8.1.6 Engineer's square.
 - 8.1.7 Engineer's parallels.
 - 8.1.8 Universal surface gauge.
 - 8.1.9 Engineer's Taper, wire & thickness gauges
 - 8.1.10 Pitch screw gauge
 - 8.2 Precision measurements
 - 8.2.1 Vernier instruments
 - (a) Vernier Height gauge.
 - (b) Vernier depth gauge.
 - (c) Dial indicator vernier caliper.
 - (d) Combination depth and angle gauge
 - 8.2.2 Micrometer calipers.
 - (a) Inside Micrometer
 - (b) Micrometer depth gauge
 - (c) Thread Micrometers
 - (d) Dial Micrometer caliper
 - (e) Tube Micrometer
 - (f) Hot gauge micrometer
 - 8.2.3 Dial indicators & indicating gauges.
 - 8.2.4 Internal gauges.

- (a) Dial bore gauges.
 - (b) Cylinder gauges.
 - (c) Slip gauges & accessories
 - 8.2.5 Gauge Blocks
 - 8.2.6 Sine Bars
- 8.3 Optical measurements
 - 8.3.1 Tool makers Microscope.
 - (a) Study
 - (b) Uses
 - 8.3.2 Use of optical flats
- 8.4 Comparators.
 - 8.4.1 Automatic gauging
 - 8.4.2 Mechanical comparator
 - (a) Study
 - (b) Uses
 - 8.4.3 Use of Electronic comparator
 - 8.4.4 Pneumatic or Air comparators
 - (a) Study
 - (b) Uses
 - 8.4.5 Projection/optical comparators.
 - (a) Study
 - (b) Uses.

9. GEAR INSPECTION AND MEASUREMENTS

3 Hours

- 9.1 Two types of gear inspection
 - 9.1.1 Analytical.
 - 9.1.2 Functional.
- 9.2 Gear tooth measurements.
 - 9.2.1 Gear tooth vernier caliper method
 - 9.2.2 Constant cord method
 - 9.2.3 Base tangent method
 - 9.2.4 Test plug method

TEXT BOOK:

1. Engineering Metrology By Jain R.K.
2. Kennedy and Andrews Inspection & Gauging

INSTRUCTIONAL OBJECTIVES

1. INSPECTION TECHNIQUES

1.1 Understand Inspection

- 1.1.1 Explain inspection and its need in the industry
- 1.1.2 Define
 - (i) Superficial inspection
 - (ii) Dimensional inspection
 - (iii) Surface testing
- 1.1.3 Explain 1.1.2

1.2 Understand inspection technique

- 1.2.1 Explain the classification of inspection
- 1.2.2 Discuss the merits and demerits of
 - (i) Floor and
 - (ii) Centralized inspection

2. QUALITY CONTROL

2.1 Understand the concept of quality control

- 2.1.1 Describe quality control
- 2.1.2 Discuss the importance of quality control in industry

2.2 Understand effect of dimensional variations on quality control

- 2.2.1 Describe dimensional variations
- 2.2.2 Give the causes of dimensional variations
- 2.2.3 Explain effect of dimensional variation on quality control

3. MARKING TOOLS

3.1 Apply different Marking Tools

- 3.1.1 Describe application of following marking tools like
 - (i) Divider
 - (ii) Scriber
 - (iii) Trammels
 - (iv) Oddleg caliper
- 3.1.2 Explain 3.1.1

4. MEASURING INSTRUMENTS

4.1 Understand the instruments used in semi-precision and precision measurements

- 4.1.1 Semi Precision Instruments
- 4.1.2 Explain Transfer Instrument
 - (i) In side/out side caliper
 - (ii) Combination set
- 4.1.3 Practice use of transfer instruments
- 4.1.4 Graduated Instruments: Apply the correct use of different graduated instruments

- 4.1.3 Describe the function of following instruments
 - (i) Steel Rule
 - (ii) Hook Rule
 - (iii) Folding Rule
 - (iv) Measuring Tape
- 4.1.4 Practice the use of graduated instruments
- 4.1.5 Linear Measuring Instruments
- 4.1.6 Apply the Linear measuring devices State use of following
 - (i) Plates
 - a) Surface plates
 - b) Tool makers surface plate
 - c) Glass surface plates
 - d) Angle plates
 - (ii) Cast iron cubes
 - (iii) Vee block
 - (iv) Straight edge
 - (v) Spirit level
 - (vii) Engineers parallel
- 4.1.7 Practice use of linear measuring devices

4.2 Precision Measuring Instruments

Apply the working and use of precision measuring instruments

- 4.2.1 Explain the working and use of following instruments
 - a. Micrometer
 - (i) Out-side micrometer
 - (ii) In-side micrometer
 - (iii) Depth micrometer or Depth gauge
 - (iv) Plug micrometer
 - (v) Vernier micrometer
 - b. Vernier Caliper English
 - (i) Vernier caliper
 - (ii) Vernier height gauge
 - (iii) Vernier depth gauge
 - (iv) Dial vernier caliper
- 4.2.2 Practice use of Precision measuring Instruments

4.3 Angular Measurement

Apply the correct use of various Angle measuring instruments

- 4.3.1 Identify the various angle measuring instruments
- 4.3.2 Observe proper care and use of following instruments
 - (i) Bevel protractor
 - (ii) Bevel protractor vernier
 - (iii) Sine Bar

5. TOLERANCE, LIMITS AND ALLOWANCE

5.1 Understand Tolerance, Limits and Allowance

- 5.1.1 Describe Tolerance
- 5.1.2 Discuss the importance of Tolerance in production

- 5.1.2 Explain types & importance of Tolerance
- 5.2 Limits**
 - 5.2.1 Define Limits
 - 5.2.2 Identify upper Limit and Lower Limit size
 - 5.2.3 Explain various dimension Limit Including standard size Nominal size, Normal size, Basic size, actual size and design size
- 5.3 Allowance**
 - 5.3.1 Define Allowance
 - 5.3.2 Explain positive and Negative allowance (clearance and Interference allowance)

6. GAUGES AND GAUGING

6.1 Understand gauge and gauging

- 6.1.1 Describe Go, not Go gauges & their uses
- 6.1.2 classify various types of gauges i.e
 - a) Fixed Gauges
 - a Ring gauge, Ring Thread gauge
 - b Plug gauge, Plug Thread gauge
 - c Snap gauge
 - d Feeler gauge
 - e Radius gauge
 - f Slip gauge or gauge block
 - g Sheet metal and wise gauge
 - h Form gauge
 - i Pin gauge
 - j Height gauge
 - k Template gauge
 - l Receiver gauge
 - m Flush pim gauge
 - n Screw thread pitch gauge
 - o Dove tail gauge
 - p Drill gauge
 - q Master gauge
 - b) Adjustable gauges
 - a Surface gauge
 - b Depth gauge
 - c Height gauge
 - d Dial gauge
 - e Adjustable Limit snap gauge
 - c) Indicating Type gauges
 - a Plug indicating gauge
 - b Parallel indicating gauge
 - c Depth indicating gauge
 - d Combine indicating gauge and universal angle gauge
 - e Indicating type snap gauge

7. THREAD MEASUREMENT AND THREAD GAUGES

7.1 Apply thread measurement and thread gauges techniques

- 7.1.1 Describe Terminology of thread
- 7.1.2 Sketch a thread showing nomenclature
- 7.1.3 Explain classes of thread fit
 - (i) Class 1 (Loose fit)
 - (ii) Class 11 (Free fit)
 - (iii) Class 111 (Medium-fit)
 - (iv) Class iv (close fit)
- 7.1.4 Select proper inspecting procedure for checking of external thread
 - (i) Three wise Method
 - (ii) Zies Micrometer

8. COMPARATORS

8.1 Understand comparator terminology

- 8.1.1 Define Comparator
- 8.1.2 Explain the working principle of :
 - a Electronic/Electrical Comparator
 - b Pneumatic comparators
 - c Optical/Projection comparators
 - d Mechanical comparator
 - e Automatic gauging comparator (Automatic gauging electronic Machine)
 - f Gauge Block Comparator
 - g Microscope

9. FITS

9.1 Understand the terminology of Fits

- 9.1.1 Define fits
- 9.1.2 Explain the types of fits
- 9.1.3 Distinguish clearance, interference, Transition fits

REFERENCE BOOKS:

- 1. Inspection and Gauging By Kennedy and Andrews
- 2. Engineering Metrology By Jain RK

MT-212 METROLOGY

96 Hours

LIST OF PRACTICALS

1. Practice of following marking tools.
 - a) Divider
 - b) Scriber
 - c) Trammel
 - d) Oddleg caliper
2. Practice of inside and outside calipers
3. Practice of combination set
4. Practice of following graduated instruments.
 - a) Steel Rule
 - b) Hook Rule
 - c) Folding Rule
 - d) Measuring Tape
5. Practice of Linear Measurement with following instruments.
 - a) Surface plate
 - b) Tool makers surface plate
 - c) Glass surface plate
 - d) Angle plate
 - e) Cast Iron cubes
 - f) Vee block
 - g) Straight Edge
 - h) Spirit level
 - i) Engineer's level
 - j) Engineer's parallel
6. Practice of precision instruments i.e.
 - i) Micrometer
 - a) Outside micrometer
 - b) Inside micrometer
 - c) Depth Micrometer
 - d) Plug Micrometer
 - e) Vernier Micrometer
 - ii) Vernier calliper
 - iii) Vernier Height gauge
 - iv) Vernier depth gauge
 - v) Dial vernier caliper
7. Practice of different angle measuring instruments
 - a) Bevel protector
 - b) Bevel protector vernier
 - c) Sine bar
8. Calculation relating to the limits, tolerance and allowance involving different types of fits.
9. Study of gauges and their uses
 - a) Fixed gauges
 - b) Adjustable gauges
 - c) Indicating gauges
10. Thread measurement and thread gauges

- a) Study of thread measurement and thread gauges and also thread fits
 - b) Practice of 3-wire method for checking of external threads
 - c) Practice of zmess micrometer
11. Practice and use of following comparators.
- a) Electrical/Electronics comparators
 - b) Pneumatic comparators
 - c) Optical/Projection comparators
 - d) Mechanical comparators
 - e) Automatic gauging comparators
 - f) Gauge block comparators
 - g) Microscope (Tool Maker microscope)

Note: Quarterly Industrial visit must be arranged for observing physically, the use of above inspection tools/instruments in quality control lab.

MT-223 ENGINEERING DRAWING & CAD-II

T	P	C
1	6	3

Total contact hrs.

Theory	32
Practical	192

Pre-requisites: BASIC ENGINEERING DRAWING & CAD-I

AIMS Engineering Drawing is a continuation of basic and engineering drawing MT-143 for 1st year Mechanical Technology. It deals with Geometrical constructions, Drawing symbols & Constructions, Sectioning, Geometrical solids, Riveted joints, fasteners, working drawings, Assembly drawings and Auto Cad.

PART-A: ENGINEERING DRAWING

- | | |
|---|----------------|
| 1. DRAWING SYMBOLS | 1 Hours |
| 1.1 Welding symbols & Plumbing symbols | |
| 1.2 Conventional breaks. | |
| 1.3 Thread symbols External & internal | |
| 2. INTERSECTIONS OF GEOMETRICAL SOLIDS | 2 Hours |
| 2.1 Intersection of plane surfaces. | |
| 2.2 Intersection of Geometrical solids | |
| 2.2.1 Curved surfaces | |
| 2.2.2 Cylinder & Cylinder | |
| 2.2.3 Cylinder & cone | |
| 3. CONIC SECTIONS | 2 Hours |
| 3.1 Description of conic sections | |
| 3.2 Definition of circles ellipse parabola & Hyperbola | |
| 3.3 Drawing of ellipse parabola Hyperbola | |
| 3.4 Construction of auxiliary views and sections | |
| 4. DEVELOPMENTS OF GEOMETRICAL SOLIDS | 2 Hours |
| 4.1 Cylinder | |
| 4.2 Cone | |
| 4.3 Prism Right and truncated | |
| 4.4 Cone frustum and truncated | |
| 5. FASTENERS DESCRIPTION AND DRAWING | 2 Hours |
| 5.1 Screw threads | |
| 5.2 Studs, nuts & Bolts | |
| 5.3 Cap screws | |
| 5.4 Machine screws | |

- 5.5 Set screws
- 5.6 Lock nuts and locking devices

- 6. KEYS & COTTERS 2 Hours**
 - 6.1 Key nomenclature
 - 6.2 Square & rectangular
 - 6.3 Gib head
 - 6.4 Wood Ruff
 - 6.5 Cotters

- 7. SHAFT COUPLING 2 Hours**
 - 7.1 Types of coupling
 - 7.2 Proportional sizes
 - 7.3 Uses

- 8. STEAM ENGINE PARTS 2 Hours**
 - 8.1 List of parts
 - 8.2 Sketch each part

- 9. RIVETS & RIVETED JOINTS 3 Hours**
 - 9.1 Button head.
 - 9.2 High button.
 - 9.3 Cone head.
 - 9.4 Flat top counter sunk.
 - 9.5 Round top counter sunk.
 - 9.6 Single riveted lap joint.
 - 9.7 Double riveted lap joint.
 - 9.7.1 Chain riveting.
 - 9.7.2 Zig Zag riveting.
 - 9.8 Single riveted single cover butt joint.
 - 9.9 Single riveted double cover butt joint.

- 10. SET OF DRAWINGS. 4 Hours**
 - 10.1 Working drawings.
 - 10.1.1 Gear shifter bracket.
 - 10.1.2 Conveyor hanger.
 - 10.1.3 Brace plate.
 - 10.1.4 Relief valve body.
 - 10.1.5 Torque tube support.
 - 10.1.6 Automotive connecting Rod.
 - 10.2 Assembly drawings.
 - 10.2.1 Cone hook.
 - 10.2.2 Jig table.
 - 10.2.3 Vee belt.
 - 10.2.4 Pivot hanger.
 - 10.2.5 Anti-vibration Mount.
 - 10.2.6 Boring bar holder.
 - 10.2.7 Hydraulic check valve.
 - 10.2.8 Stay Rod pivot.

- 10.2.9 Arbor press.
- 10.2.10 Two Flange vice.

PART-B: CAD-II

11. REVIEW OF CAD	2 Hours
11.1 Loading the software	
11.2 Important commands	
11.3 Review of CAD I to refresh knowledge	
11.4 Selection by pointing	
11.5 Removing objects	
11.6 Selection with a regular window	
11.7 Selection with crossing window	
11.8 Selection with polygon	
11.9 UNDO option	
11.10 Draw circle & centering	
12. TRIMMING AND EXTRACTING	2 Hours
12.1 Change command	
12.2 OSNAP	
12.3 ROTATE command	
12.4 BREAK command	
12.5 EXTEND command	
12.6 Trimming a circle	
13. CONSTRUCTION OF A PULLEY	2 Hours
13.1 Connected circle	
13.2 Tangent option	
13.3 Stretch command	
13.4 Array command	
13.5 Mirror command	
13.6 End command	
14. 3 D COMMANDS	4 Hours
14.1 Elevation	
14.2 Extrude	
14.3 Subtract	
14.4 Union	
14.5 Hide	
14.6 Slice	
14.7 Construction of box, cube, cylinder, cone, dish	
14.8 Construction of curved arm pulley	

Recommended Books.

1. Engineering Drawing By French & Verk.
2. ABC of Auto CAD Release 12 by Alen R Miller.
3. User Guide of AutoCAD 2000 by Autodesk.
4. Mastering AutoCAD 2000 by George Omura

INSTRUCTIONAL OBJECTIVES

1. DRAWING SYMBOLS

1.1 Knows basic concept of drawing symbols in engineering drawing

1.1.1 Describe graphical symbol for engineering drawing

1.1.2 State the usage of graphical symbol, in engineering drawing

1.2 Draw engineering drawing symbol

1.2.1 Draw graphic symbol, for welding and plumbing

1.2.2 Draw the conventional break lines of solid and hollow round bars, square rods

1.2.3 Draw sectioning symbols for different materials

1.2.4 Represent external and internal threads conventionally

2. GEOMETRIC SURFACES AND SOLIDS

2.1 Understands geometric surfaces and solids

2.1.1 Define geometric surfaces

2.1.2 Explain types of geometric solids

2.1.3 Define geometric solids

2.1.4 Explain types of geometric solids

3. CONIC SECTIONS

3.1 Understand conic sections

3.1.1 Define conic sections

3.1.2 Explain principles of obtaining circle, ellipse, parabola and hyperbola by intersecting plan

3.1.3 Draw ellipse, parabola and hyperbola by different methods.

4. DEVELOPMENT OF GEOMETRICAL SOLIDS

4.1 Knows the development of lateral surfaces of geometrical solids

4.1.1 Describe the principle and step by step procedure of development

4.1.2 Distinguish the difference in procedure for development of right and oblique geometric solid

4.1.3 Identify frustum and truncated geometrical object

4.2 Understand procedure of development of solids bounded by plane surfaces and single curved surfaces

4.2.1 Draw development of truncated right prism and cylinder

4.2.2 Draw development of frustum and truncated of right cone and pyramid

5. FASTENERS DESCRIPTION AND DRAWING

5.1 Know fasteners and their principal usage

5.1.1 Define fasteners

5.1.2 Describe difference between temporary and permanent fastening

5.1.3 Define nomenclature of screw thread

5.1.4 Describe types of threads

- 5.1.5 State different types of screw thread fasteners
- 5.2 Draw common threaded fasteners**
 - 5.2.1 Draw derailed representation vee of and square threads
 - 5.2.2 Draw hexagonal nut, nut and bolt
- 6. KEYS AND COTTERS**
 - 6.1 Understands the purpose and usage of keys and cotters**
 - 6.1.1 Define keys and cotters
 - 6.1.2 Compare keys and cotters
 - 6.1.3 Describe the types and usage of key and cotters
 - 6.2 Draw common keys and cotters**
 - 6.2.1 Draw keys in shafts an hubs
 - 6.2.2 Draw gib and cotter joint
- 7. RIVETS AND RIVETED JOINTS**
 - 7.1 Understand rivets riveting and riveted joints**
 - 7.1.1 Describe rivets and riveting
 - 7.1.2 Define terminology of riveted joints
 - 7.1.3 Explain types of riveted joints
 - 7.2 Draw rivets head and riveted joints**
 - 7.2.1 Draw rivet heads
 - 7.2.2 Draw single and double riveted Lap and Butt joint
- 8. SHAFT COUPLINGS**
 - 8.1 Understand shaft coupling**
 - 8.1.1 Define shaft coupling
 - 8.1.2 List shaft couplings
 - 8.1.3 Describe uses of shaft coupling
 - 8.1.4 Explain Orthographic views of shaft coupling
 - a) Flange coupling (Protected, unprotected)
 - b) Muff coupling
 - c) Flexible coupling
- 9. STEAM ENGINE PARTS**
 - 9.1 Understand steam engine parts**
 - 9.1.1 List steam engine parts
 - 9.1.2 Describe uses of steam engine parts
 - 9.1.3 Draw steam engine parts
 - a) Piston
 - b) Connecting Rod and
 - c) Stuff box
- 10. WORKING DRAWING**
 - 10.1 Describe working drawing**
 - 10.1.1 Describe set of working drawing
 - 10.1.2 Explain detail and assembly drawing
 - 10.1.3 Explain title blades and record strips
 - 10.1.4 Explain types of assembly drawing
 - 10.2 Prepare set of working drawing**

10.2.1 Draw working drawing, detail and assembly drawing selecting from the lists of exercise

SECTION-II CAD-II

11. REVIEW BASICS OF CAD SOFTWARE ALREADY STUDIED IN 1ST YEAR

- 11.1 Identify loading of CAD software in RAM
- 11.2 Review of commands like line, circle, change, pedit, layer, Zoom
- 11.3 Draw right angled triangle to refresh knowledge

12. UNDERSTAND SELECTING OBJECTS IN CAD-SOFTWARE

- 12.1 Describe CAD (AutoCAD Rel-2000 or latest) selection methods
- 12.2 Describe selecting by pointing
- 12.3 Describe selection of previously selected items
- 12.4 Describe selection of previously Drawn items
- 12.5 Describe selection with a regular window
- 12.6 Describe removing objects from selection set
- 12.7 Describe Adding objects to the selection set
- 12.8 Explain selecting with a crossing window
- 12.9 Explain selecting with a polygon
- 12.10 Explain undoing the previous command
- 12.11 Draw a circle with circle command
- 12.12 Explain centering the circle

13. UNDERSTAND TRIMMING AND EXTENDING

- 13.1 Identify change command
- 13.2 Explain procedure of making lines horizontal with change command
- 13.3 Explain OSNAP Screen Menu
- 13.4 Explain OSNAP cursor Menu
- 13.5 Explain procedure of Duplicating objects with the copy command
- 13.6 Explain ROTATE Command
- 13.7 Explain moving objects within a drawing
- 13.8 Explain BREAK command
- 13.9 Explain use of TRIM command by Trimming lines
- 13.10 Describe EXTEND command
- 13.11 Explain procedure of Breaking a pre-drawn circle
- 13.12 Explain procedure for Trimming the circle

14. CONSTRUCT PULLEY IN 2D (USING AutoCAD REL-2000 OR LATEST)

- 14.1 Identify importance of beginning a new drawing with the order template..
- 14.2 Draw two connected circles
- 14.3 Describe procedure for "Turning on" Tangent Osnap mode
- 14.4 Draw tangent lines with Tangent option
- 14.5 Produce rotation of Drawing
- 14.6 Explain STRETCH Command
- 14.7 Discover importance of viewing of an object with zoom command
- 14.8 Draw a concentric circle
- 14.9 Draw Tangent circles
- 14.10 Explain ARRAY command (making Polar pattern)

- 14.11 Draw an Arc
- 14.12 Draw an wedge
- 14.13 Explain MIRROR command (Replicating objects)
- 14.14 Erasing construction line and Replacing two areas with one
- 14.15 Identify default W & C options for window selection
- 14.16 Replicate the wedge with ARRAY command
- 14.17 Plot the drawing and save it
- 14.18 Identify END command

15. UNDERSTAND 3 D COMMANDS

- 15.1 Explain ELEVATION Command
- 15.2 Explain HIDE Command
- 15.3 Explain EXTRUDE Command
- 15.4 Explain SUBTRACT Command
- 15.5 Explain UNION Command
- 15.6 Explain SLICE Command
- 15.7 Explain BOX, CUBE, CYLINDER, CONE, DISH Commands
- 15.8 Explain procedure to construct Pulley in 3 D.

MT-223 ENGINEERING DRAWING & CAD-II

LIST OF PRACTICALS

192 Hours

A. ENGINEERING DRAWING

144 Hours

1. Construction of cycloid
2. Construction of involute of a circle.
3. Construction of a helix.
4. Draw welding symbols.
5. Draw sectioning symbols for different materials.
6. Representation of breaks in line, bars, tubes, square rod.
7. Conventional represent of internal and external threads.
8. Draw Hexagonal nut.
9. Draw hexagonal/square bolt and nut.
10. Practice in drawing sectional views from the objects enlisted below or similar.
 1. Gland for stuffing box.
 2. Fork for hooke's coupling.
 3. Centre for hooke's coupling.
 4. Vee block.
 5. Shackle bolts.
 6. Flange coupling.
 7. Bushed Bearings.
 8. Open bearing
 9. Arm Pulley.
 10. Cone and step pulley.
 11. Wall bracket
 12. Engine cross head.
 13. Bracket for feb.
11. Construction conic sections, ellipse, parabola and hyperbola.
12. Development of truncated square, hexagonal prism.
13. Development of truncated cylinder.
14. Development of truncated and frustum of square, hexagonal pyramid.
15. Development of truncated frustum of cone.
16. Development of funnel.
17. Construction of line of intersection of two square prism.
18. Construction of line of intersection of two cylinder of :
 - (i) Same diameter
 - (ii) Different dia meter at right angle.
19. Construction of line of intersection of tee joint.
20. Drawing of rivet head.
21. Drawing of single/double rivetted lap and butt joints in chain/zig zag rivetting.

22. Draw detail and answering drawing/working drawing selecting from the following:
 - (i) Gib and cotter joint.
 - (ii) Gear shifter.
 - (iii) Conveyor hanger.

- (iv) Bracket plate.
- (v) Relief valve body.
- (vi) Torque tube support.
- (vii) Automotive connecting rod.
- (viii) Cone hook.
- (ix) Jig tables.
- (x) Vee belt drive.
- (xi) Pivot hanger.
- (xii) Anti vibration mount.
- (xiii) Boring bar holder.
- (xiv) Hydraulic clock valves.
- (xv) Stay rod pivoted.
- (xvi) Arbor pin.
- (xvii) Flanged vice.

B. CAD-II

48 Hours

- 23. Practice commands studied in CAD-I
- 24. Draw circle with circle command and centre it
- 25. Draw two lines and make them horizontal with change command
- 26. Practice for copy command
- 27. Practice for rotate command by moving objects within drawing
- 28. Practice for breaking command for a pre-drawn circle and trim it
- 29. Draw a pulley using previous commands and options
- 30. Practical 29 continued.

MT-236 WORKSHOP PRACTICE-II
A. MACHINE SHOP
B. FOUNDRY & PATTERN MAKING
C. ADVANCE WELDING

Total contact hrs		T	P	C
Theory	64	2	12	6
Practical	384			

Pre-requisite: Workshop Practice-I

AIMS: This subject deals with the types of lathes, drilling machines, tool grinders, shaper, planner and appropriate course relating to foundry practice, pattern making and advance welding. It will provide the students the information regarding tools, work holding and supporting devices, attachments as well as selection and calculations of speed and feeds. It also includes the study of Advance welding techniques.

COURSE CONTENTS

- | | | |
|-----------|---|----------------|
| 1. | CONSTRUCTION OF LATHE MACHINE | 3 Hours |
| 1.1 | Functions of lathes and its components | |
| 1.2 | Types of lathes | |
| 1.3 | Lathe accessories, attachments and work holding devices with their uses | |
| 2. | LATHE CUTTING TOOLS | 2 Hours |
| 2.1 | Kinds of lathe cutting tools | |
| 2.2 | Lathe cutting tool design and their application | |
| 3. | CUTTING SPEED AND FEED CALCULATIONS | 2 Hours |
| 3.1 | Cutting speed and feed calculations | |
| 3.2 | Depth of cut | |
| 3.3 | Machining time | |
| 3.4 | Coolants and Lubricants | |
| 4. | LATHE OPERATION | 9 Hours |
| 4.1 | Centering | |
| 4.1.1 | Surface gauge method | |
| 4.1.2 | Dial Test indicator method | |
| 4.2 | Facing | |
| 4.2.1 | Principles of facing | |
| 4.2.2 | Facing work piece held in a chuck | |
| 4.2.3 | Facing work piece mounted between centres | |
| 4.3 | Drill and Drilling | |
| 4.3.1 | Drill and Drilling principles | |
| 4.3.2 | Centre and counter sink drilling | |
| 4.3.3 | Speeds and feeds | |

- 4.3.4 Method of drilling work piece
 - 4.4 Straight Turning
 - 4.4.1 Principles of lathe turning
 - 4.4.2 Turning classification
 - 4.4.3 Types of shoulder turning
 - 4.4.4 Methods of turning work-piece
 - 4.4.4.1 Cylindrical or con-centric turning
 - 4.4.4.2 Off set eccentric turning
 - 4.5 KNURLING
 - 4.5.1 Principles of knurling
 - 4.5.2 Types & classification of knurls
 - 4.5.3 Types of knurling tools
 - 4.6 BORING
 - 4.6.1 Boring and counter boring principles
 - 4.6.2 Boring tools and holders
 - 4.6.3 Boring work piece held in a chuck
 - 4.6.3.1 Boring a straight hole
 - 4.6.3.2 Boring a taper hole
 - 4.7 REAMING
 - 4.7.1 Principles of reaming
 - 4.7.2 Types of reamers
 - 4.7.3 Speed and feeds
 - 4.8 TAPERS AND ANGLES
 - 4.8.1 Principles of taper turning
 - 4.8.2 Taper standards
 - 4.8.3 Taper calculation
 - 4.8.4 Methods of cutting tapers
 - 4.9 THREADS AND THREAD CUTTING
 - 4.9.1 Principles of screw threads
 - 4.9.2 Thread terminology
 - 4.9.3 Forms of threads
 - 4.9.4 Thread standards
 - 4.9.5 Thread cutting calculation
 - 4.9.5.1 Millimeter system
 - 4.9.5.2 Inch standard
- 5. DRILL PRESS CONSTRUCTION 2 Hours**
- 5.1 Types of drill press
 - 5.2 Parts and function of drill press
- 6. DRILL AND DRILLING OPERATIONS 3 Hours**
- 6.1 Drill press operations
 - 6.2 Drill parts and function
 - 6.3 Grinding/sharpening a drill
 - 6.4 Tool holding devices
 - 6.5 Work holding devices
 - 6.6 Speed and feeds
 - 6.7 Coolants and cutting lubricants

7.	TOOL GRINDER	2 Hours
	7.1 Parts of grinder	
	7.2 Grinding operations	
	7.3 Grinding wheels & their numbers of function	
	7.4 Grinding rules, safety & protective devices	
8.	SHAPER CONSTRUCTION	3 Hours
	8.1 Types of shaper	
	8.2 Parts and function of shaper	
	8.3 Lubrication of shaper	
	8.4 Shaping stroke adjustment	
9.	SHAPER WORK	3 Hours
	9.1 Shaper cutting tools	
	9.2 Shaper speed and feeds	
	9.3 Clamping work for shaping	
	9.4 Shaping, Horizontal, vertical, oblique, profile	
10.	PLANNER	3 Hours
	10.1 Construction	
	10.2 Work holding methods	
	10.3 Planner operations	
B.	FOUNDRY & PATTERN MAKING	
11.	MOLDING	
	11.1 Molding Techniques	2 Hours
	11.1.1 Bedding in	
	11.1.2 Use of two parting surfaces	
	11.1.3 Loose piece patterns	
	11.1.4 Use of draw back	
	11.1.5 Ramming of pattern requiring three flasks	
	11.2 CORE MAKING	2 Hours
	11.2.1 Green sand cores	
	11.2.2 Dry sand cores	
	11.2.3 Properties of cores	
	11.2.4 Core mixtures	
	11.2.5 Core prints	
	11.2.6 Baking of cores	
	11.2.7 Prepare solid & hollow cores	
	11.3 CUPOLA OPERATION	4 Hours
	11.3.1 Properties of the melt charge	
	11.3.2 Cupola charging	
	11.3.3 Tapping and bottling	
	11.3.3.1 Tapping bar	
	11.3.3.2 Bot sticle	
	11.3.3.3 Bottling Clay	

	11.3.3.4	Bott	
	11.3.3.5	Slag bole tapping	
	11.3.3.6	Melting Zones	
	11.3.3.7	Charging the cupola, melting and pouring of molds	
11.4	Casting Defects		2 Hours
	11.4.1	Blow holes.	
	11.4.2	Shrinkage.	
	11.4.3	Mis-run and Mismatch.	
	11.4.4	Fins etc.	
11.5	PATTERN MAKING.		4 Hours
	11.5.1	Introduction to Pattern Making.	
	11.5.2	Principles of Pattern Making.	
	11.5.3	Materials of Pattern.	
	11.5.4	Types of patterns and uses	
	11.5.5	Split and loose piece patterns	
	11.5.6	Skeleton pattern	
	11.5.7	Plastic patterns	
11.6	ALLOWANCES.		2 Hours
	11.6.1	Shrinkage allowance	
	11.6.2	Draft allowance.	
	11.6.3	Rapping allowance	
	11.6.4	Machining allowance	

C. ADVANCE WELDING

12.	GAS WELDING		4 Hours
	12.1	Construction of gas cylinder	
	12.2	Construction of gas regulator	
	12.3	Welding gases	
	12.4	Blow pipes, torches and nozzles	
	12.5	Gas cutting operations	
	12.6	Welding techniques and precaution for:	
		12.6.1 Steel	
		12.6.2 Alloy steel	
		12.6.3 Cast Iron	
		12.6.4 Aluminum	
		12.6.5 Copper and copper alloys	
13.	ELECTRIC ARC WELDING		2 Hours
	13.1	Welding transformers	
		13.1.1 current setting	
		13.1.2 Uses of A.C. transformers	
	13.2	Generator	
		13.2.1 Current setting	
		13.2.2 Uses of generators	

13.2.3 Effects of polarity and its determination

14. ELECTRODES	2 Hours
14.1 Size of electrodes	
14.2 Types of electrodes	
14.3 Specific application of electrodes	
14.4 Advantages and disadvantages of long and short arcs	
14.5 Bare metal material and thickness	
15. SPECIAL WELDING PROCESS	6 Hours
15.1 Resistance welding	
15.2 Spot welding	
15.3 Seam welding	
15.4 TIG and MIG welding	
16. DEFECTS OF WELDING	2 Hours
16.1 Causes	
16.2 Remedies	
16.3 Method of testing	

TEXT BOOKS:

1. Machine tool operations Vol I & II by Burghadt
2. Foundry calculation and drawing by Lesuc Bisth
3. Exploring pattern making & foundry by Harvay D. Miner and John G. Millier
4. Oxy-acetylene hand book by lindi Air Products Co. Ltd.
5. Welding Engineering by Rossi.

INSTRUCTIONAL OBJECTIVES

A) MACHINE SHOP

1. LATHE CONSTRUCTION

1.1 Understand function of lathe and its parts

- 1.1.1 List the parts
- 1.1.2 Explain function of each part
- 1.1.3 Explain the inter-relation of each part
- 1.1.4 Explain the working of lathe in brief

1.2 Know types of Lathe

- 1.2.1 List the types of lathe
- 1.2.2 Describe each type
- 1.2.3 Describe advantages and limitation of each type

1.3 Understand Lathe accessories, attachment work holding devices with uses

- 1.3.1 Name the lathe accessories
- 1.3.2 Explain each
- 1.3.3 Name the lathe attachments
- 1.3.4 Explain each
- 1.3.5 List the work holding devices
- 1.3.6 Explain each

2. LATHE CUTTING TOOLS

2.1 Understands kinds of lathe cutting tools

- 2.1.1 List the types of lathe cutting tools
- 2.1.2 Explain each

2.2 Understand lathe tool angles

- 2.2.1 Name each angle for different lathe cutting tools
- 2.2.2 Describe each
- 2.2.3 Explain the functions and application of each angle

3. CUTTING SPEED AND FEED

3.1 Understand speed and feed

- 3.1.1 Define speed
- 3.1.2 Define feed
- 3.1.3 Describe method of speed calculation
- 3.1.4 Describe method of feed calculation
- 3.1.5 Describe relationship between speed and feed
- 3.1.6 Describe relationship between speed/feed/lathe capacity/cutting

edge of cutting tools

3.2 Understand depth of cut

3.2.1 Describe depth of cut

3.2.2 List the factor influence the depth of cut

3.2.3 Explain the relation between different factor affecting the depth of

cut

3.3 Understand machining time

3.3.1 Describe machining time

3.3.2 Explain machine time calculation method

3.4 Understand coolants and lubrication

3.4.1 List the coolants and lubrications used

3.4.2 Describe each type of coolant and lubrication

3.4.3 Explain merit/demerit of each

4. LATHE OPERATION

4.1 Understand centering

4.1.1 List different methods of centering the job

4.1.2 Describe each method of centering

4.1.3 Explain the importance of centering job

4.2 Understand simple turning

4.2.1 Describe turning

4.2.2 Describe principle of turning

4.2.3 Describe turning classification

4.2.4 Explain the method of turning a job

4.2.5 Explain the method of measuring/checking

4.2.6 Explain shoulder turning

4.2.7 Explain internal turning

4.2.8 Explain off set or eccentric turning

4.3 Understand Taper Turning

4.3.1 Describe taper turning

4.3.2 Describe principle of taper turning

4.3.3 Explain the use of formula for taper turning

4.3.4 List the methods of taper turning

4.3.5 Explain each method of taper turning

4.4 Understand Knurling

4.4.1 Define knurling

4.4.2 Describe purpose of knurling

4.4.3 Describe principle of knurling

4.4.4 List methods of knurling

4.4.5 Explain each method of knurling

4.4.6 Explain tools used in knurling

4.5 Understand thread and thread cutting

- 4.5.1 Define thread
- 4.5.2 Describe thread terminology
- 4.5.3 Describe different form of thread
- 4.5.4 Describe the thread cutting procedure
- 4.5.5 Define pitch and lead
- 4.5.6 Explain thread cutting calculation
- 4.5.7 Explain thread cutting calculation based on various systems
- 4.5.8 Explain thread cutting operations

4.6 Understand Facing

- 4.6.1 Define facing
- 4.6.2 Describe principle of facing
- 4.6.3 Explain the facing operation
- 4.6.4 Explain the facing operation on job held in chuck

4.7 Understand drilling by lathe

- 4.7.1 List different method of drilling on lathe machine
- 4.7.2 Describe each method of drilling on lathe machine
- 4.7.3 Explain the tools used in each method of drilling on lathe machine
- 4.7.4 Explain the adjustment of speed and feed for different drilling

methods

4.8 Understand Lathe boring

- 4.8.1 Define boring its function and uses
- 4.8.2 Explain boring principle and procedure
- 4.8.3 Explain boring a taper hole
- 4.8.4 Explain adjustment of speed and feed for boring
- 4.8.5 Explain boring tools

4.9 Understand Reaming by Lathe

- 4.9.1 Define reaming its function and uses
- 4.9.2 List types of reamers
- 4.9.3 Explain each types of reamers
- 4.9.4 Explain adjustment of speed and feed of reamer

5. DRILL PRESS/DRILLING

5.1 Understand drill machine

- 5.1.1 List types of drill machines
- 5.1.2 Describe each types of drill machines
- 5.1.3 List parts of a drill machine
- 5.1.4 Explain function of each parts of a drill machine

5.2 Understand drilling operation

- 5.2.1 List parts of a drill
- 5.2.2 Explain each parts a drill machine

- 5.2.3 Explain types of drills
- 5.2.4 List different angles of drill
- 5.2.5 Explain different angles of a drill machine
- 5.2.6 Explain drill holding devices
- 5.2.7 Explain drilling operation
- 5.2.8 Explain speed and feed
- 5.2.9 Explain coolant and lubrication
- 5.2.10 Explain grinding of drill-tools
- 5.2.11 Describe safety procedures

6. TOOL GRINDER

6.1 Understand grinder

- 6.1.1 List parts of grinder
- 6.1.2 List types of grinder
- 6.1.3 Describe each type of grinder
- 6.1.4 Explain speed of grinder
- 6.1.5 List the types of grinding wheels
- 6.1.6 Explain each type of grinding wheel
- 6.1.7 Explain grinding operation
- 6.1.8 Describe safety involved in grinding

7. SHAPER WORK

7.1 Understand shaper machine

- 7.1.1 List parts of a shaper
- 7.1.2 Explain each part of a shaper
- 7.1.3 Explain lubrication of shaper
- 7.1.4 Explain forward and backward stroke of a shaper
- 7.1.5 Explain shaper stroke adjustment

7.2 Shaper operation

- 7.2.1 List types of shaper tools
- 7.2.2 Explain each type of shaper tools
- 7.2.3 Explain adjustment of shaper speed and feed
- 7.2.4 List different clamping devices for job and tool
- 7.2.5 Explain each type of clamping device for job and tool
- 7.2.6 Describe oblique profile work
- 7.2.7 Explain calculation of time in shaper work

8. PLANNER

8.1 Understand planner

- 8.1.1 List parts of a planner
- 8.1.2 Explain each parts of a planner
- 8.1.3 Explain lubrication of planner
- 8.1.4 Explain forward/back-ward stroke for planner
- 8.1.5 Describe tool and work holding devices in planner
- 8.1.6 Explain differences between shaper and planner

8.2 Planner operation

- 8.2.1 Describe tool used in planner
- 8.2.2 Describe adjustment of speed and feed
- 8.2.3 Explain planning operation
- 8.2.4 Explain the attachment of planner

B) FOUNDRY AND PATTERN MAKING

9. PRINCIPLES OF PATTERN MAKING

9.1 Know the meaning and needs of pattern making

- 9.1.1 Define a pattern
- 9.1.2 State the needs of pattern making
- 9.1.3 Describe kinds of pattern its material and uses

10. TOOLS AND MATERIALS OF PATTERN MAKING

10.1 Know the tools and materials used for pattern making

- 10.1.1 Enlist the common tools used for pattern making
- 10.1.2 Describe some important hand tools for pattern making
 - a. Marking Measuring and layout Tools
 - b. Sawing Tools
 - c. Planning Tools and planners
 - d. Boring Tools
 - e. Clamping Tools
 - f. Miscellaneous Tools including:
Claw hammer, Mallets, Chisel, Gauge, Hand file, Rasp, Nail set, Screwdriver, Bradawl, Fillet Iron Cornering Tool.
- 10.1.3 Describe different machines used in pattern making
 - a. Wood working Lathe
 - b. Circular saw
 - c. Band saw
 - d. Jigsaw or scroll saw
 - e. Wood working Drilling or Boring Machine
 - f. Molder
 - g. Jointer
 - h. Planning and Thickness Machine
 - i. Mortiser/Tenoner
 - j. Disc sander/Electric Hand sander

11. TYPES OF PATTERN AND THEIR USES

11.1 Describe the type of pattern and their uses

- 11.1.1 Name the common type of pattern
- 11.1.2 Explain common types of pattern with sketches like:-
 - a. Single piece or solid pattern
 - b. Split pattern or two piece pattern

- c. Loose piece pattern
- d. Gated pattern
- e. Metals plate pattern
- f. Sweep pattern
- g. Skeleton pattern
- h. Segmented pattern

12. PATTERN ALLOWANCE

12.1 Describe the type of pattern allowance and their needs

- 12.1.1 Define pattern allowance
- 12.1.2 State the reasons for providing pattern allowances
- 12.1.3 State the types of pattern allowance
- 12.1.4 Explain the types of pattern allowance like
 - a. Contraction or shrinkage allowance
 - b. Distortion allowance
 - c. Making or finishing allowance
 - d. Draft allowance
 - e. Repairing allowance
- 12.1.5 Enlist the rate of shrinkage allowance of common metals

13. TECHNIQUES OF PATTERN CONSTRUCTION

13.1 Understand the technique of pattern making

- 13.1.1 State pattern layout techniques
- 13.1.2 Explain the pattern layout procedure
- 13.1.3 Explain sequence of operations in constructing a pattern

14. CORE AND CORE BOXES

14.1 Understand uses of core and core Boxes

- 14.1.1 Define a core
- 14.1.2 State the types of cores
- 14.1.3 Explain different types of cores
- 14.1.4 Define core prints
- 14.1.5 Sketch and explain different types of cores and core-prints
- 14.1.6 Define a core box
- 14.1.7 Name different types of core-Boxes and explain each

14.2 Understand the core making and core baking Techniques

- 14.2.1 Name the material use in core making
- 14.2.2 Explain the method of core making
- 14.2.3 Explain the necessity of baking core
- 14.2.4 Explain the method of core baking
- 14.2.5 Explain the fixing of core

15. PATTERN DESIGNING, COLOURING & STORAGE

- 15.1 Know the design considerations in pattern making**
 - 15.1.1 State the planning considerations for pattern making
 - 15.1.2 State the design consideration for pattern making

- 15.2 Understand the pattern colour code system**
 - 15.2.1 State the need of colour codes
 - 15.2.2 State the meaning of each colour

- 15.3 Know the proper storage procedure for patterns**
 - 15.3.1 Describe the procedure of proper storage
 - 15.3.2 Describe the consideration of pattern storage

16. APPLICATION OF CLEAR FINISHES

16.1 Understand the oil finishing processes and their applications

- 16.1.1 Define an oil finish
- 16.1.2 State the applications of oil finishes
- 16.1.3 Explain the methods of applying linseed oil finishes.

16.2 Understand the wax finishing processes and their applications

- 16.2.1 Define a wax polish.
- 16.2.2 State the application of wax polish.
- 16.2.3 Explain the composition and method of applying common and commercial wax polishes.

16.3 Understand the application of varnishes and lacquers

- 16.3.1 Define a varnish.
- 16.3.2 State the uses of varnishes.
- 16.3.3 Explain the composition and method of application of spirit varnish and french polish.

C. ADVANCE WELDING

17. GAS WELDING

17.1 Understand gas welding equipment

- 17.1.1 List part of oxygen cylinder
- 17.1.2 Describe function of each part
- 17.1.3 Describe function of regulator in detail
- 17.1.4 List part of acetylene cylinder
- 17.1.5 Describe function of each part
- 17.1.6 Describe function of regulator in detail

17.2 Understand gases use in welding

- 17.2.1 List all the gases used
- 17.2.2 Describe the function of oxygen in gas welding.
- 17.2.3 Describe the function properties of other combustible gasses used.
- 17.2.4 Describe the comparison between different combustible gasses used.

17.3 Understand Blow Pipes/Torches and Nozzles.

- 17.3.1 Describe the construction of blow pipe torches and nozzles.

17.3.2 List the types of blow pipes, torches nozzles.

17.3.3 Explain distinct features of each and their uses

17.4 Understand welding Techniques and Procedure for steel welding.

17.4.1 Explain Job preparation.

17.4.2 Explain the formation of flame.

17.4.3 Explain the bead and bead making.

17.5 Know welding techniques for other metals.

17.5.1 List different methods of welding materials other than steel.

17.5.2 List different methods of preheating.

17.5.3 Describe each method of welding.

a. Describe welding Cast iron

b. Describe welding aluminum.

c. Describe welding of copper and copper alloys.

d. Describe welding of alloys steel

17.6 Understand Gas Cutting.

17.6.1 Define gas cutting.

17.6.2 Describe uses of gas cutting.

17.6.3 Describe adjustment of a flame for gas cutting.

17.6.4 Describe gas cutting apparatus.

17.6.5 Explain gas cutting apparatus.

17.6.6 Describe safety precautions in gas welding and cutting

18. ELECTRIC ARC WELDING.

18.1 Understand welding transformers.

18.1.1 Describe construction of a transformer.

18.1.2 Describe principles of working of transformers.

18.1.3 Describe current setting.

18.1.4 Describe AC transformer.

18.1.5 Describe uses of AC transformer.

18.2 Understand Generators.

18.2.1 Describe construction of a generator.

18.2.2 Describe current setting.

18.2.3 Describe effect of polarity.

18.2.4 List the difference between welding by transformer and generator.

18.2.5 Describe safety procedures in ARC welding

18.3 Understand Electrode.

18.3.1 Explain the sizes of electrode.

18.3.2 List the types of electrode.

18.3.3 Explain each type.

18.3.4 Describe the use of electrode.

18.3.5 List advantages and disadvantages of long and short arc.

18.3.6 Describe specific application of electrodes.

18.3.7 Relate base metal material and electrode.

18.4 Understand special Welding Processes.

18.4.1 Explain resistance welding.

18.4.2 Explain spot welding.

18.4.3 Explain seam welding.

MT-236 WORKSHOP PRACTICE-II

LIST OF PRACTICALS

384 Hours

A) MACHINE SHOP

192 Hours

- 1-2 Practice for centering the job by surface gauge method
- 3-4 Practice for centering the job by dial test indicator method
- 5-6 Practice of path cutting tool
- 7-8 Simple turning and facing practice
- 9 Practice of counter-sinking
- 10. Practice of drilling on lathe
- 11. Practice of step turning
- 12-14 Eccentric turning practice
- 15. Knurling practice
- 16-17 Practice of boring straight hole
- 18-19 Practice for step or counter boring
- 20-21 Practice for boring taper hole
- 22. Reaming practice
- 23-24 Practice of taper turning by compound rest method
- 25-26 Practice of taper turning by offset method
- 27-28 Practice of taper turning with taper turning attachment
- 29-30 Metric thread cutting practice
- 31-32 Practice of V-threads in inch system
- 33-34 Practice for square thread in metric system
- 35-36 Practice of square thread in inch system
- 37-39 Multi-start threading practice
- 40-41 Practice for internal thread cutting on lathe
- 42-43 Drilling and tapping practice
- 44. Reaming practice on drill press
- 45. Drill grinding practice
- 46-47 Tool grinding practice
- 48-49 Practice of making flat surfaces on shaper machine
- 50-51 Slotting work practice
- 52-53 Angular work practice
- 54.55 Making flat surfaces on planner machine

B) FOUNDRY AND PATTERN MAKING

96 Hours

a. Sand Testing

- i. Moisture contents
- ii. Clay content
- iii. Permeability number
- iv. Green compressive strength
- v. Fineness number of various sand samples

b. Moulding

- i. Practice of previous (first year) mould making

- ii. Practice use of some split patterns
- iii. practice of irregular parting line patterns
- c. Core making practice**
 - i. half core
 - ii. Round core
 - iii. Practice assembling of two halves of cores
- d. Castings**
 - i. Practice use of pyrometers
 - ii. Introduction construction and operation of cupola furnace
 - iii. Practice of charging cupola furnace
 - iv. Cleaning and finishing of casting
 - a. By hand
 - b. Sand blasting
 - c. Water blasting
 - d. Short blasting
 - e. Use of different grinders
 - f. Tumbling barrel method
 - g. Hammer and chisel
 - h. Steel wire brush
 - i. Hand hacksaw
- e. Testing Casting**
 - i. Practice testing of casting defects by different methods
 - ii. Find out weight of casting by calculations

C) WELDING

96 Hours

- i. Making a Lab. joint by gas welding.
- ii. Making a butt joint by gas welding
- iii. Preparing edges by graving double V or double U
- iv. Making wall brackets by gas welding
- v. Making plate and spoon
- vi. Repairing broken pieces of cast iron and steel
- vii. Making miniature or full size grills
- viii. Making flower pots stand
- ix. Repairing and building up of steel and cast iron parts by Arc welding
- x. Making welder joints of copper and Aluminum
- xi. Practice Argon Arc welding
- xii. Practice vertical and overhead Arc welding
- xiii. Practice spot welding
- xiv. Practice cutting of M.S. and cast iron by gas and Arc method.
- xv. Testing of welded joints.

MT-242 METALLURGY

Total contact hrs.		T	P	C
Theory	64		2	0
2				

Pre-requisite: Applied Chemistry

AIMS This subject deals with the Metallurgy concepts that influence Mechanical and physical properties of Metals and Alloys. The student acquire knowledge of ores and the methods of dressing them which enhances his knowledge regarding different operations carried out in the recovery of ferrous & non-ferrous metals from their ores. The students gains also knowledge of different steel making processes. The student will also acquire knowledge of various shaping, farming, rolling methods. It will also enhance the knowledge Die-casting process of metals & powder metallurgy.

COURSE CONTENTS

- 1. INTRODUCTION TO METALLURGY. 2 Hour**
 - 1.1 Definition & Classification
 - 1.2 Scope of Metallurgy

- 2. ORES. 2 Hours**
 - 2.1 Definition of ore.
 - 2.2 Iron ores and its occurrence in nature.
 - 2.3 Natural resources of iron ores in Pakistan
 - 2.4 Classification & evaluation of iron ores.

- 3. TREATMENT OF IRON ORES 3 Hours**
 - 3.1 Hand picking.
 - 3.2 Magnetic separation.
 - 3.3 Gravity separation.
 - 3.4 Roasting and calcination.
 - 3.5 Froth floatation.

- 4. PRODUCTION PROCESS 2 Hours**
 - 4.1 Reduction and oxidation.
 - 4.2 Acid and Basic in Metallurgical terminology

- 5. REFRACTORY MATERIALS. 4 Hours**
 - 5.1 Definition and classification.
 - 5.2 Acid refractory materials.
 - 5.3 Basic refractory materials.
 - 5.4 Natural refractory materials.

- 6. PRE-SMELTING TREATMENT OF ORES. 4 Hours**
- 6.1 Concentration.
 - 6.2 Calcination
 - 6.3 Agglomeration.
 - 6.3.1 Sintering.
 - 6.3.2 Polletising
 - 6.3.3 Nodulising.
- 7. THE SMELTING OPERATION. BLAST FURNACE 5 Hours**
- 7.1 Construction of blast furnace.
 - 7.2 Chemical reaction.
 - 7.3 Zones of bast furnace
 - 7.4 Taping of molten metal.
 - 7.5 Composition of charge.
 - 7.6 Pig iron properties and uses.
- 8. MANUFACTURE OF WROUGHT IRON 4 Hours**
- 8.1 Classification of puddling furnace
 - 8.2 Charge of puddling furnace
 - 8.3 Simple operation of puddling furnace
 - 8.4 Uses of wrought iron.
- 9. TYPES OF STEELS. 4 Hours**
- 9.1 Carbon steels.
 - 9.2 Alloy steels.
 - 9.3 Alloying elements of steel and their effects
 - 9.4 Application of carbon and alloy steels.
 - 9.5 Eutectoid steel.
 - 9.6 Low Medium and high carbon steels.
 - 9.7 Intermetallic compound.
- 10. STEEL MANUFACTURING PROCESS 10 Hours**
- 10.1 Chemistry steel refining.
 - 10.2 Construction and working of open hearth furnace.
 - 10.2.1 Acid process.
 - 10.2.2 Basic Process.
 - 10.3 Bessemer convertor
 - 10.3.1 Construction of convertor
 - 10.3.2 Charge of the convertor.
 - 10.3.3 Operation of Bessemer convertor.
 - 10.4 Electric Arc furnace.
 - 10.4.1 Construction of direct arc furnace.
 - 10.4.2 Construction of indirect arc furnace
 - 10.4.3 Operation of an electric arc furnace.
 - 10.4.4 Charging of an electric arc furnace
 - 10.4.5 Oxidation period.
 - 10.4.6 Addition of Alloying elements and tapping.
 - 10.4.7 Duplex operation.

- 11. NON FERROUS METALS** **5 Hours**
- 11.1 Properties & use of non ferrous metals
 - 11.2 Ores of non ferrous metals
 - 11.3 Extraction of non ferrous metals
- 12. INDUSTRIAL SHAPING OF METALS.** **10 Hours**
- 12.1 Hot working processes.
 - 12.1.1 Rolling.
 - 12.1.2 Forging.
 - 12.1.3 Drop forging.
 - 12.1.4 Heading.
 - 12.1.5 Hot pressing.
 - 12.1.6 Extrusion
 - 12.2 Cold working process.
 - 12.2.1 Rolling.
 - 12.2.2 Drawing.
 - 12.2.3 Pressing.
 - 12.2.4 Deep drawing
 - 12.2.5 Coining.
 - 12.2.6 Spanning.
 - 12.3 Production of pipes
 - 12.3.1 List methods of pipe manufacturing
 - 12.3.2 Explain casting & forming methods
- 13. DIE-CASTING** **4 Hours**
- 13.1 Die casting & its uses
 - 13.2 Materials of dies
 - 13.3 Die casting methods
- 14. POWDER METALLURGY** **5 Hours**
- 14.1 Introduction to powder Metallurgy
 - 14.2 Powder manufacturing methods
 - 14.3 Properties of Powder
 - 14.4 Fabricating procedure & Secondary operations
 - 14.5 Powder Metallurgy applications

Text Books:

- (i) Engineers Metallurgy {Part I, II by Raymond A. Higgins
- (ii) Physical & Chemical Metallurgy by JE GARSIDE
- (iii) Physical metallurgy by ANVER

MT-242 METALLURGY

OBJECTIVES

1. INTRODUCTION

1.1 Know definition and classification

- 1.1.1 Define Metallurgy
- 1.1.2 State relationship of metallurgy with chemistry
- 1.1.3 State classification of metallurgy

1.2 Know scope of metallurgy

- 1.2.1 Describe importance of metallurgy in engineering all metals
- 1.2.2 State importance of metallurgy for a mechanical technician
- 1.2.3 Describe specific importance w.r.t. steel industry

2. ORES

2.1 Knows fundamentals

- 2.1.1 Define ore & its types
- 2.1.2 Describe Quality of good ore
- 2.1.3 Select proper ore for extraction of metal

2.2 Know Iron ore and their occurrence in nature

- 2.2.1 List types of iron ore
- 2.2.2 Describe each type
- 2.2.3 List the world ore deposits along with its Quality
- 2.2.4 List the Pakistan ore deposits alongwith its quantity
- 2.2.5 Describe economic use of Pakistan ore for making of steel
- 2.2.6 Describe iron ore needs of Pakistan steel Karachi

3. TREATMENT OF IRON ORE

3.1 Understand hand picking

- 3.1.1 Define hand picking
- 3.1.2 Explain hand picking

3.2 Understand Magnetic Separation

- 3.2.1 Define magnetic Separation
- 3.2.2 Explain magnetic separation

3.3 Understand Gravity separation

- 3.3.1 Define gravity separation
- 3.3.2 Explain gravity separation

3.4 Understand roasting and calcination

- 3.4.1 Define roasting and calcination
- 3.4.2 Explain roasting and calcination

3.5 Understand froth floatation

- 3.5.1 Define froth floatation

3.5.2 Explain froth floatation

4. PRODUCTION PROCESSES

4.1 Understand reduction and Oxidation

4.1.1 Define reduction and Oxidation

4.1.2 List different methods

4.1.3 Explain each method

4.2 Understand Acid & Basic process in Metallurgy

4.2.1 Define acid and basic in metallurgy

4.2.1 Describe the effects of acid and basic in metallurgy

4.2.3 Explain how to control the negative effects

5. REFRACTORY MATERIAL

5.1 Understand the basics

5.1.1 Define refractory material

5.1.2 List the types of refractory material

5.1.3 Explain the Quality of a refractory material

5.2 Understand acidic refractory materials

5.2.1 Define acidic refractory material

5.2.2 Explain its use

5.3 Understand basic refractory materials

5.3.1 Define basic refractory materials

5.3.2 Explain its use

5.4 Understand neutral Refractory materials

5.4.1 Define neutral refractory material

5.4.2 Explain its use

6. SMELTING OF IRON

6.1 Understand pre-smelting treatment of ores

6.1.1 Explain concentration

6.1.2 Explain calcination

6.1.3 Explain agglomeration

6.1.4 Explain sintering

6.1.5 Explain pelletizing

6.1.6 Explain Modulizing

6.2 Understand smelting operation in Blast Furnace(BF)

6.2.1 Explain parts of a Blast Furnace

6.2.2 Explain operations of Blast Furnace

6.2.3 Describe sizes of Blast Furnace

6.2.4 Explain chemical reactions in the blast furnace

6.2.5 Explain the Quantity of ore required to be fed

6.2.6 Explain the escape of hot gases through chimney

6.2.7 Explain charging procedure of Blast Furnace

- 6.2.8 Explain Tapping of iron and slag
- 6.2.9 Explain different of topers in the Blast Furnace
- 6.2.10 Explain the refractory lining for Blast Furnace
- 6.2.11 Explain the use of pre-heating of air for Blast Furnace
- 6.2.12 Explain the plant for preheating the air-ancillary plant
- 6.2.13 Explain the refractory bricks used in ancillary plant
- 6.2.14 Explain flow of hot gases from Blast Furnace to ancillary plant
- 6.2.15 Explain flow of hot air from ancillary plant to Blast Furnace

7. PIG IRON

7.1 Understand pig iron

- 7.1.1 Define pig iron
- 7.1.2 Explain properties of pig iron
- 7.1.3 Explain uses of pig iron
- 7.1.4 Describe forms of pig iron obtained from Blast Furnace

8. WROUGHT IRON

8.1 Understand wrought iron

- 8.1.1 Define wrought iron
- 8.1.2 Describe properties
- 8.1.3 Explain uses

8.2 Understand wrought iron production

- 8.2.1 Describe raw material med for wrought iron
- 8.2.2 Explain construction of puddling furnace
- 8.2.3 Explain operation in puddling furnace
- 8.2.4 Describe the capacity of puddling furnace
- 8.2.5 Enlist the types of puddling furnaces

9. STEEL

9.1 Know difference between steel and iron

- 9.1.1 Define steel
- 9.1.2 Define iron
- 9.1.3 List difference between steel and iron

9.2 Understand Types of steel

- 9.2.1 List the types of steel w.r.t. percentage of carbon
- 9.2.2 Define each type
- 9.2.3 Describe the properties of each
- 9.2.4 Explain the uses of each

9.3 Understand alloy steel

- 9.3.1 Describe alloy steel
- 9.3.2 List alloying elements
- 9.3.3 Describe the uses of different alloy steels
- 9.3.4 Define stainless steel
- 9.3.5 Explain the properties of stainless steel

10. STEEL MANUFACTURING

10.1 Know basic chemistry.

- 10.1.1 List the raw material used for steel manufacturing.
- 10.1.2 Describe the constituents of each raw material.
- 10.1.3 Describe chemical reaction taking place in steel manufacturing furnace.

10.2 Understand open hearth process.

- 10.2.1 Describe parts of open Hearth Furnace (O H F)
- 10.2.2 Describe operation inside O.H.F.
- 10.2.3 Describe charging/discharging of O.H.F.
- 10.2.4 Describe fuel supply/heating of O.H.F.
- 10.2.5 Describe refractory lining of O.H.F.
- 10.2.6 Appreciate quality of steel obtained through O.H.F.
- 10.2.7 Estimate the quantity of steel produced by O.H.F. in Pakistan and the world

10.3 Understand steel converter.

- 10.3.1 Describe parts of steel converter.
- 10.3.2 Describe charging of converter.
- 10.3.3 Describe oxygenation process in converter
- 10.3.4 Explain alloying of steel in the converter.
- 10.3.5 Describe discharging of the converter.
- 10.3.6 Describe the converter used in Pakistan Steel L.D. converter.
- 10.3.7 Explain the difference between L.D. converter and Bessemer

converter.

10.4 Understand Electric Steel Furnaces

- 10.4.1 List types of electric furnaces.
- 10.4.2 List parts of electric furnaces
- 10.4.3 Explain the working of electric furnaces
- 10.4.4 Describe the quality of steel obtained through electric furnaces
- 10.4.5 Describe the capacities of electric furnaces

11. NON FERROUS METALS.

11.1 Know non ferrous metals.

- 11.1.1 Define a non ferrous metal.
- 11.1.2 List common non ferrous.

11.2 Understand composition and uses of non ferrous metals.

- 11.2.1 Describe mechanical properties of Copper, Aluminum & Zinc.
- 11.2.2 Explain the engg. uses of non ferrous metal.

11.3 Understand Extraction of Non ferrous metals

- 11.3.1 Name ores of Cu,Al & Zn.
- 11.3.2 Explain methods of extraction of Cu,Al & Zn.

12. INDUSTRIAL SHAPING OF METALS.

12.1 Know hot working processes.

- 12.1.1 Define hot working.
- 12.1.2 Describe hot rolling.
- 12.1.3 Describe hot forging.
- 12.1.4 Describe drop forging.
- 12.1.5 Describe extrusion.
- 12.1.6 Describe heading.
- 12.1.7 Describe hot pressing.

12.2 Know cold working processes.

- 12.2.1 Define cold working.
- 12.2.2 Describe cold rolling.
- 12.2.3 Describe cold pressing.
- 12.2.4 Describe cold drawing.
- 12.2.5 Describe cold forging.

12.3 Understand production of pipes

- 12.3.1 List methods of manufacturing of pipes
- 12.3.2 Explain manufacturing by casting and forming methods

13. DIE CASTING

13.1 Understand Die-casting

- 13.1.1 State Die-casting
- 13.1.2 Explain uses of Die-casting
- 13.1.3 Name the materials of Dies
- 13.1.4 State Die-casting methods
- 13.1.5 Explain Die-casting process step by step

14. POWDER METALLURGY

14.1 Understand Powder metallurgy

- 14.1.1 Describe powder metallurgy and uses
- 14.1.2 Explain methods of making powders & their properties
- 14.1.3 Explain fabricating procedures (compacting, sintering)
- 14.1.4 Explain secondary operations
- 14.1.5 Differentiate powder metallurgy methods from other production

methods

Recommended Books:

1. Frier Elementary Metallurgy
2. Metallurgy of Iron & Steel by Bradely
3. Metallurgy part 1 & 11 by Higgings.