REVISED CURRICULUM

OF

DIPLOMA OF ASSOCIATE ENGINEER

IN

MECHANICAL TECHNOLOGY with Sp. in Metallurgy & Welding

2015

MECHANICAL TECHNOLOGY with Sp. in Metallurgy & Welding

Revised Scheme of Studies

FIRST YEAR					
COURSE CODE		**SUBJECTS**	**T**	**P**	**C**
Gen	111	Islamiat and Pak Studies	1	0	1
Eng	112	English	2	0	2
Math	113	Applied Mathematics	3	0	3
Phy	122	Applied Physics	1	3	2
Ch	112	Applied Chemistry	1	3	2
Comp	142	Computer Applications	1	3	2
ET	101	Basic Electricity	1	0	1
MT	132	Engineering Drawing-I	1	3	2
MT	121	Safety Practice and Procedures	1	0	1
MW	102	Theory of welding & forging	2	0	2
MW	142	Ferrous Metallurgy	2	0	2
MW	131	Theory of Sheet Metal	1	0	1
MW	113	Workshop practice –I	0	9	3
Total			17	21	24
SECOND YEAR					
COURSE CODE		**SUBJECTS**	**T**	**P**	**C**
Gen	211	Islamiat and Pak Studies	1	0	1
Math	212	Applied Mathematics-II	2	0	2
MGM	221	Business Management and Industrial Economics	1	0	1
MT	232	Engineering Drawing-II	1	3	2
MW	223	Theory of welding	3	0	3
MW	262	Non Ferrous Metallurgy	2	0	2
MW	202	Machine Elements	2	0	2
MW	212	Machine and Tools	2	0	2
MW	272	Pipe Layout	1	3	2
MW	285	Workshop practice –II	0	15	5
Total			15	21	22

THIRD YEAR					
COURSE CODE		**SUBJECTS**	**T**	**P**	**C**
Gen	**311**	**Islamiat and Pak Studies**	**1**	**0**	**1**
IMH	**311**	**Industrial Management and Human Relations**	**1**	**0**	**1**
Mgm	**321**	**Business Communication**	**1**	**0**	**1**
Ch	**313**	**Applied Chemistry**	**1**	**6**	**3**
MW	**333**	**Materials Testing**	**2**	**3**	**3**
MW	**343**	**Metallography & heat treatment**	**2**	**3**	**3**
MW	**322**	**Advance Welding**	**2**	**0**	**2**
MW	**355**	**Workshop practice –III**	**0**	**15**	**5**
Total			**10**	**27**	**19**

اسلامیات/مطالعہ پاکستان

موضوعات حصہ اول اسلامیات سال اول

کل وقت: 20 گھنٹے

کتاب و سنت

قرآن مجید

1- تعارف قرآن مجید 2- نزول قرآن 3- مکی و مدنی سورتوں کی خصوصیات 4- وحی کی اقسام 3

5- پندرہ منتخب آیات معہ ترجمہ

1- لن تنالوا البر حتی تنفقوا مما تحبون

2- واعتصموا بحبل الله جمیعا ولا تفرقوا

3- ولا یجرمنکم شنان قوم علی ان لا تعدلوا

4- ان الله یامرکم ان تودوا الامانات الی اهلها

5- ان الله یامر بالعدل والاحسان

6- ان الصلوة تنهی عن الفحشاء والمنکر

7- لقد کان لکم فی رسول الله اسوة حسنة

8- ان اکرمکم عند الله اتقاکم

9- وما اتاکم الرسول فخذوه ومانهاکم عنه فانتهو

10- واوفوبالعهد

11- وعاشرو هن بالمعروف

12- یمحق الله الربوٰ ویربی الصدقات

13- واصبر علی ما اصابک

14- وقولوا قولا سدیدا

15- ان الدین عند الله الاسلام

حصہ اول

حصہ اسلامیات　　تدریسی مقاصد

1- قرآن مجید

عمومی مقصد۔　طالب علم یہ سمجھنے کے قابل ہو کہ اسلام کی تعلیمات کا اصل سرچشمہ قرآن مجید ہے۔

خصوصی مقاصد۔　طالب علم اس قابل ہو جائے گا کہ:

1- قرآن مجید کی تعریف کر سکے گا۔

2- قرآن مجید کے نزول کی صورت بیان کر سکے

3- قرآن مجید کی مکی و مدنی سورتوں کی پہچان کر سکے

4- منتخب آیات کا ترجمہ و تشریح کر سکے

عمومی مقصد۔　یہ سمجھنے کے قابل ہو جائے گا کہ منتخب قرآنی آیات کے ذریعے اسلامی تعلیمات کا مفہوم کیا ہے۔

خصوصی مقصد۔　طالب علم اس قابل ہو جائے کہ:

1- قرآنی آیات کا ترجمہ و تشریح کر سکے

2- قرآنی تعلیمات کی روشنی میں اپنی اور معاشرتی اصلاح کر سکے

2- سنت

عمومی مقصد۔　طالب علم حدیث نبوی کی اہمیت اور ضرورت کو اچھی طرح سمجھنے کے قابل ہو جائے گا۔

خصوصی مقاصد

☆ [illegible]

3- منتخب احادیث نبویہ

عمومی مقصد۔　احادیث کی روشنی میں اخلاقی اقدار سے [illegible]

خصوصی مقاصد۔　احادیث کا ترجمہ و تشریح کر سکے

محمد رسول اللہ صلی اللہ علیہ وسلم کے اسوۂ حسنہ کی پیروی کا جذبہ پیدا ہو سکے۔

4- دین اسلام

عمومی مقصد۔ دین اسلام کے بنیادی عقائد اور عبادات کے بارے میں جان سکے اور بیان کر سکے

خصوصی مقاصد:

- ☆ لفظ دین اسلام کے لغوی اور اصطلاحی معنی بیان کر سکے۔
- ☆ اسلام کے بنیادی عقائد کی اہمیت بیان کر سکے۔
- ☆ اسلام کے بنیادی عقائد کے انسان کی انفرادی و اجتماعی زندگی پر پڑنے والے اثرات بیان کر سکے
- ☆ عبادت کے لفظی و اصطلاحی معنی بیان کر سکے۔
- ☆ عقیدے اور عبادت کا فرق بیان کر سکے۔
- ☆ عبادات (نماز، روزہ، حج، زکوٰۃ) کے فوری احکامات اور انسانی زندگی پر ان کے اثرات بیان کر سکے

نصاب اخلاقیات سال اول

تدریسی مقاصد

- موصوعات کا مطلب بیان لر سکے۔
- عملی زندگی سے مثالوں کی نشاندہی کر سکے۔
- اپنی شخصیت اور معاشرے پر موضوعات کے مثبت اثرات پیدا کرنے کے طریقے بیان کر سکے
- دیانت داری کی اہمیت بیان کر سکے۔
- وفاداری کی اہمیت بیان کر سکے۔
- نظم وضبط کی افادیت بیان کر سکے۔
- صدق بیان کی ضرورت بیان کر سکے۔
- حوصلہ مندی کے فوائد بیان کر سکے
- وقت کی پابندی کے فوائد بیان کر سکے
- صفائی اور باہمی اعتماد سے حسن کارکردگی کو بیان کر سکے
- مصلحت کے فوائد بیان کر سکے

نصاب سال اول Gen III

حصہ دوم مطالعہ پاکستان کل وقت: 12 گھنٹے

موضوعات

- حریت فکر

مسلمان قوم میں آزادی فکر کی تاریخ۔ مسلمانوں میں سیاسی آزادی کی اہمیت اور ضرورت۔ ذہنی و جسمانی غلامی کے نقصانات

- نظریہ پاکستان

قیام پاکستان کی اساس (دین اسلام) قیام پاکستان کی غرض و غایت۔ نظریہ پاکستان کی وضاحت۔ نظریہ پاکستان علامہ اقبال اور قائداعظم کے ارشادات کی روشنی میں

- نظریہ پاکستان کا تاریخی پہلو

محمد بن قاسم کی آمد۔ مجدد الف ثانی اور شاہ ولی اللہ کی تبلیغ [illegible] کی تحریک [illegible]

- محمد بن قاسم کے ہندوستان پر حملہ کی وجہ بیان
- محمد بن قاسم کے ہندوستان پر حملہ کے اثرات بیان کر سکے
- وہ بیان کر سکے کہ ہندوستان میں ہندو مسلم دو قومی نظریہ کا نکتہ آغاز کیا ہے۔
- مجدد الف ثانی کی علمی خدمات بیان کر سکے
- شاہ ولی اللہ کی علمی خدمات بیان کر سکے
- مجدد الف ثانی اور شاہ ولی اللہ نے جو تبلیغ دین اور مسلمانوں میں سیاسی شعور پیدا کیا اسے بیان کر سکے۔

علمی تحریکیں

عمومی مقصد۔

- برصغیر کی علمی تحریکوں سے آگاہی حاصل ہو سکے

خصوصی مقاصد

- علی گڑھ۔ دیوبند۔ ندوۃ العلماء۔ مدرسۃ الاسلام۔ اسلامیہ کالج۔ انجمن حمایت اسلام نے تعلیم کے ذریعہ جو سیاسی شعور مسلمانوں میں پیدا کیا اسے بیان کر سکے۔
- آزادی ہند کے سلسلہ میں تحریک مجاہدین کی خدمات بیان کر سکے۔

E

Total contact hours

Theory	64	T	P	C
Practical	0	2	0	2

AIMS At the end of the course, the students will be equipped with cognitive skill to enable them to present facts in a systematic and logical manner to meet the language demands of dynamic field of commerce and industry for functional day-to-day use and will inculcate skills of reading, writing and comprehension.

COURSE CONTENTS

ENGLISH PAPER "A"

1. PROSE/TEXT **16 hrs**

1.1 First eight essays of Intermediate. English Book-II

2. CLOZE TEST **4 hrs**

1.2 A passage comprising 50-100 words will be selected from the text. Every 11thword or any word for that matter will be omitted. The number of missing word will range between 5-10. The chosen word may or may not be the one used in the text, but it should be an appropriate word.

ENGLISH PAPER "B"

3. GRAMMAR **26 hrs**

3.1 Sentence Structure.
3.2 Tenses.
3.3 Parts of speech.
3.4 Punctuation,
3.5 Change of Narration.
3.6 One word for several
3.7 Words often confused

4. COMPOSITION **8 hrs**

4.1 Letters/Messages
4.2 Job application letter
4.3 For character certificate/for grant of scholarship
4.4 Telegrams, Cablegrams and Radiograms, Telexes, Facsimiles
4.5 Essay writing
4.6 Technical Education, Science and Our life, Computers,
Environmental Pollution, Duties of a Student. **4 hrs**

5. TRANSLATION **6 hrs**

5.1 Translation from Urdu into English.
For Foreign Students: A paragraph or a dialogue.

RECOMMENDED BOOKS

1. Technical English developed by Mr. Zia Sarwar, Mr. Habib-ur –Rehman, Evaluated by Mr.Zafar Iqbal Khokhar, Mr. ZahidZahoor,Vol - I, National Book Foundation

Eng-112 ENGLISH

INSTRUCTIONAL OBJECTIVES
PAPER-A

1. DEMONSTRATE BETTER READING, COMPREHENSION AND VOCABULARY

1.1 Manipulate, skimming and scanning of the text.
1.2 Identify new ideas.
1.3 Reproduce facts, characters in own words
1.4 Write summary of stories

2. UNDERSTAND FACTS OF THE TEXT

2.1 Rewrite words to fill in the blanks recalling the text.
2.2 Use own words to fill in the blanks.

PAPER-B

3. APPLY THE RULES OF GRAMMAR IN WRITING AND SPEAKING

3.1 Use rules of grammar to construct meaningful sentences containing a subject and a predicate.
3.2 State classification of time, i.e. present, past and future and use verb tense correctly in different forms to denote relevant time.
3.3 Identify function words and content words.
3.4 Use marks of punctuation to make sense clear.
3.5 ' Relate what a person says in direct and indirect forms.
3.6 Compose his writings.
3.7 Distinguish between confusing words.

4. APPLY THE CONCEPTS OF COMPOSITION WRITING TO PRACTICALSITUATIONS

4.1 Use concept to construct applications for employment, for character certificate for grant of scholarship.
4.2 Define and write telegrams, cablegrams and radiograms, telexes, facsimiles
4.3 Describe steps of a good composition writing.
4.4 Describe features of a good composition.
4.5 Describe methods of composition writing.
4.6 Use these concepts to organize facts and describe them systematically in practical situation;

5. APPLIES RULES OF TRANSLATION

5.1 Describe confusion.
5.2 Describe rules of translation.
5.3 Use rules of translation from Urdu to English in simple paragraph and sentences.

Math-113 APPLIED MATHEMATICS

Total contact hours	96	**T**	**P**	**C**
Theory		3	0	3

Pre-requisite: Must have completed a course of Elective Mathematics at Matric level.

AIMS After completing the course the students will be able to

1. Solve problems of Algebra, Trigonometry, vectors. Menstruation, Matrices and Determinants.
2. Develop skill, mathematical attitudes and logical perception in the use of mathematical instruments as required in the technological fields.
3. Acquire mathematical clarity and insight in the solution of technical problems.

COURSE CONTENTS

1 QUADRATIC EQUATIONS 6 Hrs

1.1 Standard Form
1.2 Solution
1.3 Nature of roots
1.4 Sum & Product of roots
1 .5 Formation
1.6 Problems

2 ARITHMETIC PROGRESSION AND SERIES 3Hrs

2.1 Sequence
2.2 Series
2.3 nth term
2.4 Sum of the first n terms
2.5 Means
2.6 Problems

3 GEOMETRIC PROGRESSION AND SERIES 3Hrs

3.1 nth term
3:2 sum of the first n terms
3.3 Means
3.4 Infinite Geometric progression
3.5 Problems

4 BINOMIAL THEOREM 6 Hrs

4.1 Factorials
4.2 Binomial Expression
4.3 Binomial Co-efficient
4.4 Statement
4.5 The General Term
4.6 The Binomial Series.
4.7 Problems

5 PARTIAL FRACTIONS 6 Hrs

5.1 Introduction
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 Problems

6 FUNDAMENTALS OF TRIGONOMETRY 6 Hrs

6.1 Angles
6.2 Quadrants
6.3 Measurements of Angles
6.4 Relation between Sexagesimal& circular system
6.5 Relation between Length of a Circular Arc & the Radian Measure of its centralAngle
6.6 Problems

7 TRIGONOMETRIC FUNCTIONS AND RATIOS 6 Hrs

7.1 trigonometric functions of any angle
7.2 Signs of trigonometric Functions
7.3 Trigonometric Ratios of particular Angles
7.4 Fundamental Identities
7.5 Problems

8 GENERAL INDENTITIES 6 Hrs

8.1 The Fundamental Law
8.2 Deductions
8.3 Sum & Difference Formulae
8.4 Double Angle Identities
8.5 Half Angle Identities
8.6 Conversion of sum or difference to products
8.7 Problems

9 SOLUTION OF TRIANGLES 6 Hrs

9.1 The law of Sines
9.2 The law of Cosines
9.3 Measurement of Heights & Distances
9.4 Problems

10 MENSURATION OF SOLIDS 30 Hrs

10.1 Review of regular plane figures and Simpson's Rule
10.2 Prisms
10.3 Cylinders
10.4 Pyramids
10.5 Cones
10.6 Frusta

10.7 Spheres

11 VECTORS 9 Hrs

11.1 Sealers & Vectors
11.2 Addition & Subtraction
11.3 The unit Vectors I, j, k
11.4 Direction Cosines
11.5 Sealer or Dot Product
11.6 Deductions
11.7 Dot product in terms of orthogonal components
11.8 Deductions
11.9 Analytic Expression for a x b.
11.10 Problems.

12 MATRICES AND DETERMINANTS 9 Hrs

12.1 Definition of Matrix
12.2 Rows & Columns
12.3 Order of a Matrix
12.4 Algebra of Matrices
12.5 Determinants
12.6 Properties of Determinants
12.7 Solution of Linear Equations
12.8 Problems

REFERENCE BOOKS

Applied Mathematics Math-113, by Nasir -ud-Din Mahmood, Sana-ullah Khan, Tahir Hameed, Syed Tanvir Haider, Javed Iqbal, Vol - I, National Book Foundation

Math-113 APPLIED MATHEMATICS-I

INSTRUCTIONAL OBJECTIVES

1 USE DIFFERENT METHODS FOR THE SOLUTION OF QUADRATIC EQUATIONS

1.1 Define a standard quadratic equation.
1.2 Use methods of factorization and method of completing the square for solvingthe equations.
1.3 Derive quadratic formula.
1.4 Write expression for the discriminant
1.5 Explain nature of the roots of a quadratic equation.
1.6 Calculate sum and product of the roots.
1.7 Form a quadratic equation from the given roots.
1.8 Solve problems involving quadratic equations.

2 UNDERSTAND APPLY CONCEPT OF ARITHMETIC PROGRESSION AND SERIES

2.1 Define an Arithmetic sequence and a series
2.2 Derive formula for the nth term of an A.P.
2.3 Explain Arithmetic Mean between two given numbers
2.4 Insert n Arithmetic means between two numbers
2.5 Derive formulas for summation of an Arithmetic series
2.6 Solve problems on Arithmetic Progression and Series

3 UNDERSTAND GEOMETRIC PROGRESSION AND SERIES

3.1 Define a geometric sequence and a series.
3.2 Derive formula for nth term of a G.P.
3.3 Explain geometric mean between two numbers.
3.4 Insert n geometric means between two numbers.
3.5 Derive a formula for the summation of geometric Series.
3.6 Deduce a formula for the summation of an infinite G.P.
3.7 Solve problems using these formulas.

4 EXPAND AND EXTRACT ROOTS OF A BINOMIAL

4.1 State binomial theorem for positive integral index.
4.2 Explain binomial coefficients: (n,0), (n,1)……..(n,r),…….(n,n)
4.3 Derive expression for the general term.
4.4 Calculate the specified terms.
4.5 Expand a binomial of a given index. -
4.6 Extract the specified roots
4.7 Compute the approximate value to a given decimal place.
4.8 Solve problems involving binomials.

5 RESOLVE A SINGLE FRACTIONINTO PARTIALFRACTIONS USINGDIFFERENT METHODS.

5.1 Define a partial fraction, a proper and an improper fraction.
5.2 Explain all the four types of partial fractions.

5.3 Set up equivalent partial fractions for each type.
5.4 Explain the methods for finding constants involved.
5.5 Resolve a single fraction into partial fractions.
5.6 Solve problems involving all the four types.

6 UNDERSTAND SYSTEMS OF MEASUREMENT OF ANGLES.

6.1 Define angles and the related terms.
6.2 Illustrate the generation of angle.
6.3 Explain sexagesimal and circular systems for the measurement of angles
6.4 Derive the relationship between radian and degree.
6.5 Convert radians to degrees and vice versa.
6.6 Derive a formula for the circular measure of a central angle.
6.7 Use this formula for solving problems.

7 APPLY BASIC CONCEPTS AND PRINCIPLES OF TRIGONOMETRICFUNCTIONS

7.1 Define the basic trigonometric functions/ratios of an angle as ratios of the sides of a right triangle.
7.2 Derive fundamental identities.
7.3 Find trigonometric ratios of particular angles.
7.4 Draw the graph of trigonometric functions.
7.5 Solve problems involving trigonometric functions.

8 USE TRIGONOMETRIC IDENTITIES IN SOLVING TECHNOLOGICALPROBLEMS

8.1 List fundamental identities
8.2 Prove the fundamental law
8.3 Deduce important results
8.4 Derive-sum and difference formulas
8.5 Establish half angle, double angle & triple angle formulas
8.6 Convert sum or difference into product& vice versa
8.7 Solve problems

9 USE CONCEPTS, PROPERTIES AND LAWS OF TRIGONOMETRIC FUNCTIONS FOR SOLVING TRIANGLES

9.1 Define angle of elevation and angle of depression.
9.2 Prove the law of sins and the law of cosines.
9.3 Explain elements of a triangle.
9.4 Solve triangles and the problems involving heights and distances.

10 USE PRINCIPLES OF MENSTRUATION IN FINDING SURFACES, VOLUMEAND WEIGHTS OF SOLIDS.

10.1 Define menstruation of plane and solid figures
10.2 List formulas for perimeters & areas of plane figure.
10.3 Define pyramid and cone.

10.4 Define frusta of pyramid and cone.
10.5 Define a sphere and a shell.
10.6 Calculate the total surface and volume of each type of solid.
10.7 Compute weight of solids.
10.8 Solve problems of these solids.

11. USE THE CONCEPT AND PRINCIPLES OF VECTORS IN SOLVINGTECHNOLOGICAL PROBLEMS.

11.1 Define vector quantity.
11.2 Explain addition and subtraction of vector
11.3 Illustrate unit vectors I, j, k.
11.4 Express a vector in the component form.
11.5 Explain magnitude, unit vector, direction consines of a vector.
11.6 Derive analytic expression for dot product and cross product of two vector.
11.7 Deduce conditions of perpendicularly and parallelism of two vectors.
11.8 Solve problems

12. USE THE CONCEPT OFMATRICES & DETERMINANTS IN SOLVING TECHNOLOGICAL PROBLEMS

12.1 Define a matrix and a determinant.
12.2 List types of matrices.
12.3 Define transpose, ad joint and inverse of a matrix.
12.4 State properties of determinants.
12.5 Explain basic concepts.
12.6 Explain algebra of matrices.
12.7 Solve linear equation by matrices.
12.8 Explain the solution of a determinant.
12.9 Use Crammers Rule for solving linear equations

Total Contact Hours

Theory	32	**T**	**P**	**C**
Practical	96	1	3	2

AIMS: The students will be able to understand the fundamental principles and concept of physics, use these to solve problems in practical situations/technical courses and understand concepts to learn advance physics/technical courses,

COURSE CONTENTS

1 MEASUREMENTS. 2 Hrs

1.1 Fundamental units and derived units
1.2 Systems of measurement and S.I. units
1.3 Concept of dimensions, dimensional formula
1.4 Conversion from one system to another
1.5 Significant figures

2. SCALARS AND VECTORS. 4 Hrs

2.1 Revision of head to tail rule
2.2 Laws of parallelogram, triangle and polygon of forces
2.3 Resolution of a vector
2.4 Addition of vectors by rectangular components
2.5 Multiplication of two vectors, dot product and cross product

3. MOTION 4 Hours

3.1 Review of laws and equations of motion
3.2 Law of conservation of momentum
3.3 Angular motion
3.4 Relation between linear and angular motion
3.5 Centripetal acceleration and force
3.6 Equations of angular motion

4. TORQUE, EQUILIBRIUM AND ROTATIONAL INERTIA 2 Hours

4.1 Torque
4.2 Centre of gravity and centre of mass
4.3 Equilibrium and its conditions
4.4 Torque and angular acceleration
4.5 Rotational inertia

5. WAVE MOTION 5 Hrs

5.1 Review Hooke's law of elasticity,
5.2 Motion under an elastic restoring force.
5.3 Characteristics of simple harmonic motion
5.4 S.H.M. and circular motion
5.5 Simple pendulum
5.6 Wave form of S.H.M.
5.7 Resonance

5.8 Transverse vibration of a stretched string

6. SOUND **5 Hrs**

6.1 Longitudinal waves
6.2 Intensity, loudness, pitch and quality of sound
6.3 Units of Intensity of level and frequency response of ear
6.4 Interference of sound waves silence zones, beats
6.5 Acoustics
6.6 Doppler effect

7. LIGHT **5 Hrs**

7.1 Review laws of reflection and refraction
7.2 Image formation by mirrors and lenses
7.3 Optical instruments
7.4 Wave theory of light
7.5 Interference, diffraction, polarization of light waves
7.6 Applications of polarization in sunglasses, optical activity and stress analysis

8. OPTICAL FIBER **2 Hrs**

8.1 Optical communication and problems
8.2. Review total internal reflection and critical angle
8.3 Structure of optical fiber
8.4 Fiber material and manufacture
8.5 Optical fiber - uses.

9. LASERS **3 Hrs**

9.1 Corpuscular theory of light
9.2 Emission and absorption of light
9.3 Stimulated absorption and emission of light
9.4 Laser principle
9.5 Structure and working of lasers
9.6 Types of lasers with brief description.
9.7 Applications (basic concepts)
9.8 Material processing
9.9 Laser welding
9.10 Laser assisted machining
9.11 Micro machining
9.12 Drilling scribing and marking
9.13 Printing
9.14 Lasers in medicine

RECOMMENDED BOOKS

1. Applied Physics 122, developed by Mr. Khalid Mehmood, Dr. Muhammad Ajmal, Zafar Iqbal Tarar, Asif Ali and Habib-ullah.

Phy-122 APPLIED PHYSICS

INSTRUCTIONAL OBJECTIVES

1 USE CONCEPTS OF MEASUREMENT TO PRACTICAL SITUATIONS AND TECHNOLOGICAL PROBLEMS

1. 1 Write dimensional formulae for physical quantities
1.2 Derive units using dimensional equations
1.3 Convert a measurement from one system to another
1.4 Use concepts of measurement and significant figures in problem solving.

2 USE CONCEPTS OF SCALARS AND VECTORS IN SOLVING PROBLEMS INVOLVING THESE CONCEPTS

2.1 Explain laws of parallelogram, triangle and polygon offorces
2.2 Describe method of resolution of a vector into components
2.3 Describe method of addition of vectors by rectangular components
2.4 Differentiate between dot product and cross product of vectors
2.5 Use the concepts in solving problems involving addition resolution and multiplication of vectors

3 USE THE LAW OF CONSERVATION OF MOMENTUM AND CONCEPTS OF ANGULAR MOTION TO PRACTICAL SITUATIONS

3.1 Use law of conservation' of momentum to practical/technological problems
3.2 Explain relation between linear and angular motion
3.3 Use concepts and equations of angular motion to solve relevant technological problems

4 USE CONCEPTS OF TORQUE, EQUILIBRIUM AND ROTATIONAL INERTIA TO PRACTICAL SITUATION/PROBLEMS

4.1 Explain Torque
4.2 Distinguish between Centre of gravity and centre of mass
4.3 Explain rotational Equilibrium, and its conditions
4.4 Explain. Rotational Inertia giving examples
4.5 Use the above concepts in solving technological problems.

5 USE CONCEPTS OR WAVE MOTION IN SOLVING RELEVANT PROBLEMS

5.1 Explain Hooke's Law of Elasticity
5.2 Derive formula for Motion under an elastic restoring force
5.3 Derive formulae for simple harmonic motion and simple pendulum
5.4 Explain wave form with reference to S.H.M. and circular motion
5.5 Explain Resonance
5.6 Explain Transverse vibration of a stretched 'string
5.7 Use the above concepts and formulae of S.H.M. to solve relevant problems.

6 UNDERSTAND concepts OF SOUND

6.1 Describe longitudinal wave and its propagation
6.2 Explain the concepts: Intensity, loudness, pitch and quality of sound
6.3 Explain units of Intensity of level and frequency response of ear
6.4 Explain phenomena of silence zones, beats

6.5 Explain Acoustics of buildings.
6.6 Explain Doppler Effect giving mathematical expressions.

7 USE THE CONCEPTS OF GEOMETRICAL OPTICS TO MIRRORS AND LENSES

7.1 Explain laws of reflection and refraction
7.2 Use mirror formula to solve problems
7.3 Use the concepts of image formation by mirrors and lenses to describe working of optical instruments, e.g. microscopes, telescopes, camera and sextant.

8 UNDERSTAND WAVE THEORY OF LIGHT

8.1 Explain wave theory of light
8.2 Explain phenomena of interference, diffraction, polarization of light waves
8.3 Describe uses of polarization given in the course contents.

9 UNDERSTAND THE STRUCTURE, WORKING AND USES OF OPTICAL FIBER

9.1 Explain the structure of the Optical Fiber
9.2 Explain its principle of working
9.3 Describe use of optical fiber in industry and medicine.

LIST OF PRACTICALS

1. Draw graphs representing the functions:

a) $y=mx$ for $m=0, 0.5, 1, 2$

b) $y=x^2$

c) $y = l/x$

2. Find the volume of a given solid cylinder using vernier calipers.
3. Find the area of cross-section of the given wire using micrometer screw gauge.
4. Prove that force is directly proportional to (a) mass, (b) acceleration, using fletchers trolley
5. Verify law of parallelogram of forces using Grave-sands apparatus.
6. Verify law of triangle of forces and Lami's theorem
7. Determine the weight of a given body using
   a) Law of parallelogram of forces
   b) Law of triangle of forces
   c) Lami's theorem
8. Verify law of polygon of forces using Grave-sands apparatus.
9. Locate the position and magnitude of resultant of like parallel forces.
10. Determine the resultant of two unlike parallel forces.

II. Find the weight of a given body using principle ofmoments.

12. Locate the centre of gravity of regular and irregular shaped bodies.
13. Find Young's Modules of Elasticity of a metallic wire.
14. Verify Hooke's Law using helical spring.
15. Study of frequency of stretched string with length.
16. Study of variation of frequency of stretched string with tension.
17. Study resonance of air columnin resonance tube and find velocity of sound.
18. Find the frequency of the given tuning fork using resonance tube.
19. Find velocity of sound in rod by Kundt's tube
20, Verify rectilinear propagation of light and study shadow formation.
21. Study effect of rotation of plane mirror on reflection.
22. Compare the refractive indices of given glass slabs.
23. Find focal length of concave mirror by locating centre of curvature.
24. Find focal length of concave mirror by object and image method
25. Find focal length of concave mirror with converging lens.
26. Find refractive index of glass by apparent depth.
27. Find refractive index of glass by spectrometer.
28. Find focal length of converging lens by plane mirror.
29. Find focal length of converging lens by displacement method.
30. Find focal length of diverging lens using converging lens.
31. Find focal length of diverging lens using concave mirror.
32. Find angular magnification of an astronomical telescope.
33. Find angular magnification of a simple microscope (Magnifying Glass)
34. Find angular magnification of a compound microscope.
35. Study working and structure of camera.
36. Study working and structure of sextant.
37. Compare the different scales of temperature and verify the conversion formula.
38. Determine the specific heat of lead shots.

39. Find the coefficient of linear expansion of a metallic rod.
40. Find the heat of fusion of ice.
41. Find the heat of vaporization.
42. Determine relative humidity using hygrometer:

Ch-112 APPLIED CHEMISTRY

T	**P**	**C**
1	3	2

Total Contact Hours
Theory **32**
Practical **96**

Pre-requisite: The student must have studied the subject of elective chemistry at Secondary, school level.

AIMSAfter studying this course a student will be able to;
1. Understand the significance and role of chemistry in the development of modern technology.
2. Become acquainted with the basic principles of chemistry as applied in the study of relevant Technology.
3. Know the scientific methods for production, properties and use of materials of industrial & .technological significance.
4. Gains skill for the efficient conduct of practical's in a Chemistry lab.

COURSE CONTENTS

1 INTRODUCTION AND FUNDAMENTAL CONCEPTS 2 Hrs
1.1 Orientation with reference to this technology
1.2 Terms used & units of measurements in the study of chemistry
1.3 Chemical Reactions & their types

2 ATOMIC STRUCTURE 2 Hrs
2.1 Sub-atomic particles
2.2 Architecture of atoms of elements, Atomic No. & Atomic Weight
2.3 The periodic classification of elements periodic law
2.4 General characteristics of a period and group

3 CHEMICAL BOND 2 Hrs
3.1 Nature of chemical Bond
3.2 Electrovalent bond with examples
3.3 Covalent Bond (Polar and Non-polar, sigma & Pi Bonds with examples
3.4 Co-ordinate Bond with examples

4 WATER 2 Hrs
4.1 Chemical nature and properties.
4.2 Impurities
4.3 Hardness of water (types, causes & removal)
4.4 Scales of measuring hardness (Degrees Clark
4.5 Boiler feed water, scales & treatment
4.6 Sea-water desalination, sewage treatment

5 ACIDS, BASES AND SALTS 2 Hrs
5.1 Definitions with examples
5.2 Properties, their strength, basicity & Acidity
5.3 Salts and their classification with examples

5.4 pH-value and scale

6 OXIDATION & REDUCTION 2 Hrs

6.1 The process, definition& examples
6.2 Oxidizing and reducing agents
6.3 Oxides and their classifications

7 NUCLEAR CHEMISTRY 2 Hrs

7.1 Introduction
7.2 Radioactivity (alpha, beta and gamma rays)
7.3 Half life process
7.4 Nuclear reaction & transformation of elements

8 CEMENT 2 Hrs

8.1 Introduction
8.2 Composition and manufacture
8.3 Chemistry of setting and hardening
8.4 Special purpose cements

9 GLASS 2 Hrs

9.1 Composition and raw material
9.2 Manufacture
9.3 Varieties and uses

10 PLASTICS AND POLYMERS 2 Hrs

10.1 Introduction and importance
10.2 Classification
10.3 Manufacture
10.4 Properties and uses

11 PAINTS, VARNISHES AND DISTEMPER 2 Hrs

11.1 Introduction
11.2 Constituents
11.3 Preparation and uses

12 CORROSION 2 Hrs

12.1 Introduction with causes
12.2 Types of corrosion
12.3 Rusting of iron
12.4 Protective measures against-corrosion

13 REFRACTORY MATERIALS AND ABRASIVE 2 Hrs

13.1 Introduction to Refractories
13.2 Classification of Refractories

13.3 Properties and Uses
13.4 Introduction to Abrasives
13.5 Artificial and Natural Abrasives and their uses

14 ALLOYS 2 Hrs
14.1 Introduction with need
14.2 Preparation and Properties
14.3 Some Important alloys and their composition
14.4 Uses

15 FUELS AND COMBUSTION 2 Hrs
15.1 Introduction of fuels
15.2 Classification of fuels
15.3 Combustion
15.4 Numerical Problems of Combustion

16 LUBRICANTS 1 Hr
16.1 Introduction.
16.2 Classification.
16.3 Properties of lubricants.
16.4 Selection of lubricants:

17 POLLUTION 1 Hr
17.1 The problem and its dangers.
17.2 Causes of pollution.
17.3 Remedies to combat the hazards of pollution.

BOOKS RECOMMENDED

1. Applied Chemistry-112, developed byMr. Muhammad Ayub, Mr. QasimShamim, Mr. YousufQamar, Shaukat Ali Awan and Muhammad Naushad

Ch-112 APPLIED CHEMISTRY

INSTRUCTIONAL OBJECTIVES

1 UNDERSTAND THE SCOPE, SIGNIFICANCE AND FUNDAMENTAL ROLE OF THE SUBJECT

1.1 Define chemistry and its important terms
1.2 State the units of measurements in the study of chemistry
1.3 Write chemical formula of common compounds
1.4 Describe types of chemical reactions with examples

2 UNDERSTAND THE STRUCTURE OF ATOMS AND ARRANGEMENT OF SUB ATOMIC PARTICLES IN THE ARCHITECTURE OF ATOMS

2.1 Define atom.
2.2 State the periodic law of elements.
2.3 Describe the fundamental sub atomic particles
2.4 Distinguish between atomic ho. and mass no.; isotopes and isobars
2.5 Explain the arrangements of electrons in different shells and sub energy levels
2.6 Explain the grouping and placing of ^elements' in the periodic table

3 UNDERSTAND THE NATURE OF CHEMICAL LBOUND

3.1 Define chemical bond
3.2 Describe the nature of chemical bond
3.3 Differentiate .between electrovalent an^ covalent bonding
3.4 Explain the formation of polar and non polar, sigma and pi-bond with examples
3.5 Describe the nature of coordinate bond with examples

4 UNDERSTAND THE CHEMICAL NATURE OF WATER

4.1 Describe the chemical nature of water with its formula
4.2 Describe the general impurities present in water
4.3 Explain the causes and methods to removing hardness of water
4.4 Express hardness .in different units like mg/Iiter, p.p.m, degrees Clark and degrees French
4.5 Describe the formation and nature of scales in boiler feed water
4.6 Explain the method for the treatment of scales
4.7 Explain the sewage treatment and desalination of sea water

5 UNDERSTAND THE NATURE OF ACIDS, BASES AND SALTS

5.1 Define acids, bases and salts with examples
5.2 State general properties of acids and bases
5.3 Differentiate between acidity and basicity and use the related terms
5.4 Define salts, state their classification with examples
5.5 Explain p-H value of solution and pH scale

6 UNDERSTAND THE PROCESS OF OXIDATION AND REDUCTION

6.1 Define oxidation
6.2 Explain the oxidation process with examples
6.3 Define reduction
6.4 Explain reduction process with examples
6.5 Define oxidizing and reducing-agents and give it least six examples of each

6.6 Define oxides
6.7 Classify the oxides and give example

7 UNDERSTAND THE FUNDAMENTALS OF NUCLEAR CHEMISTRY
7.1 Define nuclear chemistry and radio activity
7.2 Differentiate between alphas, Beta and Gamma particles
7.3 Explain hall-life process
7.4 Explain at least six nuclei reactionsresulting in the transformation of some elements
7.5" State important uses of isotopes

8 UNDERSTAND THE MANUFACTURE, SETTING AND HARDENING CEMENT
8.1 Define port land cement and give its composition
8.2 Describe the method of manufacture
8.3 Describe the chemistry of setting and hardening of cement
8.4 Distinguish between ordinary and special purpose cement

9 UNDERSTAND THE PROCESS OF MANUFACTURE OF GLASS.
9.1 Define glass
9.2 Describe its composition and raw materials
9.3 Describe the manufacture of glass
9.4 explain its varieties and uses

10 UNDERSTAND THE NATURE AND IMPORTANCE OF PLASTICS POLYMERS

10.1. Define plastics and polymers
10.2 Explain the mechanism of polymerization
10.3 Describe the preparation and uses of some plastics/polymers

11 KNOW THE.CHEMISTRY OF PAINTS, VARNISHES AND DISTEMPERS
11.1 Define paints, varnishes and distemper
11.2 State composition of each
11.3 State methods of preparation of each and their uses

12 UNDERSTAND THE PROCESS OF CORROSION WITH ITS CAUSES AND TYPES
12.1 Define corrosion
12.2 Describe different types of corrosion
12.3 State the causes of corrosion
12.4 Explain the process of rusting of iron
J2.5 Describe methods to prevent/control corrosion

13 UNDERSTAND THE NATURE OF REFRACTORY MATERIALS AND ABRASIVE
13.1 Define refractory materials
13.2 Classify refractory materials

13.3 Describe properties and uses of refractories
13.4 Define abrasive.
13.5 Classify natural and artificial abrasives
13.6 Describe uses of abrasives

14 UNDERSTAND THE NATURE AND IMPORTANCE OF ALLOYS

14.1 Define alloy
14.2 Describe different methods for the preparation of alloys
14.3 Describe important properties of alloys
14 4 Enlist some important alloys with their composition, properties and uses

15 UNDERSTAND THE NATURE OF FUELS AND THEIR COMBUSTION

15.1 Define fuels
15.2 Classify fuels and make distinction of solid, liquid & gaseous fuels
15.3 Describe important Fuels
15.4 Explain combustion
15.5 Calculate air quantities in combustion, gases

16 UNDERSTAND THE NATURE OF LUBRICANTS.

16.1 Define a lubricant
16.2 Explain the uses of lubricants
16.3 Classify lubricants and cite examples
16.4 State important properties of oils, greases and solid lubricants
16.5 State the criteria for the selection of lubricant tor, particular purpose/job

17 UNDERSTAND THENATURE OF POLLUTION

17.1 Define Pollution (air. water, food)
17.2 Describe the causes of environmental pollution.
17.3 Enlist some common pollutants.
17.4 Explain methods to prevent pollution

CH-112 APPLIED CHEMISTRY 96 Hours

1. To introduce the common apparatus, glassware and chemical reagents used in the chemistry lab.
2. To purify a chemical substance by crystallization.
3. To separate a mixture of sand and salt.
4. To find the melting point of substance.
5. To find the pH of a solution with pH paper.
6. To separate a mixture of inks by chromatography.
7. To determine the co-efficient of viscosity of benzene with the help of Ostwald vasomotor.
8. To find the surface tension of a liquid with a stalagmometer.
9. To perform electrolysis of water to produce Hydrogen and Oxygen.
10. To determine the chemical equivalent of copper by electrolysis of Cu SO.
11. To get introduction with the scheme of analysis of salts for basic radicals.
12. To analyse 1st group radicals (Ag^{+} - Pb^{++} - Hg^{+}).
13. To make practice for detection 1st group radicals.
14. To get introduction with the scheme of II group radicals.
15. To detect and confirm II-A radicals (hg^{++}, Pb^{++++}, Cu^{+}, Cd^{++}, Bi^{+++}).
16. To detect and confirm II-B radicals Sn^{+++}, Sb^{+++}, As^{+++}).
17. To get introduction with the scheme of III group radicals (Fe^{+++} - Al^{+++}, Cr^{+++})
18. To detect and confirm Fe^{+++}, Al^{+++} and Cr^{+++}.
19. To get introduction with he scheme of IV group radicals.
20. To detect and confirm An^{++} and Mn^{++} radicals of IV group.
21. To detect and conform Co^{++} and Ni^{++} radicals of IV group.
22. To get introduction with the Acid Radical Scheme.
23. To detect dilute acid group.
24. To detect and confirm CO''_3 and HCO'_3 radicals.
25. To get introduction with the methods/apparatus of conducting volumetric estimations.
26. To prepare standard solution of a substance.
27. To find the strength of a given alkali solution.
28. To estimate HCO'_3 contents in water.
29. To find out the %age composition of a mixture solution of KNO_3 and KOH volumetrically.
30. To find the amount of chloride ions (Cl') in water volumetrically.

COMP-142 **COMPUTER APPLICATIONS**

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

Pre-requisites: None

AIMS:This subject will enable the student to be familiar with the fundamental concepts of Computer Science. He will also learn MS-Windows, MS-Office, and Internet to elementary level.

Course Contents:

1. ELECTRONIC DATA PROCESSING (E.D.P.) 6 Hrs

1.1 Basic Terms of Computer Science Data & its, types, Information, Hardware, Software
1.2 Computer & its types
1.3 Block diagram of a computer system
1.4 BIT, Byte, RAM & ROM
1.5 Input &Output devices
1.6 Secondary storage devices
1.7 Types of Software
1.8 Programming Languages
1.9 Applications of computer in different fields
1.10 Application in Engineering, Education & Business

2. MS-WINDOWS 2 Hrs

2.1 Introduction to Windows
2.2 Loading & Shut down process
2.3 Introduction to Desktop items (Creation of Icons, Shortcut, Folder & modify Taskbar)
2.4 Desktop properties
2.5 Use of Control Panel
2.6 Searching a document

3. MS-OFFICE (MS-WORD) 8 Hrs

3.1 Introduction to MS-Office
3.2 Introduction to MS-Word & its Screen
3.3 Create a new document
3.4 Editing & formatting the text
3.5 Saving & Opening a document
3.6 Page setup (Set the Margins & Paper)
3.7 Spell Check & Grammar
3.8 Paragraph Alignment
3.9 Inserting Page numbers, Symbols, Text box & Picture in the document
3.10 Use the different Format menu drop down commands(Drop Cap, Change Case, Bullet & Numbering and Border & Shading)
3.11 Insert the 'Table and it's Editing
3.12 Printing the document
3.13 Saving a document file as PDF format

4. MS-OFFICE (MS-EXCEL) 9 Hrs

4.1 Introduction to MS-Excel & its Screen
4.2 Entering data & apply formulas in worksheet

4.3 Editing & Formatting the Cells, Row & Colum
4.4 Insert Graphs in sheet
4.5 Page setup, Print Preview & Printing
4.6 Types & Categories of Charts

5. MS. OFFICE (MS-POWER POINT) 4 Hrs

5.1 Introduction to MS-Power point
5.2 Creating a, presentation
5.3 Editing & formatting a text box
5.4 Adding pictures & colors to a slide
5.5 Making slide shows
5.6 Slide Transition

6. INTERNET & E-MAIL 3Hrs

6.1 Introduction to Internet & browser window
6.2 Searching, Saving and Print a page from internet
6.3 Creating, Reading & Sending E-Mail
6.4 Explain some advance features over the internet and search engines

COMP-142 **COMPUTER APPLICATIONS**

Instructional Objectives:

1. UNDERSTAND ELECTRONIC DATA PROCESSING (E.D.P)

1.1. Describe Basic Terms of Computer Science.Data& its Types, Information, Hardware, Software
1.2. Explain Computer & its types
1.3. Explain Block diagram of a computer system
1.4. State the terms such as BIT, Byte, RAM & ROM
1.5. Identify Input & Output devices
1.6. Describe Secondary Storage devices
1.7. Explain Types of Software
1.8. Introduction to Programming Language
1.9. Explain Applications of computer in different fields
1.10. Application in Engineering, Education & Business

2. UNDERSTAND MS-WINDOWS

2.1 Explain Introduction to Windows
2.2 Describe Loading & Shut down process
2.3 Explain Introduction to Desktop items(Creation of Icons, Shortcut, Folder & modify Taskbar)
2.4 Explain Desktop properties
2.5 Describe Use' of Control Panel (add/remove program, time & date, mouse and create user account)
2.6 Explain the method of searching a document

3. UNDERSTAND MS-OFFICE (MS-WORD)

3.1 Explain Introduction to MS-Office
3.2 Describe -Introduction to MS-Word & its Screen
3.3 Describe create a new document
3.4 Explain Editing & formatting the text
3.5 Describe saving & Opening a document
3.6 Explain Page setup, (Set the Margins & Paper)
3.7 Describe Spell Check & Grammar
3.8 Explain Paragraph Alignment
3.9 Explain Inserting Page numbers, Symbols, Text box & Picture in the document
3.10 Describe Use the different Format menu drop down commands(Drop Cap, Change Case, Bullet &Numbering and Border & Shading)
3.11 Explain Insert the Table and its Editing and modifying
3.12 Describe printing the document
3.13 Describe the method of file saving as a PDF Format

4. UNDERSTAND MS-OFFICE (MS-EXCEL)

4.1 Explain Introduction to MS-Excel & its Screen
4.2 Describe Entering data & apply formulas in worksheet
4.3 Describe Editing &Formatting the, Cells, Row & Column
4.4 Explain Insert Graphs in sheet
4.5 Describe Page setup, Print preview & Printing
4.6 Explain in details formulas for sum, subtract, multiply, divide, average
4.7 Explain in details the types of charts e.g pie chart, bar chart

5. UNDERSTAND MS-OFFICE (MS-POWER POINT)

5.1 Describe Introduction to MS-Power point
5.2 Explain creating a presentation
5.3 Describe Editing & formatting a text box
5.4 Explain Adding pictures & colors to a slide
5.5 Describe Making slide shows
5.6 Explain Slide Transitions

6. UNDERSTAND INTERNET &E-MAIL

6.1 Explain Introduction to Internet and browser window
6.2 Explain Searching, Saving and Print a page from internet
6.3 Describe Creating, Reading & Sending E-Mail and attachments
6.4 Explain some advance features over the internet and how to search topics on different search engines

Recommended Textbooks:

1. **Bible Microsoft Office 2007 by John Walkenbach**
2. **Bible Microsoft Excel 2007 by John Walkenbach**
3. **Bible Microsoft PowerPoint 2007 by John Walkenbach**

COMP-142 **COMPUTER APPLICATIONS**

List of Practical:

1. **Identify key board, mouse, CPU, disk drives, disks, monitor, and printer** and **3Hrs**

2. **MS WINDOWS XP** **12 Hrs**
   - 2.1 Practice of loading and shutdown of operating system
   - 2.2 Creating items (icons, shortcut, folders etc) and modifying taskbar
   - 2.3 Changing of wallpaper, screensaver, and resolution
   - 2.4 Practice of control panel items (add/remove, time and date,mouse, and create user account)

3. **MS OFFICE (MS-WORD)** **27 Hrs**
   - 3.1 Identifying the MS Word Screen and its menu
   - 3.2 Practice of create a new document, saving and re-opening it fromthe location and spell check & grammar
   - 3.3 Practice of Page Formatting (Borders, Character Spacing, Paragraph,Bullets& Numberings and Fonts)
   - 3.4 Practice of different tool bars like standard, format& drawing tool bars
   - 3.5 Practice of Insert pictures, clipart, and shapes
   - 3.6 Practice of header and footer
   - 3.7 Practice of insert table and also format of table
   - 3.8 Practice of page setup, set the page margins, and printing documents

4. **MS OFFICE (MS-EXCEL)** **27 Hrs**
   - 4.1 Identifying the MS EXCEL Screen and its menu
   - 4.2 Practice of create a new sheet, saving and re-opening it from thelocation and spell check
   - 4.3 Practice of insert and delete of row and columns (format of cell)
   - 4.4 Practice of entering data and formulas in worksheet(Add, Subtract, Multiplying, and Divide & Average)
   - 4.5 Repeating practical serial number04
   - 4.6 Practice of insert chart and its types
   - 4.7 Practice of page setup, set the page margins, and printing

5. **MS OFFICE (MS-POWER POINT)** **15 Hrs**
   - 5.1 Identifying the MS POWER POINT Screen and its menu
   - 5.2 Practice of create a new presentation and save
   - 5.3 Practice of open saves presentations
   - 5.4 Practice of inset picture and videos

6. **INTERNET & E-MAIL** **12 Hrs**
   - 6.1 Identifying internet explorer
   - 6.2 Practice of searching data from any search engine
   - 6.3 Practice of create an E-Mail account and how to send and receivemails, download attachments

ET-101 BASIC ELECTRICITY

TOTAL CONTACT HOURS	T	P	C
THEORY 32 HRS	1	0	1

COURSE CONTENTS

AIMS: At the end of this course, the students will be able to:-

1. Understand the nature of electricity, electrical wiring and electrical circuit.
2. Understand Ohm's law and law of resistance.
3. Learnt about power, energy, magnetism and three phase AC system.
4. Understand mechanism of transformer and rectifier machines.

1. NATURE OF ELECTRICITY **1HR**

1.1 Atomic theory, free electrons

1.2 Electromotive force ,potential difference, electric current and their units

2. ELECTRICAL MATERIALS **1HR**

2.1 Conductor, resister and insulator, units of conductance and resistance

3. ELECTRIC CIRCUIT **3HRS**

3.1 Component of an electric circuit, state & effects of open & short circuit

3.2 Series circuit, explanation, characteristic and simple calculation

3.3 Parallel circuit, explanation, characteristic and simple calculation

4. OHM'S LAW **3HRS**

4.1 Definition, explanation and mathematical equations and application

5. LAW OF RESISTANCE **1HR**

5.1 Explanation, formula and calculation

6. EFFECT OF TEMPERATURE ON RESISTANCE **1HR**

6.1 Temperature coefficient, formula and calculation

7. POWER AND ENERGY **3HRS**

7.1 Explanation, formula and units

7.2 Simple calculation.

8. EFFECTS OF ELECTRIC CURRENT **2HRS**

8.1 Thermal, chemical and magnetic effects of electric current

8.2 Magnetic field around a straight conductor and a solenoid

9. MAGNATISM **2HRS**

9.1 Natural and artificial magnet ,definition of pole ,lines of forces ,attraction and repulsion rules

9.2 Temporary and permanent magnet and electromagnets

10. ALTERNATING CURRENT & THREE PHASE AC SYSTEM **4HRS**

10.1 Definition of A.C ,cycle , frequency , R.P.M value

10.2 Components of AC circuit(resistor ,coil & capacitor)

10.3 Power formula in single phase & power factor and power calculations

10.4 Star system and delta system, voltage& current relation in both systems

11. TRANSFORMER 4HRS

11.1 Working principle ,types w.r.t core supply and transformation ratio

11.2 Welding transformer, its use and cooling system.

12. RECTIFIER 3HRS

12.1 Rectifier action, types of rectifier, half wave & full wave rectifier circuit explanation

13. ELECTRICAL WIRING 4HRS

13.1 Types of cables, their uses and current carrying capacity. Stripping, joining, soldering and insulating joints.

13.2 Purpose and types of switches, single way, two ways, main switches, their types and current ratings.

13.3 Simple wiring circuits and rules related to domestic and power wiring.

13.4 Introduction to types of wiring, their merits and demerits.

13.5 Fuse and circuit breakers, their kinds, merits and demerits and specifications.

13.6 Electrical shock, safety practice, artificial respiration.

RECOMMENDEDBOOKS

1-Examples of Electrical Calculation by Admiralty.

2-Electrical Technology by B.L Teraja

3-Electrical Engineering by C.L Dawes

4-Fundamentals of Electrical Engineering by M. Kuzmetsov

ET-101 BASIC ELECTRICITY

INSTRUCTIONAL OBJECTIVES

1. UNDERSTAND FUNDAMENTAL CONCEPT OF ELECTRICITY

1.1 Define & explain electricity.
1.2 Define term Electromotive force ,potential difference, electric current and their units

2 UNDERSTAND ELECTRICAL MATERIALS

2.1 Define the term Conductor, insulator and resistor
2.2 Explain different materials and their uses as Conductor, insulator, and resistor
2.3 Define the Conductance, resister resistance and their units

3 UNDERSTAND ELECTRIC CIRCUIT

3.1 Explain a simple electric circuit and its components
3.2 Differentiate between open & short circuit
3.3 Define & understand series and parallel circuit and their characteristics.
3.4 Explain the current and voltage distribution in series and parallel circuit.

4 UNDERSTAND OHM'S LAW

4.1 Understand ohm's law
4.2 Define and explain ohm's law
4.3 Apply ohm's law for solving simple problems

5 UNDERSTAND LAW OF RESISTANCE

5.1 Understand law of resistance
5.2 Explain effect of length and cross sectional area on resistance of a conductor
5.3 Explain effect of material on resistance
5.4 Define specific resistance
5.5 Solve simple problems involving length, area and specific resistance

6 UNDERSTAND TEMPERATURE CO-EFFICIENT

6.1 Define term temperature co-efficient (positive and negative)
6.2 Explain effect of temperature co-efficient on resistors
6.3 Name materials with positive and negative co-efficient

7 UNDERSTAND POWER ,ENERGY AND THEIR UNITS

7.1 Define power and energy
7.2 Write formula and units of electrical power and energy
7.3 Calculate simple problems of energy and power

8 UNDERSTAND EFFECTS OF ELECTRIC CURRENT

8.1 Explain Thermal, chemical and magnetic effects of electric current
8.2 Explain the right hand grip rule for Magnetic field of a conductor
8.3 Draw the magnetic field of a solenoid

9 UNDERSTAND THE MAGNETISM

9.1 Explain Natural and artificial magnet
9.2 Define attraction and repulsion rules
9.3 Define forces produced by an electromagnet

9.4 Explain use of Temporary and permanent magnet and electromagnets

10 UNDERSTAND ALTERNATING CURRENT & THREE PHASE AC SYSTEM

10.1 Definition of cycle , frequency , R.P.M value of alternating current
10.2 Explain effect of alternating current on resister, inductor and capacitor
10.2.1 Solve an AC power problem with simple formula
10.2.2 Explain necessity of three phase system
10.2.3 Identify phase and line voltage and current in star connection circuit
10.2.4 Identify phase and line voltage and current in delta connection circuit
10.2.5 Calculate power in three-phase circuit
10.3 Define power factor

11 UNDERSTAND WORKING PRINCIPLE OF TRANSFORMER

11.1 Explain Working principle of transformer
11.2 Explain construction of transformer
11.3 Classify transformer w.r.t core, supply voltage and transformation ratio
11.4 Explain use and connection of welding transformer
11.5 Explain cooling system of transformer

12 UNDERSTAND RECTIFICATION PROCESS

12.1 Explain working of a Rectifier, half wave and full wave rectification
12.2 Types of full wave rectification

13 UNDERSTAND BASIC ELECTRICAL WIRING

13.1 Explain cords (flexible cables) and PVC, VIR, Insulated cable with respect to insulation
13.2 Explain current carrying capacity of different cables and cords
13.3 Explain methods of stripping, joining, soldering and insulating the joints
13.4 Identify different switches used in electrical wiring (1-way, 2-way, Main)
13.5 Identify current rating of a switch
13.6 Explain single lamp circuit
13.7 Draw stair case lighting circuit
13.8 Draw a simple circuit for a small house wiring
13.9 Explain batten and conduit wiring, their merits and demerits
13.10 Explain working of stair case wiring system
13.11 State common rules for lighting and power wiring
13.12 Explain the necessity of fuse in an electric circuit
13.13 Explain different types of fuse and their rating
13.14 Explain the necessity of using miniature circuit, breaker used in house wiring
13.15 Explain the necessity of earthing the electrical appliances and welding plants
13.16 Explain electrical shocks
13.17 Explain safety devices used to avoid shocks
13.18 Explain different methods of artificial respiration
13.19 List safety practice w.r.t electric shocks

Total Contact Hours		**T**	**P**	**C**
Theory:	**32 Hrs.**	**1**	**3**	**2**
Practical:	**96 Hrs.**			

Pre-requisites: None

AIMS At the end of this course the students will be able to understand the Fundamentals of Engineering Drawing used in the various fields of industry especially in the Mechanical sector. The students will be familiarizing with the use of conventional drawing equipment as well as the modern techniques used for this subject. Also they will be familiarize with AutoCAD and will achieve ability to draw simple geometrical figures and two dimensional drawing of objects.

Detail Course Contents:

PART-A Manual Drawing 70%

1 APPLICATION OF TECHNICAL DRAWING 1HR

1.1 Importance of Technical Drawing

1.2 Uses of Technical Drawing

1.3 Type of Drawing

1.4 Application of Technical drawing

2 DRAWING TOOLS/EQUIPMENT 2HRS

2.1 Introduction and importance of Drawing equipment

2.2 List of drawing equipment

2.3 Construction, uses and care of all equipment

2.4 Drawing Pencil, their grading, sharpening and using techniques

2.5 Scale and its types

3 TYPES OF LINES 3 HRS

3.1 Basic lines

3.2 Importance of lines

3.3 Common Types of lines

3.4 Uses and correct line weightage

3.5 Use of pencil for different lines

3.6 Application of lines

4 LETTERING 1HR

4.1 Importance of a good lettering

4.2 Guide lines

4.3 Style of letters

4.4 Lettering devices

5 DRAFTING GEOMETRY 2HRS

5.1 Introduction to geometry and its terms

5.2 Different conventional shapes

5.3 Basic geometrical construction

6 SKETCHING 1HR

6.1 Introduction to sketching

6.2 Techniques of sketching straight lines in different directions

6.3 Sketching circles and arcs

6.4 Sketching Ellipse

6.5 Sketching of pictorial views

7 DEVELOPMENT OF OBJECTS 2HRS

7.1 Introduction to the development

7.2 Role of development in Packaging Industry

7.3 Methods to develop the objects

8 DIMENSIONING 3HRS

8.1 Definition of dimensioning

8.2 Types of dimensioning

8.3 Elements of dimensioning

8.4 System of measurements

8.5 Dimensioning of multi view drawing

8.6 Dimensioning pictorial views

8.7 Dimensioning rules and practices

8.8 Note & specification

9 PICTORIAL DRAWING 4HRS

9.1 Introduction and Uses of pictorial drawing

9.2 Three types of pictorial views

9.3 Isometric drawing of rectangular block with circles

9.4 Oblique drawing of rectangular block

10 Multi-view drawings 4HRS

10.1 Definition and multi-view drawings

10.2 Orthographic projections

10.3 1st angle and 3rd angle projection

10.4 Principal views and its arrangements

PART- B AutoCAD - I 30%

11 INTRODUCTION OF AUTOCAD 3HRS

11.1 Introduction to Auto CAD

11.2 Importance and uses of Auto CAD

11.3 System requirements

11.4 Installation of Auto CAD

11.5 User interface

11.6 Coordinate system

11.7 Function keys

12 DRAWING AND EDIT 2HRS

12.1 Standard tools bar

12.2 Draw Commands (Line, polyline, Arc, Circle, Polygon, Ellipse)

12.3 Modify Commands (Erase, Copy, Move, Mirror, Trim)

12.4 Edit Command

12.5 File menu

12.6 Help command

13 DRAWING LAYOUT 2HRS

13.1 Introduction of drawing layout and working area

13.2 Layout commands (Limits, units, ortho, grid, snap, Osnap)

14 DIMENSIONS AND LETTERING 2HRS

14.1 Introduction to dimensioning

14.2 Create Dimensioning

14.3 Edit Dimensioning

14.4 Introduction to lettering

14.5 Lettering Font and styles

RECOMMENDED BOOKS:

1. Mechanical Drawing (12th Addition) by French. Svensen, Helsel and Urbanick
2. Drafting Fundamentals by scot. Foy, Schwendan
3. Engineering Drawing and Design 2nd addition by Cecil Jenson / Jay Helsel
4. Engineering Drawing by colinsimmous, Dennis Maguire

5. Technical Drawing by Frederik E. Alva. Henry Cecil
6. Text Book of machine Drawing by R.K. Dhawan
7. Engineer Drawing by M.B. Shah (B.C.Rana)
8. Autodesk OfficialTraining Courseware(AOTC) Volume1
9. Autodesk OfficialTraining Courseware(AOTC) Volume2
10. Engineering drawing by N.D Bhutt
11. Engineering drawing by A.C parkenson
12. Auto CAD 2010 tutorial 1st level 2D fundamentals by Randy Shih
13. Engineering drawing and CAD-I by M. HafeezAshrafi

MT-132 **BASIC ENGINEERING DRAWING & CAD-I**

Instructional Objectives:

PART-A Manual Drawing 70%

1 KNOW THE APPLICATION OF TECHNICAL DRAWING

1.1 Describe the technical drawing and its importance

1.2 Describe the uses of drawing in manufacturing and construction fields

1.3 Describe the free hand and instrumental drawing

1.4 Explain the types of instrumental drawing

1.5 Recognize the different application of technical drawing

2 KNOW AND USE THE COMMON DRAFTING EQUIPMENT AND ACCESSORIES

2.1 State the introduction and importance of drafting equipment

2.2 Identify the different instruments used in drafting

2.3 Describe the construction, uses and care of all equipment

2.4 Describe the use of pencils, their Grading and sharpening techniques

2.5 Explain the scale and its different types

3 UNDERSTAND THE TYPES OF LINES, CORRECT WEIGHT AGE AND THEIR APPLICATION IN TECHNICAL DRAWINGS

3.1 Describe the point, line and types of straight lines

3.2 Describe the importance of lines

3.3 Describe the common types of lines

3.4 Identify the each line Characteristics

3.5 Describe different lines with proper grade pencil

3.6 Describe each line with his correct weightage

4 APPLIES THE GOOD LETTERING ON A DRAWING

4.1 Know the importance of good lettering in Engineering drawing

4.2 Describe the Gide lines for vertical and Inclined lettering

4.3 State the proper pencil for lettering with holding techniques and lettering rules

4.4 Describe different lettering devices such as lettering guide and lettering instrument

5 APPLY DRAWING SKILL WITH THE AID OF DRAWING INSTRUMENTS IN GEOMETRICAL CONSTRUCTION

5.1 Define the concept of common terms used in Geometrical construction

5.2 Explain different geometrical shapes

5.3 Describe basic geometrical constructions (Angles, Triangles, Quadrilateral, Polygons)

6 UNDERSTAND SKETCHING

6.1 Describe sketching

6.2 State Sketching Technique of Horizontal, Vertical and inclined lines

6.3 Describe circular arc using circular line method and square method

6.4 State sketching of an ellipse using rectangular method

6.5 Described the sketching of pictorial views

7 KNOW ABOUT DEVELOPMENT OF OBJECTS

7.1 Define development and its applications

7.2 Explain the role of development in Packaging Industry

7.3 Describe the methods of development of cube, cone, pyramid, prism and cylinder

7.3.1 Parallel line or Rectangle method

7.3.2 Radial line or Triangle method

7.3.3 Triangulation method

8 UNDERSTAND DIMENSIONING OF MULTI-VIEW AND PICTORIAL DRAWINGS

8.1 Define dimensioning

8.2 State the types of dimensioning

8.3 Enlist the elements of dimensioning

8.4 Describe the system of measurements

8.5 Indicate complete dimension on multi-view drawings

8.6 Indicate complete dimension on pictorial drawings

8.7 Follow the general rules of dimensioning

8.8 State notes and specification

9 UNDERSTAND PICTORIAL DRAWING

9.1 Describe the pictorial drawing

9.2 State three types of pictorial drawings

9.3 Describe isometric view of rectangular blocks and circles

9.4 Describe oblique drawing of a rectangular blocks

10 UNDERSTAND THE MULTI-VIEW PROJECTIONS

10.1 Introduction of multi-view drawings

10.2 State the orthographic method of projection

10.3 Explain the 1st and 3rd angle projections

10.4 State six principal views

PART- B Auto CAD - I 30%

11 INTRODUCTION OF AUTOCAD

11.1 Introduction to Auto CAD

11.2 Enlist Importance and uses of Auto CAD

11.3 State System requirements

11.4 How to Install Auto CAD

11.5 Describe User interface

11.6 Explain Coordinate system

11.7 State Function keys

12 KNOW ABOUT DRAWING AND EDITING

12.1 State Standard tools bar

12.2 Describe Draw Commands (Line, polyline, Arc, Circle, Polygon, Ellipse)

12.3 State Modify Commands (Erase, Copy, Move, Mirror, Trim)

12.4 Describe Edit Commands

12.5 State File menu

12.6 What is Help command

13 UNDERSTAND DRAWING LAYOUT

13.1 Introduction of drawing layout and working area

13.2 State Layout commands (Limits, units, ortho, grid, snap, Osnap)

14 UNDERSTAND DIMENSIONS AND LETTERING

14.1 Introduction to dimensioning

14.2 State Create Dimensioning

14.3 Describe Edit Dimensioning

14.4 Introduction to lettering

14.5 State Lettering Font and styles

MT-132 BASIC ENGINEERING DRAWING & CAD-I

List of Practical: PART-A (MANUAL DRAWING)

1. Draw different types of drawing lines
2. Practice of single stroke capital vertical & inclined lettering
3. Use of Tee-square, set squares and compass for drawing inclined lines, circles, semi circles and crossing of lines
4. Construction of perpendicular, bisects line, angles and equal division of lines
5. Construction of angles and triangles
6. Construction of quadrilaterals and circles elements (parts)
7. Construction of inscribe and circumscribe figures (square, triangle and hexagon)
8. Construction of polygons by tow method
9. Construction of Ellipse by two different methods
10. Draw Orthographic projection 1 angle (Three different blocks)
11. Draw Orthographic projection 3rd angle (Three different blocks)
12. Draw Orthographic projection of Isometric Drawing (Two different blocks)
13. Draw Orthographic projection of Oblique Drawing (Two different blocks)
14. Construction of multi view drawing of Gland
15. Construction of multi view drawing of Open Bearing
16. Development of prism
17. Development of cylinder
18. Development of cone
19. Development of pyramid
20. Development of cube

PART-B (AUTO CAD - I)

1. Installation of Auto CAD
2. Starting Auto CAD
3. Apply Title bar, Tool bar, menu bar, Status bar, command line
4. Draw different lines and angles
5. Draw different 2D geometrical shapes
6. Draw 2D step block
7. Draw Photo Frame
8. Draw 2D different objects
9. Draw name plate and Title on a drawing
10. Apply dimension on a 2D drawing

MT-121 SAFETY PRACTICES & PROCEDURES

TOTAL CONTACT HOURS	**THEORY 32 HRS**	**T**	**P**	**C**
		1	**0**	**1**

AIMS: At the end of this course, the students will be able to:-

1 Adopt safety rules to be desired in Labs of different types of industries.
2 Understand methods of prevention of accident.
3 Provide first aid and rescue in case of any accident.
4 Know about different types of work permits.

COURSE CONTENTS

1. INTRODUCTION AND IMPORTANCE OF SAFETY 2HRS

1.1 Introduction

1.2 Importance in institute shops

1.3 Importance in industry

1.4 Accident cost

2. ACCIDENTS IN CHEMICAL INDUSTRY 3HRS

2.1 Accidents in petroleum industry

2.2 Accidents in paint shop/industry

2.3 Explosive vapors and gases

2.4 Accidents in fertilizers and others chemical industry

3. ACCIDENTS IN MECHANICAL INDUSTRY 3HRS

3.1 Material handling and transportation

3.2 Accidents due to hand tools

3.3 Accidents in machines shop

3.4 Accidents in metal work shop

3.5 Accidents in foundry, welding and forging shop

4. ELECTRIC SHOCKS & EARTHLING (Prevention and its remedy) 2HRS

4.1 Electricity as danger

4.1 Electric shock phenomena

4.2 Reasons of electric shock

4.3 Prevention of electric shock

4.4 First aid in electric shock

5 ACCIDENTS IN OTHER INDUSTRIES 3HRS

5.1 Accidents in mines

5.2 Accidents in leather industries

5.3 Accidents in power plants

5.4 Accidents in printing industry

6 ENVIRONMENTAL EFFECT ON ACCIDENTS 3HRS

6.1 Industrial ventilation

6.2 Exhaust systems

6.3 Industrial noise

6.4 Illumination for safety and comfort

6.5 Industrial hygiene and plant sanitation

7 PERSONAL PROTECTIVE EQUIPMENTS 2HRS

7.1 For face and hand protection

7.2 For body protection

7.3 For protection from chemical & gases

8 SAFETY ON PLANT 2HRS

8.1 Plant lay out for safety

8.2 House Keeping for safety

8.3 Lay out for safety

9 FIRE ACCIDENTS 2HRS

9.1 Fire hazard

9.2 Causes

9.3 Fire Fighting Equipments

9.4 Plant lay out for fire safety

10 WORK PERMIT SYSTEM 4HRS

10.1 Introduction of work permit system

10.2 Definition of work permit

10.3 Types of work permit

10.3.1 Hot work permit

10.3.2 Cold work permit

10.3.3 Height work permit

10.3.4 Confined space/Vessel work permit

10.3.5 Vehicle entry permit

11 FIRST AID 2HRS

11.1 Importance

11.2 Procedure

11.3 Extended medical service

12 PROMOTING SAFETY **2HRS**

12.1 Employees training

12.2 Displays/Safety Signs

12.3 Guidance

13 SAFETY LAWS **2HRS**

13.1 Pakistan factory act (laws concerning to safety)

13.2 Workman compensation act

13.3 Industrial insurance

RECOMMENDED BOOKS

1. Safety Practice & Procedures by Niaz Muhammad Mirza

Instructional Objectives:

1. **KNOW ABOUT IMPORTANCE OF SAFETY PRACTICES AND ITS NECESSITY IN THE INDUSTRY**
   - 1.1 Describe importance of housekeeping, Safety and accidents
   - 1.2 Describe the importance of safety practices in Institute shops/labs
   - 1.3 Describe the hazards for not observing safety
   - 1.4 State necessity/importance of observing safety in the industry at the Cost of accident
2. **KNOW ABOUT CAUSES AND PREVENTIONS OF ACCIDENT IN CHEMICAL BASED INDUSTRY**
   - 2.1 State the type and causes of accidents in petroleum, fertilizer, plaint and chemical based industry
     - 2.1.1 Enlist causes and preventions of chemical based industrial accidents
   - 2.2 Describe accidental causes and effects of explosive gases and vapors
     - 2.2.1 Describe toxic chemicals and their effects on human
     - 2.2.2 List of preventions for accidental causes due to explosive gases and vapors

3. **KNOW ABOUT CAUSES AND PREVENTION OF ACCIDENTS IN MECHANICAL INDUSTRY**
   - 3.1 List of accidents in material handling and transportation in industry
     - 3.1.1 Describe the methods of prevention of accident due to material and machine handling in manufacturing Industry
   - 3.2 Explain proper use of hand tools to prevent accident
   - 3.3 Describe accidents in machines shop
   - 3.4 Describe accidents in Metal workshop
   - 3.5 Describe accidents in foundry, welding and forging shop
4. **KNOW ABOUT ELECTRIC SHOCKS & EARTHLING (PREVENTION AND ITS REMEDY)**
   - 4.1 Describe Electricity as danger
   - 4.2 Describe Electric shock phenomena
   - 4.3 Describe Reasons of electric shock
   - 4.4 Describe Prevention of electric shock
   - 4.5 Describe First aid in electric shock

5. KNOW ABOUT CAUSES AND METHODS OF PREVENTION OF ACCIDENT IN DIFFERENT INDUSTRIES

5.1 Describe accidents in Mines

5.2 Describe accidents in Leather industries

5.3 Describe accidents in Power plant (Steam)

5.4 Describe accidents in printing industry.

6. UNDERSTAND THE ENVIRONMENTAL EFFECT OF ACCIDENT AND THEIR REMEDIES

6.1 Explain importance and purpose of industrial ventilation

6.2 Describe exhaust system in industry and their important

6.3 Identify effect of noise on environment and its role in accidents

6.3.1 Causes of audible (Noise) their control vibrations and vibration dampers and necessity of hearing protectors

6.4 Identify the advantages of illumination for safety and comfort

6.5 Explain necessity of plant hygiene for safety and comfort

7. KNOW ABOUT PRINCIPLE METHOD AND IMPORTANCE OF PERSONAL PROTECTIVE DEVICE

7.1 State useful protective devices

7.2 List personal protective devices and describe their importance

7.2.1 Describe protection devices protecting Hand, faces, Ear, Leg, Foot and Eyes

7.2.2 Describe protection

7.2.3 Describe personal safety Equipments.

7.2.4 Describe lather safety belt, fire ropes, chain, slings and other supports for precautions

7.3 Describe use of protection devices for protecting from chemicals and gases

8. KNOW ABOUT THE BASIC CONCEPT OF SAFETY IN PLANT LAYOUT

8.1 Identify the safety aspect in plant layout

8.2 Describe the house keeping procedure for safety

8.3 Identify the procedure of lay out machines and equipments by considering safety aspect

9. KNOW ABOUT FIRE ACCIDENTS AND THEIR PREVENTION

9.1 Describe prevention of fire accidents on plant

9.2 Know the causes of fire hazard

9.2.1 Identify fire hazard and their types

9.2.2 List the causes of accidents due to fire

9.3 Know Steps to control fire/fire fighting

9.3.1 Training of fire fighting with the help of Rescue 1122

9.3.2 Know the types of fire extinguishers and their use

9.4 Identify the fire safety points in plant layout

10. KNOW ABOUTWORK PERMIT SYSTE

10.1Describe work permits system

10.2 Definition of work permit

10.3 Describe the Types of work permit

10.3.1 Describe Hot work permit

10.3.2 Describe Cold work permit

10.3.3 Describe Height work permit

10.3.4 Describe Confined space/Vessel work permit

10.3.5 State Vehicle entry permit

11. KNOW THE METHODS OF PROVIDING FIRST AID

11.1 Identify the importance of first aid

11.2 Explain the methods of providing first aid and their training may be arranged to train the students in first aid procedure (a video)

11.3 Identify the step by step procedure of providing medical services

12. UNDERSTAND THE METHODS AND PROCEDURES FOR PROMOTING SAETY CULTURE

12.1 Identify the importance of safety

12.2 Describe methods of promoting safety concept by display charts, play cards, Banners and wall chalking; through guidance

12.3 List methods of promoting safety concepts

13. UNDERSTAND SAFETY LAWS

13.1 Describe clauses of Pakistan Factory Act related to safety

13.2 Describe Workman compensation Act

13.3 Identify the procedure for industrial insurance and social security

MW-102 THEORY OF WELDING AND FORGING

TOTAL CONTACT HOURS THEORY 64HRS T P C

2 0 2

AIMS: At the end of this course, the students will be able to:-

1. Understand the different safety rules of welding processes.
2. Understand different welding terminologies, abbreviations, positions, processes, joints and types of welds.
3. Understand different arc welding machines, gas welding techniques, blow pipes.
4. Understand forging tools and forging operations.

1. SAFETY RULES 3HRS

1.1 Safety Rules in Gas Welding

1.2 Safety Rules in Arc Welding

1.3 Safety Rules in Forging

2. WELDING TERMINOLOGIES 06HRS

2.1 Arc

2.2 Arc length

2.3 Arc blow

2.4 Root Gap

2.5 Root face

2.6 Root Pass

2.7 Crater/Arc crater

2.8 Electrode

2.9 Base metal

2.10 Bead/layer/pass

2.11 Blind weld

2.12 Stringer bead

2.13 Weave bead

2.14 Back pass/bead

2.15 Backing strip

2.16 Bevel angle

2.17 Spatter

2.18 Tack weld/tacking/fit up

2.19 Heat affected zone

2.20 Intermittent welding

2.21 Fusion

2.22 Pre-heating

2.23 Post-heating

3. STANDARD WELDING ABBREVIATIONS 2HRS

3.1 SMAW

Shielded Metal Arc Welding

3.2 GTAW/TIG

Gas Tungsten Arc Welding/Tungsten Inert Gas

3.3 GMAW/MIG

Gas Metal Arc Welding/Metal Inert Gas

3.4 MAG

Metal Active Gas

3.5 FCAW

Flux cored Arc Welding

3.6 PAW

Plasma Arc Welding

3.7 SAW

Submerged Arc Welding

3.8 OFW

Oxy-Fuel Welding

3.9 EBW

Electron Beam Welding

3.10 ESW

Electro slag welding

3.11 FW

Friction Welding

3.12 LBW

Laser Beam Welding

3.13 ASTM

American Society for Testing Materials

3.14 ASME

American Society of Mechanical Engineers

3.15 AWS

American Welding Society

3.16 WPS

Welding Procedures Specification

3.17 PQR

Procedure Qualification Record

3.18 QA/QC

Quality Assurance/Quality Control

3.19 API

American Petroleum Institute

3.20 AISI

American Iron and Steel Institute

3.21 PWHT

Post Welding Heat Treatment

3.22 QCI

Quality Control Inspector

3.23 WQT

Welder Qualification Test

4. WELDING PROCESSES **8HRS**

4.1 Fusion welding processes

(a) Gas welding

(b) SMAW

(c) GTAW or TIG or ORGON or TMAW

(d) GMAW or MIG/MAG

(e) SAW

(f) FCAW

4.2 Pressure welding processes

(a) Spot welding

(b) Seam welding

(c) Forge welding

5. ARC WELDING MACHINES **4HRS**

5.1 Transformers

5.2 Motor Generators

5.3 Rectifier

6. POLARITY **1HR**

6.1 Definition

6.2 Types

7. WELDING CONSUMABLES **10HRS**

7.1 Electrodes and its types

7.2 Filler Wires/Rods

7.3 Fluxes

7.4 Types of Coating

7.5 Electrode Numbering (AWS system)

8. WELDING POSITIONS (PLATE & PIPE) 6HRS

G=Groove, F=Fillet

FOR PLATE

8.1 Flat positions (1G,1F)

8.2 Horizontal position (2G,2F)

8.3 Vertical position (up & down) (3G,3F)

8.4 Overhead position (4G,4F)

FOR PIPE

8.5 Flat position 1G (Pipe rolled)

Pipes placed face to face horizontally and welder not move

8.6 Horizontal position 2G (Pipe fixed)

(Pipes placed vertically face to face to weld horizontally)

8.7 5G (Pipe fixed)

Pipes placed face to face horizontally and welder has to move for welding.

8.8 6G Position Pipe inclined at 45° & fixed

9. WELDING JOINTS 2HRS

9.1 Lap joint

9.2 Butt joint

9.3 Open square butt

9.4 Single V butt joint

9.5 Double V butt joint

9.6 Single U butt joint

9.7 Double U butt joint

9.8 Single J butt joint

9.9 Double J butt joint

9.10 Tee joint

9.11 Corner joint

9.12 Edge joint

9.13 Cruciform joint

10. TYPES OF WELDS 2HRS

10.1 Bead weld

10.2 Groove Weld

10.3 Fillet Weld

10.4 Plug Weld

10.5 Slot weld

11. GAS WELDING **3HRS**

11.1 Types of gases use during gas welding process

11.2 Acetylene (Production & Supply)

11.3 Manifold system for gas welding(oxygen & acetylene)

12. BLOW PIPES (WELDING TORCHES) **3HRS**

12.1 Injector Blow Pipe

12.2 Non Injection Blow Pipe

13. PRESSURE REGULATORS **3HRS**

13.1 Oxygen Pressure Regulator

13.2 Acetylene Pressure Regulator

14. GAS CYLINDERS **2HRS**

14.1 Oxygen gas cylinders

14.2 Acetylene gas cylinders

14.3 Rubber hoses

15. OXY-ACETYLENE FLAMES **2HRS**

15.1 Types & uses

15.2 Chemistry

16. GAS WELDING METHODS (WELDING TECHNIQUES) **2HRS**

16.1 Forehand welding

16.2 Backhand welding

17. FORGING **5HRS**

17.1 Forging tools

17.2 Forging operations

17.3 Flattening

17.4 Upsetting

17.5 Drawing Down

17.6 Fullering

17.7 Swaging

17.8 Bending

17.9 Twisting

RECOMMENDEDBOOKS

1- Forging and Welding by R.E.Smith.
2- Welding Engineering by Roossi.
3- Welding Technology by O.P.Khanna
4- Oxy-acetylene by the Linde Air Products Co. New York

MW-102 THEORY OF WELDING AND FORGING

INSTRUCTIONAL OBJECTIVES

1. KNOW ABOUT SAFETY RULES OBSERVED IN WELDING AND SMITHY SHOP

1.1 Enlist safety rules in arc welding.

1.2 Enlist safety rules in gas welding.

1.3 Enlist safety rules in forging shop

2. KNOW ABOUT WELDING TERMINOLOGIES

2.1 Define different terms relating to welding.

3. UNDESTAND WELDING ABBREVIATIONS

3.1 Understand different welding abbreviations and their exact names

4. KNOW ABOUT WELDING PROCESS

4.1 Enlist different welding processes (fusion & pressure welding)

4.2 Describe welding processes (fusion & pressure) used in industries.

5. UNDERSTAND ARC WELDING MACHINES

5.1 Explain AC welding machines .(Transformer)

5.2 Explain DC welding machine(Motor generator)

5.3 Explain Rectifier.

6. UNDERSTAND POLARITY

6.1 Define polarity

6.2 Explain types of polarity

7. UNDERSTAND VARIOUS CONSUMABLE MATERIALS USED IN WELDING

7.1 Explain different types of electrodes

7.2 State different types of filler rods

7.3 State function and types of fluxes used during welding.

7.4 Explain function and types of coating.

7.5 Explain electrode numbering system

8. UNDERSTAND WELDING POSITIONS FOR PLATE & PIPE WELDING

8.1 Enlist different welding positions for plate welding

8.2 Draw diagram of welding joints for each plate welding position.

8.3 Name different welding positions for pipe welding

8.4 Draw diagram of welding joints for each pipe welding position

8.5 State the terms 1G,2G,3G,4G,5G,6G,1F,2F,3F,4F

9. UNDERSTAND WELDING JOINTS

9.1 Name different welding joints

9.2 Draw diagrams of welding joints

10. UNDERSTAND DIFFERENT TYPES OF WELDS

10.1 Describe bead weld

10.2 Describe groove weld

10.3 Describe single and double fillet weld

10.4 Describe plug weld

10.5 Describe Slot weld

11. KNOW ABOUT GAS WELDING

11.1 State types of gases can be used in gas welding process.

11.2 Explain method of production & supply of acetylene.

11.3 State manifold system both oxygen & acetylene.

12. UNDERSTAND BLOW PIPES

12.1 State working of injector type blow pipe.

12.2 State non injector or high pressure blow pipe

13. KNOW ABOUT PRESSURE REGULATORS

13.1 State functions of pressure regulator

13.2 State oxygen gas pressure regulator

13.3 State acetylene gas pressure regulator

13.4 State working of single stage pressure regulator

13.5 State working of double stage pressure regulator

14. UNDERSTAND GAS CYLINDERS AND HOSE PIPES

14.1 State oxygen and acetylene gas cylinder

14.2 State rubber hoses

14.3 Differentiate between oxygen and acetylene cylinders

14.4 Differentiate between oxygen and acetylene hose pipes

15. UNDERSTAND OXY-ACETYLENE FLAMES

15.1 Name oxy acetylene flames and their temperatures.

15.2 Explain types and uses of flames

15.3 Explain chemistry of oxy acetylene flame.

16. UNDERSTAND DIFFERENT GAS WELDING TECHNIQUES

16.1 Explain fore hand welding technique

16.2 Explain back hand welding technique

17. UNDERSTAND FORGING PROCESS & FORGING TOOLS

17.1 Enlist forging tools

17.2 Explain forging operations

17.3 Describe flatering, upsetting, drawing down, fullering, swaging, bending and twisting

MW-142 **FERROUS METALLURGY**

Total Contact hours:		T	P	C
Theory:	64 hours.	2	0	2

AIMS The students will be able to:

1. Understand iron ores and the method of dressing them.

2. Have knowledge of different processes carried out for recovery of iron from their ores.

3. Have knowledge of different steel making processes.

4. Have knowledge of various mechanical deformation processes used in industry.

COURSE CONTENTS

1. INTRODUCTION TO METALLURGY. 3HRS

1.1 Define (Metal, Non Metal, Alloy, Ferrous Metal, Non Ferrous metal, Metalloids)

1.2 Metallurgy.

1.3 Classification of metallurgy.

1.4 Importance of Metallurgy in industry.

2. OCCURRENCE OF IRON ORES. 2HRS

2.1 Earth Crust

2.2 Mineral.

2.3 Ore

2.4 Name of iron ores and their formulas

2.4 Extent of Iron ores in nature.

2.5 Iron ores in Pakistan.

3. TREATMENT OF IRON ORES (ORE DRESSING TECHNIQUES) 6HRS

3.1 Hand Picking.

3.2 Crushing (Jaw crusher, Roll crusher).

3.3 Grinding (Ball Mill, Rod Mill).

3.4 Magnetic Separation.

3.5 Gravity Separation.

3.6 Froth Floatation.

3.7 Roasting and calcinations.

3.8 Pre-smelting Processes

3.8.1 Concentration

3.8.2 Agglomeration (Briquetting, Palletizing, Nodulizing, Sintering)

4. REFRACTORY MATERIALS 2HRS

4.1 Definition and classification.

4.2 Acid Refractory materials.

4.3 Basic Refraction Materials.

4.4 Neutral Refractory materials.

4.5 Acid and Basic terminology in metallurgy.

4.6 Reduction and oxidation reactions

5. BLAST FURNACE 9HRS

5.1 Construction of blast furnace.

5.2 Charge of blast furnace

5.3 Operation of blast furnace.

5.4 Chemistry of iron ore refining.

5.5 Products of blast furnace and their uses.

6. CUPOLA FURNACE. 4HRS

6.1 Construction of cupola furnace.

6.2 Cupola charge.

6.3 Operation of cupola furnace.

6.4 Zones of cupola furnace.

7. STEEL AND ITS CLASSIFICATION. 3HRS

7.1 Define Steel (Carbon Steel, Alloy steel)

7.2 Classification of Carbon Steel and Alloy steel.

7.3 Application and uses of carbon and alloy steels.

8. OPEN HEARTH FURNACE **4HRS**

8.1 Construction of Open-hearth furnace

8.2 Operation of open-hearth furnace (Acid, Basic)

8.3 Charge of open-hearth furnace (Acid, Basic)

9. BESSEMER CONVERTOR. **4HRS**

9.1 Construction of Bessemer converter.

9.2 Charge of Bessemer Convector.

9.3Operation of Bessemer converter.

9.4 Advantages of Bessemer process

10. ELECTRIC ARC FURNACE. **9HRS**

10.1 Define and classify electric Arc furnace

10.2 Construction of Direct electric arc furnace.

10.3 Construction of In-direct electric arc furnace.

10.4 Operation of direct and indirect electric arc furnaces

10.4.1 Charging

10.4.2 Oxidation period

10.4.3 De-oxidation period

10.4.4 Addition of alloying element

10.4.5 Tapping

10.5 Duplex operation.

11. INDUCTION FURNACE. **4HRS**

11.1 Construction of induction Furnace.

11.2 Working Principle.

11.3 Operation of furnace.

12. STEEL CASTINGS. 4HRS

12.1 Continuous casting machine.

12.2 Ingot Casting.

12.3 Slab

12.4 Billets.

12.5 Blooms

13. MECHANICAL DEFORMATION (WORKING) PROCESSES 10HRS

13.1 Mechanical properties (Stress, Strain, Ductility, Malleability, Hardness, Brittleness)

13.2 Cold working

13.3 Hot working

13.4 Rolling.

13.4.1 Types of Rolling Mills (Two high, three high, four high)

13.4.2 Rolling Products.

13.5 Forging.

13.5.1 Types of Forging (Black smith forging, Drop forging, press Forging upset forging)

13.5.2 Forging products.

13.6 Extrusion

13.6.1 Types of extrusion (Direct extrusion, In-direct extrusion)

13.6.2 Extrusion products.

13.7 Drawing

13.7.1 Wire drawing.

13.7.2 Deep drawing

13.8 Spinning process.

13.9 Blanking and Piercing.

RECOMMENDEDBOOKS.

1. Process and Physical Metallurgy by James E Garside.

2. The Manufacture of Iron and Steel by D.V.O. Broudt, Bsc. A.R. M.A. I. m. English University Press Lted. London.

3. Casting and Forming Process in Manufacturing by James S.Campbell, Jr. McGraw Hill Book Co.

4. Elementary Metallurgy and Metallography by M. Sharagen.

5. Workshop Technology by W.A.J Chapman.

6. Basic Metallurgy Vol-I by American Society for Metals.

7. An Introduction to Modern Iron making by Dr. R.H. Tupkary, V.R.Tupkary

8. An Introduction to Modern Iron making by Dr. R.H. Tupkary, V.R.Tupkary

MW-142 FERROUS METALLURGY

INSTRUCTIONAL OBJECTIVES

1. KNOW ABOUT BASIC TERMINOLOGY OF METALLURGY.

1.1 Define the following (Metal, Non Metal, Alloy, Ferrous Metal, Non Ferrous metal, Metalloids)

1.2 Define Metallurgy.

1.3 State classification of metallurgy.

1.4 Enlist Importance of Metallurgy in industry.

2. KNOW ABOUT OCCURRENCE OF IRON ORES.

2.1 Define Earth Crust

2.2 State Mineral.

2.3 Describe Ore

2.4 State extent of each Iron ore in nature.

2.5 Enlist areas where Iron ores occurs in Pakistan.

3. UNDERSTAND TREATMENT OF IRON ORES (ORE DRESSING TECHNIQUES).

3.1 State Hand picking method.

3.2 Describe crushing of iron ore by jaw crusher and roll crusher Techniques

3.3 State grinding of Iron ore by Ball Mill and Rod Mill Methods

3.4 Explain Magnetic Separation method

3.5 Describe Gravity Separation method

3.6 Describe Froth Floatation method

3.7 State Roasting and calcination

3.8 Enlist Pre-smelting Processes

3.8.1 Define Concentration

3.8.2 Describe Agglomeration, Briquetting, Palletizing, Nodulizing, Sintering

4. KNOW ABOUT REFRACTORY MATERIALS.

4.1 Define and classify refractory materials

4.2 State Acid Refractory materials

4.3 State Basic Refraction Materials.

4.4 State Neutral Refractory materials.

4.5 Define acid and basic terminology in metallurgy

4.6 Define Reduction and oxidation reactions

5. UNDERSTAND RECOVERY OF IRON FROM ITS ORES IN BLAST FURNACE.

5.1 Explain construction of blast furnace

5.2 State Charge of blast furnace

5.3 Describe operation of blast furnace

5.4 State chemistry of iron ore refining

5.5 State products of blast furnace and their uses.

6. UNDERSTAND PRODUCTION OF CAST IRON IN CUPOLA FURNACE.

6.1 Describe construction of cupola furnace.

6.2 Enlist cupola charge and charge ratio.

6.3 Explain operation of cupola furnace.

6.4 State zones of cupola furnace**.**

7. KNOW ABOUT STEEL AND ITS CLASSIFICATION

7.1 Define Steel (Carbon Steel, Alloy steel)

7.2 State Classification of Carbon Steel and Alloy steel.

7.3 Enlist applications and uses of carbon and alloy steels.

8. UNDERSTAND STEEL MANUFACTURING BY OPEN HEALTH FURNACE

8.1 State construction of Open-hearth furnace

8.2 Describe operation of an open-hearth furnace (Acid, Basic)

8.3 Enlist Charge of open-hearth furnace (Acid, Basic)

9. UNDERSTAND THE BESSEMER PROCESS.

9.1 Describe construction of Bessemer converter.

9.2 Enlist charge of Bessemer Convector.

9.3 State operation of Bessemer converter.

9.4 Enlist advantages of Bessemer Process

10. UNDERSTAND MANUFACTURING OF STEEL AND ALLOY STEEL BY ELECTRIC ARC FURNACE.

10.1 Define and classify an Arc furnace

10.2 Describe construction of direct electric arc furnace.

10.3 Describe construction of In-direct electric arc furnace

10.4 . State operation of direct and In-direct electric arc furnaces

10.4.1 Enlist charge material and state method of charging

10.4.2 State oxidation period

10.4.3 State de-oxidation period

10.4.4 State addition of alloying element and tapping

10.4.5 State tapping

10.5 Explain duplex operation.

11. UNDERSTAND STEEL MELTING IN INDUCTION FURNACE.

11.1 Describe construction of induction Furnace.

11.2 State working Principle of induction furnace.

11.3 Describe operation of induction furnace.

12. KNOW ABOUT STEEL CASTINGS.

12.1 State continuous casting machine.

12.2 Define Ingot Casting.

12.3 State slab

12.4 Define billets.

12.5 State blooms

13. UNDERSTAND MECHANICAL DEFORMATION (WORKING) PROCESSES APPLIED TO METALS AND ALLOYS

13.1 Define Mechanical properties (Stress, Strain, Ductility, Malleability, Hardness, and Brittleness)

13.2 State cold working

13.3 State hot working

13.4 Define Rolling.

13.4.1 Describe types of Rolling Mills (Two high, three high, four high)

13.4.2 Enlist rolling Products.

13.5 State forging.

13.5.1 State types of Forging processes (Black smith forging, Drop forging, press Forging upset forging)

13.5.2 Enlist forging products.

13.6 State Extrusion process

13.6.1 Describe types of extrusion (Direct extrusion, In-direct extrusion)

13.6.2 Enlist extrusion products.

13.7 Describe Drawing process

13.7.1 State wire drawing.

13.7.2 State deep drawing.

13.8 Describe spinning process.

13.9 State Blanking and Piercing

MW-131 THEORY OF SHEET METAL

TOTAL CONTACT HOURS 32 HOURS	**T**	**P**	**C**
	1	**0**	**1**

AIMS: At the end of this course, the students will be able to:-

1. Understand scope, application and safety rules of sheet metal trades.
2. Understand and use different tools of sheet metal.
3. Understand different sheet metal joining methods.

COURSE CONTENTS

1. INTRODUCTION TO SHEET METAL TRADE 1HR

1.1 Scope of sheet metal trade

1.2 Application of sheet metal trade

1.3 Safety precautions in sheet metal trade

2. SHEET METAL TOOLS 2HRS

2.1 Scriber

2.2 Divider

2.3 Surface gauge

3. STAKES **3HRS**

3.1 Blow horn stake

3.2 Beak horn stake

3.3 Hatchet stake

3.4 Square stake

3.5 Needle case stake

3.6 Double case stake

3.7 Hollow mandrel stake

4. MALLETS AND HAMMERS **3HRS**

4.1 Mallet

4.2 Copper or lead hammer

4.3 Ball peen hammer (Straight & cross peen)

4.4 Raising hammer

4.5 Riveting hammer

4.6 Nail hammer

4.7 Setting hammer

5. SHEARS AND SNIPS **3HRS**

5.1 Straight snip

5.2 Circular snip

5.3 Right and left hand snip

5.4 Hand lever shear

5.5 Bench shear

5.6 Double cutting shear

5.7 Bulldog snip

6. SHEET METAL FOLDING TOOLS **2HRS**

6.1 Handy seamer/tong

6.2 Seam Groover/Hand Groover

7. FACTORS ON WHICH SELECTION OF THE PARTICULAR JOINING METHOD DEPENDS **2HRS**

7.1 Material used

7.2 Easy to join

7.3 Strength required

7.4 Economy

8. SHEET METAL JOINING METHODS **3HRS**

8.1 Seaming Definition

8.2 Single standing seam

8.3 Double standing seam

8.4 Bottom single seam

8.5 Bottom double seam

8.6 Corner single seam

8.7 Corner double seam

8.8 Grooved single seam

8.9 Grooved double seam

8.10 Formula to calculate Seaming allowance

9. RIVETING **3HRS**

9.1 Different shapes of rivet heads

9.2 Rivet material

9.3 Types of rivets used in sheet metal work

9.4 Riveting procedure

10.SOLDERING **3HRS**

10.1 Solders and soldering materials

10.2 Factors governing strength of soldered joints

10.3 Design of soldered joints

10.4 Methods of heating

10.5 Soldering procedure

10.6 Final cleaning

10.7 Application

11.BEADING AND GROOVING **2HRS**

11.1 Reasons of Beading and Grooving

11.2 Procedure of Beading

12.WIRING **2HRS**

12.1 Why the wiring is done

12.2 Formula to calculate wiring allowance

13.INTRODUCTION TO SHEET METAL MACHINES **2HRS**

13.1 Sheet bending machines

13.2 Beading and grooving machines

13.3 Light gauge shearing machines

13.4 Pulmax machines introduction and different operations done on the machines

14. COATING OF METALS **2HRS**

14.1 Galvanizing

14.2 Tin Coating

14.3 Electroplating

14.4 Phosphating

14.5 Anodizing

RECOMMENDEDBOOKS

1- Sheet Metal Shop Practice Third edition by Bruce & Meyer

2- Metal Work by Ludwig

3- Sheet Metal Technology by Robert Smith

MW-131 THEORY OF SHEET METAL

INSTRUCTIONAL OBJECTIVES

1. UNDERSTAND SHEET METAL TRADE

1.1 State scope of sheet metal trade

1.2 State various applications of sheet metal trade

1.3 Observe safety precautions regarding personal, machinery and equipment

2. UNDERSTAND SHEET METAL TOOLS

2.1 Describe the uses of Scriber

2.2 Describe the uses of Divider

2.3 Describe the uses of Surface gauge

2.4 Sketch scriber, divider and surface gauge

3. UNDERSTAND THE USE OF STAKES

3.1 State use of Blow horn stake

3.2 State use of Beak horn stake

3.3 State use of Hatchet stake

3.4 State use of Square stake

3.5 State use of Needle case stake

3.6 State use of Double case stake

3.7 State use of Hollow mandrel stake

3.8 Sketches of above stakes

4. UNDERSTAND WORKING OF MALLETS AND HAMMERS

4.1 State use of Mallet

4.2 State use of Copper or lead hammer

4.3 State use of Ball peen hammer (Straight & cross peen)

4.4 State use of Raising hammer

4.5 State use of Riveting hammer

4.6 State use of Nail hammer

4.7 State use of Setting hammer

4.8 Sketches of above hammers

5. UNDERSTAND USES OF SHEARS AND SNIPS

5.1 State use of Straight snip

5.2 State use of Circular snip

5.3 Differentiate Right and left hand snip

5.4 State use of Hand lever shear

5.5 State use of Bench shear

5.6 State use of Double cutting shear

5.7 State use of Bulldog snip

6. SHEET METAL FOLDING TOOLS

6.1 Handy seamer/tong

6.2 Seam Groover/Hand Groover

7. UNDERSTAND FACTORS ON WHICH THE SELECTION OF THE PARTICULAR JOINING METHOD DEPENDS

7.1 Select joining methods in respect of Material used

7.2 Select joining methods in respect of Easy to join

7.3 Select joining methods in respect of Strength required

7.4 Select joining methods in respect of Economy

8. UNDERSTAND DIFFERENTSHEET METAL JOINING METHODS

8.1 Seaming Definition

8.2 Formula to calculate Seaming allowance

8.3 Describe Single standing seam

8.4 Describe Double standing seam

8.5 Describe Bottom single seam

8.6 Describe Bottom double seam

8.7 Describe Corner single seam

8.8 Describe Corner double seam

8.9 Describe Grooved single seam

8.10 Describe Grooved double seam

9. UNDERSTAND RIVETING METHODS

9.1 Define riveting & describe different shapes of rivet heads

9.2 Describe Rivet material

9.3 Explain types of rivets used in sheet metal work

9.4 Explain Riveting procedure

10. UNDERSTAND SOLDERING

10.1 Define Soldering & Enlist soldering materials

10.2 Enlist and describe Factors governing strength of soldered joints

10.3 Explain Design of soldered joints

10.4 State different Methods of heating used in soldering

10.5 Explain Soldering procedure

10.6 State Final cleaning of soldered joints

10.7 State Application of soldering

11. UNDERSTAND THE PROCESS OF BEADING AND GROOVING

11.1 State Reasons of Beading and Grooving

11.2 State Procedure of Beading

12. UNDERSTAND WIRING IN SHEET METAL

12.1 State reasons for wiring in sheet metal work

12.2 Formula to calculate wiring allowance

13. UNDERSTAND WORKING OF SHEET METAL MACHINES

13.1 State working of Sheet bending machines

13.2 State working of Beading and grooving machines

13.3 State working of Light gauge shearing machines

13.4 Describe different working operations performed by Pulmax machines

14. KNOW ABOUT COATING OF METALS

14.1 Describe Galvanizing

14.2 Describe Tin Coating

14.3 Describe Electroplating

14.4 Describe Phosphating

14.5 Describe Anodizing

MW-113 WORKSHOP PRACTICE-I

LIST OF PRACTICALS

	Sr.No	Name of Joints	Practical Hours
Bench Work	1	Simple filing practice Mild steel 75x37x6mm 1pc	**45 HRS**
	2	Preparation of square bar by filing at 90^0 1" x1" x 3" (25x25x75mm) 1pc	
	3	Zigzag Hacksaw cutting MS Flat 100x37x2mm 2pcs	
	4	Taping & Drilling Exercise MS Flat 100x100x6mm 1pc	
SHEET METAL WORK	1	Simple –seam (Gal. sheet 0.56mm or SWG 24) 250x75x0.56mm 2pcs	**45 HRS**
	2	Wiring (Gal. sheet 0.56mm or SWG 24)	

		250x75x0.56mm 2pcs	
	3	Bottom folding (Gal. sheet 0.56mm or SWG 24) 250x75x0.56mm 2pcs	
	4	Cylinder formation (Gal. sheet 0.56mm or SWG 24) 250x75x0.56mm 2pcs	
	5	Corner seam-In ward fold (Gal. sheet 0.56mm or SWG 24) 250x75x0.56mm 2pcs	
	6	Corner seam-out ward fold (Gal. sheet 0.56mm or SWG 24) 250x75x0.56mm 2pcs	
	7	Riveting Practice (Gal/M.S sheet) 1mm thickness	
SMAW	1	Introduction to arc welding equipment	**72HRS**
	2	Manipulation of Arc i-Striking the arc ii-Maintaining of arc iii-Breaking &restriking of arc	
	3	Bead making(Stringer & Weaving) (Flat)position MS Flat 200x100x3mm 1pc	
	4	Butt joint flat position MS Flat 200x50x6mm 2pcs	
	5	Tee joint flat position or 1-F MS Flat 200x50x3mm 2pcs	
	6	Corner joint flat position or 1-F MS Flat 200x50x3mm 2pcs	
	7	Lap joint flat position or 1-F MS Flat 200x50x3mm 2pcs	
	8	Single V butt joint flat position MS Flat 200x50x6mm 2pcs	
GAS WEL DIN	1	Introduction to Welding Equipment	**70 HRS**

	2	Lighting and formation of Flames	
	3	Bead making practice flat position fore hand technique MS Flat 200x50x3mm 1pc	
	4	Open square Butt joint flat position fore hand technique 200x50x3mm 2pcs	
	5	Open square Butt joint flat position back hand technique200x50x3mm 2pcs	
	6	Corner joint flat position fore hand technique 200x50x3mm 2pcs	
	7	Lap joint flat position fore hand technique 200x50x3mm 2pcs	
	8	Tee joint flat position fore hand technique 200x50x3mm 2pcs	
FORGING WORK .	1	Lightening of forge	**60 HRS**
	2	Forging round bar to square (M.S barØ25mmx 400mm 1pc	
	3	Twisting of square bar (M.S barØ25mmx 400mm 1pc	
	4	Bending of square bar at 90 degree (M.S barØ25mmx 400mm 1pc	
	5	Forging of a flat chisel M.S barØ25mmx 400mm 1pc	
	6	Hardening and Tempering of cold chisel	

اسلامیات/مطالعہ پاکستان

نصاب (سال دوم)

حصہ اول	اسلامیات	Gen 211	ٹی	پی	سی
			1	0	1

حصہ دوم مطالعہ پاکستان

کل وقت:20 گھنٹے

موضوعات

1۔ سورہ المومنوں ایک تا گیارہ آیات معہ ترجمہ

2۔ دس منتخب احادیث معہ ترجمہ وتشریح

- خیر کم من تعلم القران و علمه
- لاایمان لمن لا امانة له و لادین لمن عهدله
- ایاکم والظن ان الظن اکذب الحدیث
- من احدث فی امرنا هذا ما لیس منه فهورد
- من حمل علینا السلاح فلیس منا
- اناو کا فل الیتیم فی الجنة هکذا
- لا یومن احد کم حتی اکون احب الیه من والده و ولده و الناس اجمعین
- من بنی لله مسجد ابنی الله له بیتاً فی الجنة
- لاضرر ولا ضرار فی الاسلام
- کلکم راع و کلکم مسئول عن رعیته

3۔ سیرت طیبہ

- مکی زندگی، ولادت، بعثت، ہجرت

مدنی زندگی، مواخات، میثاق مدینہ، فتح مکہ (اسباب ونتائج)

خطبہ حجۃ الوداع

4۔ حضور ﷺ بحیثیت:

معلم کامل۔ سربراہ خاندان

5۔ اسلامی معاشرہ

نظام تعلیم اور اس کے مقاصد۔ عدل وانصاف۔ امر بالمعروف ونہی عن المنکر

جہاد، کسب حلال، مسجد (اہمیت وفضیلت)

6۔ اسلامی ریاست۔ ریاست کی تعریف۔ اسلامی ریاست کی خصوصیات۔ اسلامی حکومت کے فرائض۔ اسلامی طرز حکومت۔

سال دوم　　اسلامیات

تدریسی مقاصد

قرآن مجید　　منتخب آیات قرآنی

عمومی مقصد۔ طالب علم پہچان سکے کہ آیات قرآنی کی روشنی میں مومن کے اوصاف کیا ہیں۔

خصوصی 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۔
- احادیث نبویہ

عمومی مقصد۔ احادیث کی روشنی میں اسلام کی اخلاقی اقدار (انفرادی و اجتماعی) سے آگاہ ہو سکے۔

خصوصی مقاصد

- احادیث کا ترجمہ بیان کر سکے
- احادیث کی تشریح کر سکے
- احادیث کی روشنی میں اسلام کی اخلاقی اقدار کی وضاحت کر سکے۔
- ان احادیث میں دی گئی تعلیمات کے مطابق اپنی زندگی گزار سکے۔

سیرت طیبہ

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

خصوصی مقاصد

- حضور ﷺ کی ابتدائی زندگی اختصار کے ساتھ بیان کر سکے۔
- حضور ﷺ کی ہجرت کا واقعہ بیان کر سکے۔
- حضور ﷺ کی مدنی زندگی اختصار سے بیان کر سکے۔
- حضور ﷺ کی بطور معلم خصوصیات بیان کر سکے۔
- حضور ﷺ کی بطور سربراہ خاندان خصوصیات بیان کر سکے۔

اسلامی معاشرہ

عمومی مقصد اسلامی معاشرہ کی خصوصیات سے آگاہی حاصل کر سکے۔

خصوصی مقاصد

- اسلامی معاشرہ کا معنی و مفہوم بیان کر سکے۔
- اسلامی معاشرہ کی امتیازی خصوصیات بیان کر سکے۔
- اسلامی معاشرہ میں عدل و احسان کی اہمیت بیان کر سکے۔
- تبلیغ کے لغوی معنی بیان کر سکے۔
- تبلیغ کے لفظی و اصطلاحی معنی بیان کر سکے۔
- جہاد کی اہمیت بیان کر سکے۔
- جہاد اور قتال میں فرق بیان کر سکے۔
- جہاد کی مختلف اقسام بیان کر سکے۔
- لفظ مسجد کی تعریف کر سکے۔
- مسجد کی سابقہ حیثیت کو بحال کرنے کے بارے میں اقدامات کو جان سکے۔

اسلامی ریاست

عمومی مقاصد ، اسلامی ریاست کی خصوصیات بیان کر سکے۔

خصوصی مقاصد

- ریاست کی تعریف بیان کر سکے۔
- اسلامی ریاست میں طرز حکومت سے آگاہی حاصل کر سکے۔
- اسلامی ریاست کی خصوصیات بیان کر سکے۔
- اسلامی ریاست کے اغراض و مقاصد بیان کر سکے۔
- اسلامی ریاست کے قیام کے لئے جدوجہد کر سکے۔

نصاب اخلاقیات (غیر مسلم طلباء کیلئے)

ٹی	پی	سی
1	0	1

سال دوم

کل وقت 20 گھنٹے

موضوعات

معاشرتی اقدار (بلحاظ ہمسایہ، اقوام، قومی سطح، شہری سطح، صنعتی اداروں کی سطح، ضروریات، ورثہ

- حقوق و فرائض
- قوت برداشت
- قوت ارادی
- لگن و جذبہ
- وسیع النظری
- بے غرضی
- انسان دوستی
- حفاظتی شعور
- پاس آزاری
- کامل آگاہی
- تغیرات کو قبول کرنا
- خود شناسی

نصاب اخلاقیات

سال دوم

تدریسی مقاصد

عمومی مقاصد　　طالب علم

اخلاقیات کی اہمیت وضرورت سے آگاہ ہو سکے اور بیان کر سکے۔

خصوصی مقاصد　　طالب علم اس قابل ہو۔

- موضوعات کا مطلب بیان کر سکے۔
- عملی زندگی سے مثالوں کی نشاندہی کر سکے۔
- اپنی شخصیت اور معاشرے پر موضوعات کے مطابق مثبت اثرات پیدا کرنے کے طریقے بیان کر سکے۔
- اعلیٰ اخلاقی اقدار میں سے:

قوت برداشت، قوت ارادی۔ لگن جذبہ، وسیع النظری، بے غرضی، انسان دوستی حفاظتی شعور، پاس آزادی، کامل آگاہی اور خود شناسی کی اہمیت بیان کر سکے۔

- اخلاقیات سے متصف ہو کر قومی خدمت بہتر طور پر انجام دے سکے۔

نصاب مطالعہ پاکستان

ٹی	پی	سی
1	0	1

سال دوم　　کل وقت 12 گھنٹے

حصہ دوم

موضوعات

- دو قومی نظریہ
- تحریک پاکستان
- انڈین کانگرس
- مسلم لیگ
- تقسیم بنگال
- میثاق لکھنو
- تحریک خلافت
- حصہ دوم
- مطالعہ پاکستان
- تدریسی مقاصد

MATH-212 **Applied Mathematics-II**

	T	**P**	**C**
Total Contact Hours:			
	2	0	2

Theory: 64 Hours.

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. 4 **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 Problems

2. DIFFERENTIATION. **4 Hours**

2.1 Increments
2.2 Different Coefficient or Derivative
2.3 Differentiation ab-initio or by first principle
2.4 Geometrical Interpretation of Differential Coefficient
2.5 Differential Coefficient of Xa, (ax + b)a
2.6 Three important rules
2.7 Problems.

3. DIFFERENTIATION OF ALGEBRIC FUNCTION.

4 Hours

3.1 Explicit function
3.2 Implicit function
3.3 Parametric forms
3.4 Problems

4. DIFFERENTATION OF TRIGNOMETRIC FUNCTION.

4 Hours

4.1 Differentional coefficient of sin x ,cos x ,tang x from first principle.
4.2 Differentional coefficient of Cosec x, Sec x, Cot x.
4.3 Differentiation of inverse trigonometric function.
4.4 Problems.

5. DIFFERENTIATION OF LOGARITHIMIC & EXPONENTIAL FUNCTION. **4 Hours**

5.1 Differentiation of In x
5.2 Differentiation of log ax
5.3 Differentiation of ax
5.4 Differentiation of ex
5.5 Problems.

6. RATE OF CHANGE OF VARIABLE. **4 Hours**

6.1 Increasing and decreasing function
6.2 Maxima and Minima values
6.3 Criteria for maximum and minimum values.
6.4 Method of finding maxima and minima.
6.5 Problems.

7. INTEGRATION. **8 Hours**

7.1 Concept
7.2 Fundamental Formulas
7.3 Important Rules
7.4 Problems.

8. METHOD FOR INTEGRATION. **6 Hours**

8.1 Integration by substitution
8.2 Integration by parts
8.3 Problems.

9. DEFINITE INTEGRALS. **6 Hours**

9.1 Properties
9.2 Application to Area
9.3 Problems

10. PLANE ANALYTIC GEOMETRY & STRAIGHT LINE. **6 Hours**

10.1 Coordinate System
10.2 Distance Formula
10.3 The Ratio Formulas
10.4 Inclination and slope of a line
10.5 The Slope Formula
10.6 Problems.

11. EQUATION OF STRAIGHT LINE. **6 Hours**

11.1 Some Important Forms
11.2 General form
11.3 Angle formula
11.4 Parallelism and perpendicularity

11.5 Problems

12. THE EQUATION OF THE CIRCLE. 8 Hours

12.1 Standard form of equation
12.2 Central form of equation
12.3 General form of equation
12.4 Radius & coordinate of the Centre
12.5 Problems

REFREFNCE BOOK

Applied Mathematics Math-113, by Nasir -ud-Din Mahmood, Sana-ullah Khan, Tahir Hameed, Syed Tanvir Haider, Javed Iqbal, Vol - I, National Book Foundation

MATH -212 APPLIED MATHEMATICS –II

INSTRUCTIONAL OBJECTIVES

1. USE THE CONCEPT OF FUNCTION AND THEIR LIMITS IN SOLVING SIMPLE PROBLEMS

1.1 Define a function
1.2 List all types of function
1.3 Explain the concept of limit and limit of a function
1.4 Explain fundamental theorem on limits
1.5 Derive some important limits
1.6 Solve simple problems on limits

2. UNDERSTAND THE CONCEPT OF DIFFERENTIAL COEFFICIENT

2.1 Derive mathematics expression for a differential coefficient.
2.2 Explain geometrical interpretation of differential coefficient.
2.3 Differentiate a content, constant associated with a variable and the sum of finite number of function.
2.4 Solved related problems.

3. USE RULES OF DIFFERENTIAL TO SOLVE PROBLEMS OF ALGEBRIC FUNCTIONS.

3.1 Differentiate ab-initio Xn and (ax+b)n
3.2 Derive product, quotient and chain rules.
3.3 Find derivative of implicit function & explicit function.
3.4 Differentiate parametric forms; function w.r.t another function and by rationalization.
3.5 Solve problems using these formulas.

4. USE RULES OF DIFFERENTIATION TO SOLVE PROBLEMS OF ALGEBRIC FUNCTIONS.

4.1 Differentiate from first principle sin x ,cosx,tang x.
4.2 Derive formula for derivation of sec x,cosec x, cot x.
4.3 Find differential coefficient of inverse trigonometric functions.

5. USE RULES OF DIFFERENTIATION TO LOGARITHMIC AND EXPONENTIAL FUNCTIONS.

5.1 Derive formulas for differential coefficient of logarithmic and exponential functions.
5.2 Solve problems using these formulas.

6. UNDERSTAND RATE OF CHANGE OF ONE VARRIABLE WITH RESPECT TO ANOTHER.

6.1 Write expression for velocity, acceleration, and slope of a line.
6.2 Define an increasing and decreasing function, maxima and minima values, of inflection
6.3 Explain criteria for maxima and minima values of a function.

6.4 Solve problems involving rate of change of variables.

7. APPLY CONCEPT OF INTEGRATION IN SOLVING TECHNOLOGICALPROBLEMS

7.1 Explain the concept of integration
7.2 Write basic theorem of integration
7.3 List some important rules of integration
7.4 Derive fundamental formulas of integration
7.5 Solve problems based on these formulas /rules.

8. UNDERSTAND DIFFERENT METHODS OF INTEGRATION.

8.1 List standard formulas
8.2 Integrate a function by substitution method
8.3 Find integrals by the method of integration by parts
8.4 Solve problems using these methods.

9. UNDERSTAND THE METHOD OF SOLVING DEFENITE INTEGRALS.

9.1 Define definite integral
9.2 List properties of definite integrals using definite integrals.
9.3 Find areas under curves
9.4 Solve problems of definite integrals.

10. UNDERSTAND THE CONCEPT OF PLANE ANALYTIC GEOMETRY.

10.1 Explain the rectangular coordinate system
10.2 Locate points in different quadrants
10.3 Derive distance formula
10.4 Prove section formula
10.5 Derive slope formula
10.6 Solve problems using the above formulas.

11. USE EQUATIONS OF STRAIGHT LINE IN SOLVING PROBLEMS.

11.1 Define a straight line
11.2 State general form of equation of a straight line
11.3 Derive slope intercept and intercept forms of equations.
11.4 Derive expression for angle between two straight lines
11.5 Derives conditions of perpendicularity and parallelism lines
11.6 Solve problems involving these equations/formulas.

12. SOLVE TECHNOLOGICAL PROBLEMS USING EQUATION OF CIRCLE.

12.1 Define a circle
12.2 Describe standards, central and general forms of the equation of a circle.
12.3 Convert general forms to the central forms of equation of a circle.
12.4 Deduce formulas for the radius and the coordinates of the centre of a circle from the general form.

12.5 Derive equation of the circle passing through three given points.
12.6 Solve problems involving these equations

Total Contact Hours

		T	P	C
Theory	32			
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. ENTERPRENEURIAL 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 Dishonor 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 labor.

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. SaeedNasir,Introduction to Business, IlmiKitabKhana, Lahore.
3. S.M. Akhtar, An Introduction to Modern Economics, United Limited, Lahore.

Mgm-221 BUSINESS MANAGEMENT AND INDUSTRIAL ECONOMICS.
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 ENTERPRENEURIAL 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 it 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 organizational set up and objectives of IDBP.

12.3 Explain organizational 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.

MT-232 **ENGINEERING DRAWING-II**

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

Pre-requisites: BASIC ENGINEERING DRAWING -I

AIMS:At the end of this course students will be able to understand the use of engineering drawings in various fields of industry specially related with Mechanical Technology. They will be understand the various symbols, development and intersections, machine parts, sectioning, fasteners, keys & cotters, coupling, riveted joints and detail and the assembly drawings of their respective parts. Moreover they can draw the above said parts communicating their manufacturing details in each aspect. In part B students will be able to apply the Auto-Cad Commands and can draw respective 2D & 3D drawings with their applications.

Corse Contents:

Detail of Contents:

PART-A MANUAL DRAWING

1. DRAWING SYMBOLS **3HRS**

1.1 Machining Symbols

1.2 Welding symbols

1.3 Material Symbols

1.4 Thread Symbols

1.5 Conventional Breaks

2. SECTIONING **2HRS**

2.1 Sectioning and its purposes

2.2 Cutting Plane, C.P. Line, Section Lines

2.3 Type of sectional views

2.4 Parts not sectioned

3. ENGINEERING CURVES **3HRS**

3.1 Introduction to curves

3.2 Application of engineering curves

3.3 Cone and conic sections

3.4 Involutes and spiral

3.5 Cycloid and Helix

4. FASTENERS DESCRIPTION **3HRS**

4.1 Fasteners

4.2 Threads & nomenclature

4.3 Screw Threads, their types

4.4 Nuts, Bolts and studs

4.5 Locking devices

5. PRODUCTION DRAWINGS **4HRS**

5.1 Working / production drawing

5.2 Types of production drawings

5.3 Importance of detail and assembly drawings

5.4 Title blocks

6. APPLICATION OF TOLERANCE, ALLOWANCE AND FITS **3HRS**

6.1 Introduction

6.2 Tolerance

6.3 Allowance

6.4 Difference between Tolerance and Allowance

6.5 Fit and its types with their Applications

PART-B: AUTOCAD

1. CREATING AND EDITING **4HRS**

1.1 Drawing Tools and Tool bars

1.2 Editing Tools and Tool bars

1.3 Text (write and change)

1.4 Title block

2. SOLID MODELING/3D MODELING **4HRS**

2.1 Introduction of 2D and 3D objects

2.2 Extrude 2D object and 3D Model

2.3 Commands

2.3.1 Extrude

2.3.2 Subtract

2.3.3 Revolve

2.3.4 Orbit

2.3.5 Align

2.3.6 Render

3. DIMENSION AND DRAWING SHEETS **4HRS**

3.1 Dimensioning 2D solids

3.2 Dimensioning 3D solids

3.3 Dimensioning Font/Styles

4. BILL OF MATERIALS, PARTS LISTS **2HRS**

4.1 Bill of Materials

4.2 Parts Lists

4.3 Ballooning Parts

RECOMMENDED BOOKS

1. Engineering Drawing by French Verick.
2. Fundamentals of Engineering Drawing by Luzzader.
3. Engineering Drawing and CAD-II by (Muhammad HafeezAshrafi)
4. AutoCAD 2010 Tutorial First Level: 2D Fundamentals by Randy H. Shih
5. AutoCAD 2010 Tutorial Second Level: 3D Modeling by Randy H. Shih

Instructional Objectives:

After completion of this Course students will be able to;

1. **KNOW ABOUT DRAWING SYMBOLS**
   - 1.1 Describe uses of symbols in production drawing
   - 1.2 State importance of different symbols on various production drawings
   - 1.3 Describe Material, Machining, Plumbing, Piping & welding Symbols
   - 1.4 Explain and draw Thread symbols
   - 1.5 Why conventional breaks apply
2. **KNOW ABOUT SECTIONING**
   - 2.1 Define the sectioning and its purposes
   - 2.2 State cutting plane, C.P. line and section lines
   - 2.3 Explain different types of sectional views
   - 2.4 Describe the parts which are not sectioned
3. **KNOW ABOUT INTERSECTION OF DUCTS/PIPES**
   - 3.1 Define plane and curved surfaces
   - 3.2 State application of engineering curves
   - 3.3 Explain cone and conic sections
   - 3.4 State involutes and spiral
   - 3.5 Describe cycloid and helix

4. **KNOW ABOUT FASTENERS**
   - 4.1 Define the term fasteners
   - 4.2 Explain threads and its nomenclature/terms
   - 4.3 Explain screw thread and their types
   - 4.4 Describe the function of nut, bolts, studs and their types
   - 4.5 Explain locking devices
5. **KNOW ABOUT PRODUCTION DRAWINGS**
   - 5.1 Explain Working / production drawing.
   - 5.2 Explain types of production drawings
   - 5.3 Explain importance of detail and assembly drawing.
   - 5.4 State title blocks.
6. **KNOW ABOUT THE APPLICATION OF TOLERANCE, ALLOWANCE AND FITS**
   - 6.1 Define tolerance
   - 6.2 Define allowance
   - 6.3 Difference between tolerance and allowance
   - 6.4 Describe fit, its types and their applications.

PART-B: AUTOCAD

1. KNOW ABOUT CREATING AND EDITING

1.1 Describe Drawing Tools and Tool bars

1.2 Describe Editing Tools and Tool bars

1.3 Describe Text (write and change)

1.4 Describe Title block

2. KNOW ABOUT SOLID MODELING/3D MODELING

2.1 Introduction of 2D and 3D objects

2.2 Describe Extrude 2D object and 3D Model

2.3 Explain Commands

2.3.1 Extrude

2.3.2 Subtract

2.3.3 Revolve

2.3.4 Orbit

2.3.5 Align

2.3.6 Render

3. KNOW ABOUT DIMENSION AND DRAWING SHEETS

3.1 Describe Dimensioning 2D solids

3.2 Describe Dimensioning 3D solids

3.3 Describe Dimensioning Font/Styles

4. KNOW ABOUT BILL OF MATERIALS, PARTS LISTS

4.1 State Bill of Materials

4.2 State Parts Lists

4.3 State Ballooning Parts

MT-232 **ENGINEERING DRAWING-II**

List of Practical: **96Hrs**

(PART-A:MANUAL DRAWING

1. SYMBOLS

1.1 Plumbing and Piping Symbols

1.2 Welding Symbols, Threads Symbols

1.3 Material, Machining Symbols and Conventional Breaks

2. SECTIONING

2.1 Draw different types of sectioning views

2.1.1 Full sectioning

2.1.2 Half sectioning

2.1.3 Off-set

2.1.4 Revolved

2.1.5 Broken

3. FASTENERS

3.1 Draw Nut & Bolt (Hex.)

3.2 Draw four Threads forms

4. ENGINEERING CURVES

4.1 Construction of parabola and hyperbola

4.2 Construction of spiral curves

4.3 Construction of involutes curve of square, rectangle, hexagonal and circle

4.4 Construction of cycloid

5. PRODUCTION DRAWINGS

5.1 Draw working drawing of an engineering object

5.2 Draw assembly drawing of an engineering object

5.3 Detail drawing showing part list, material list and Title block.

MT-232 ENGINEERING DRAWING -II

List of Practical:

(PART-B: AUTOCAD

1. Understand AutoCAD
2. Practice View Commands
3. Understand Drawing Lines and types of lines command
4. Understand Toolbars and Profiles
5. 2-D drawings and commands
6. Practice Draw Commands
7. Practice Modify Commands
8. Understand Selecting Objects
9. Understand Object Properties
10. Understand Drafting Settings and Object Snaps
11. Practice Dimensions
12. Practice Text Tools
13. Understand Title blocks and Templates
14. Understand Viewports and Layouts
15. Understand User Coordinate System (UCS)and the Z-axis
16. Practice 3D Wireframe Modeling and mesh
17. Understand UCS, Viewports and Wireframe Modeling
18. Practice 3D Surface Modeling
19. Practice Solid Modeling - Constructive Solid Geometry
20. Understand Regions, Extrude and Solid Modeling
21. Creating region by p-edit command
22. Practice Multi-view Drawings from 3D Models
23. Practice Symmetrical Features in Designs
24. Practice Advanced Modeling Tools and Techniques
25. Conceptual Design Tools and Techniques
26. Exercise Practical Drawings

MW-223 THEORY OF WELDING

TOTAL CONTACT HOURS: Theory 96 Hours	**T**	**P**	**C**
	3	**0**	**3**

COURSE CONTENTS:

PART-A

1. EFFECT OF ELEMENTS ON WELDING OF STEEL 6HRS

1.1Oxygen
1.2 Nitrogen

1.3 Hydrogen

1.4 Sulphur

1.5 Phosphorous

1.6 Carbon

1.7 Manganese

1.8 Silicon

1.9 Chromium

1.10 Aluminum

1.11 Nickel

1.12 Copper

2. GAS AND ELECTRIC ARC WELDING METHOD OF CARBONSTEELS 8HRS

2.1 Low carbon steel

2.2 Medium carbon steel

2.3 High carbon steel (e.g Tool Steel)

3. GAS AND ELECTRIC WELDING OF CAST IRON 4HRS

3.1 Cast Iron and its types

3.2 Gas welding method of Gray of cast iron

3.3 Electric arc welding method of Gray cast iron

3.4 Gas welding of S.G Iron

3.5 Arc welding of S.G Iron

3.6 Buttering, Notching and Studding of casting

4. BRAZING AND BRAZE WELDING OF SIMILAR & DISSIMILAR METALS 4HRS

4.1 Brazing of low carbon steel

4.2 Brazing of cast iron

4.3 Brazing of cast iron with steel

4.4 Brazing of low carbon steel with stainless steel

5. CHROMIUM STEEL/ STAINLESS STEEL 8HRS

5.1 Types of Stainless Steel

5.2 Electric arc welding of stainless steel

5.3 Gas welding of stainless steel

6. COPPER AND COPPER ALLOYS 8HRS

6.1 Gas welding of copper

6.2 Arc welding of copper

6.3 Gas welding of Brasses (copper zinc alloys)

6.4 Electric arc welding of brasses

6.5 Gas welding of silicon bronze (Copper silicon alloys)

6.6 Electric arc welding of silicon bronze

7. ALUMINUM AND ALUMINUM ALLOYS 6HRS

7.1 Gas welding of aluminum

7.2 Arc welding of aluminum

7.3 Gas welding of Heat treatable alloys

7.4 Arc welding of Heat treatable alloys

8. METAL ELECTRODES/WELDING CONSUMABLES ACCORDING TO ASME-SEC. II 8HRS

8.1 Introduction of ASME Section II (Material Specification)

8.1.1 Part A -Ferrous Material Specifications

8.1.2 Part B- Non-ferrous Material Specifications

8.1.3 Part C-Specifications for Welding Rods, Electrodes, and Filler Metals

8.1.4 Part D- Properties/Composition

8.2 Bare electrodes

8.2 Coated electrodes

8.3 Classification of mild steel electrodes

8.4 Classification of low alloy steel electrodes

8.5 Classification of corrosion resistant electrodes

8.6 Classification of ferrous electrodes

PART-B

9. MECHANISM OF TRANSFER OF METAL 4HRS

9.1 Gravity

9.2 Gas expansion

9.3 Electromagnetic force

9.4 Electric forces

9.5 Surface tension

10. MANIPULATION OF WELDING ARC DURING DIFFERENT WELDING PROCESSES 4HRS

10.1 Manipulation of the arc and its requirements

10.2 Polarity

10.3 Arc crater and penetration

10.4 Arc length and arc voltage

10.5 Welding current values

10.6 Arc blow

11. OXY ACETYLENE GAS CUTTING OF METALS 6HRS

11.1 Manual and machine gas cutting

11.2 Chemistry of oxygen cutting

11.3 Oxy-acetylene gas cutting of plain carbon steel

11.4 Oxy-acetylene gas cutting of cast iron

11.5 Oxy-acetylene gas cutting of stainless steel

12. ARC CUTTING 4HRS

12.1 Carbon arc cutting

12.2 Metal arc cutting

12.3 Plasma Arc Cutting

13. UNDER WATER CUTTING 4HRS

13.1 Oxygen cutting

13.2 Arc and arc oxygen cutting

14. WELDING JIGS AND FIXTURES 4HRS

14.1 Factors regarding designing of jigs

14.2 Types of Jigs & Fixtures

14.3 Locating points and clamping devices

15. THERMAL STRESS SET UP DURING WELDING 4HRS

15.1 Thermal Stresses

15.2 Expansion and contraction

15.3 Control of shrinkage/ warping

16. RESIDUAL STRESSES 4HRS

16.1 Residual Stresses

16.2 Stress relieving methods

17. WELDING DEFECTS AND THEIR REMEDIES 8HRS

17.1 Porosity

17.2 Blow holes

17.3 Pin hole/ Gas pore

17.4 Poor penetration

17.5 Undercut

17.6 Cracks

17.7 Nonmetallic inclusion/ Slag Inclusions

17.8 Spatters

17.9 Crater

17.10 Lack of Fusion

18. ESTIMATION OF COST OF WELD 2HRS

18.1 Factors in estimating cost of weld

18.2 Calculations.

Recommended Books:

1. Welding Engineering by Boniface. E. Rossi
2. Welding Principles for Engineers by Joe, Lawrence

MW-223 THEORY OF WELDING

INSTRUCTIONAL OBJECTIVES

1. UNDERSTAND THE EFFECT OF ELEMENTS ON WELDING OF STEEL

1.1 Define Weldability

1.2 Explain effects of the following elements on weldability of Steel.

a. Oxygen
b. Nitrogen
c. Hydrogen
d. Sulphur
e. Phosphorous
f. Carbon
g. Manganese
h. Silicon
i. Chromium
j. Aluminum
k. Nickel
l. Copper

2. UNDERSTAND GAS AND ELECTRIC ARC WELDING METHOD OF CARBON STEELS

2.1 Explain the Gas & Electric arc welding of Low carbon steel

2.2 Explain the Gas & Electric arc welding Medium carbon steel

2.3 Explain the Gas & Electric arc welding of High carbon steel

3. UNDERSTAND GAS AND ELECTRIC WELDING OF CAST IRON

3.1 Define Cast Iron and its types

3.2 Explain Gas welding method of Gray of cast iron

3.3 Explain Electric arc welding method of Gray cast iron

3.4 Explain Gas welding of S.G Iron

3.5 Explain Arc welding of S.G Iron

3.6 Describe Buttering, Notching and Studding of casting

4. UNDERSTAND BRAZING AND BRAZE WELDING OF SIMILAR & DISSIMILAR METALS

4.1 Differentiate Brazing and Braze welding

4.2 Explain Brazing of low carbon steel

4.3 Explain Brazing of cast iron

4.4 Describe Brazing of cast iron with steel

4.5 Describe Brazing of low carbon steel with stainless steel

5. UNDERSTAND CHROMIUM STEEL/ STAINLESS STEEL

5.1 State Types of Stainless Steel

5.2 Explain Electric arc welding of stainless steel

5.3 Explain Gas welding of stainless steel

6. COPPER AND COPPER ALLOYS

6.1 Explain Gas welding of copper

6.2 Explain Arc welding of copper

6.3 Explain Gas welding of Brasses (copper zinc alloys)

6.4 Explain Electric arc welding of brasses

6.5 Explain Gas welding of silicon bronze (Copper silicon alloys)

6.6 Explain Electric arc welding of silicon bronze

7. ALUMINUM AND ALUMINUM ALLOYS

7.1 Explain Gas welding of aluminum

7.2 Explain Arc welding of aluminum

7.3 Explain Gas welding of Heat treatable alloys

7.4 Explain Arc welding of Heat treatable alloys

8. UNDERSTAND METAL ELECTRODES/WELDING CONSUMABLES ACCORDING TO ASME-SEC. II

8.1 Introduction of ASME Section II (Material Specification)

8.1.1 State Part A-Ferrous Material Specifications

8.1.2 State Part B- Non-ferrous Material Specifications

8.1.3 State Part C-Specifications for Welding Rods, Electrodes, and Filler Metals

8.1.4 State Part D- Properties/Composition

8.2 Differentiate between Bare and Coated electrodes

8.3 Describe Classification of mild steel electrodes

8.4 Describe Classification of low alloy steel electrodes

8.5 Describe Classification of corrosion resistant electrodes

8.6 Describe Classification of ferrous electrodes

9. INDERSTAND MECHANISM OF TRANSFER OF METAL

9.1 Explain Gravity factor involved in transfer of metal

9.2 Explain Gas expansion factor involved in transfer of metal

9.3 Explain Electromagnetic force factor involved in transfer of metal

9.4 Explain Electric forces factor involved in transfer of metal

9.5 Explain Surface tension factor involved in transfer of metal

10. UNDERSTAND MANIPULATION OF WELDING ARC DURING DIFFERENT WELDING PROCESSES

10.1 Explain method of Manipulation of the arc and its requirements

10.2 Explain Polarity and its uses

10.3 Explain Arc crater and penetration

10.4 Select Arc length and arc voltage

10.5 Select Welding current values

10.6 Explain Arc blow and its effects

11. UNDERSTAND OXY ACETYLENE GAS CUTTING OF METALS

11.1 Differentiate Manual and machine gas cutting

11.2 Explain Chemistry of oxygen cutting

11.3 Describe Oxy-acetylene gas cutting of plain carbon steel

11.4 Describe Oxy-acetylene gas cutting of cast iron

11.5 Describe Oxy-acetylene gas cutting of stainless steel

12. UNDERSTAND THE ARC CUTTING

12.1 Define Carbon arc cutting

12.2 Define Metal arc cutting

12.3 Differentiate between Carbon & Metal arc cutting

12.4Describe Plasma Arc Cutting

13. UNDERSTAND THE UNDER WATER CUTTING 13.1 Explain under water Oxygen cutting

13.2 Explain under water Arc and arc oxygen cutting

14. UNDERSTAND WELDING JIGS AND FIXTURES

14.1 State factors in designing of jigs

14.2 Explain types of Jigs & Fixtures

14.3 State locating points with nature of work

14.4 Explain types of clamping devices

15. UNDERSTAND THERMAL STRESS SET UP DURING WELDING

15.1 Define Thermal Stresses

15.2 State effect of Expansion and contraction

15.3 Explain Control of shrinkage/ warping

16. UNDERSTAND RESIDUAL STRESSES SET UP DURING WELDING

16.1 Define Residual Stresses

16.2 Explain Stress relieving methods

17. UNDERSTAND WELDING DEFECTS AND THEIR REMEDIES

17.1 Define Porosity and explain its effects and remedies

17.2 Define Blow holes and explain its effects and remedies

17.3 Define Pin hole/ Gas pore and explain its effects and remedies

17.4 Define Poor penetration and explain its effects and remedies

17.5 Define Undercut an explain its effects and remedies

17.6 Define Cracks and explain its effects and remedies

17.7 Define Non-metallic inclusion/ Slag Inclusions and explain its effects and remedies

17.8 Define Spatters and explain its effects and remedies

17.9 Define Crater and explain its effects and remedies

17.10 Define Lack of Fusion and explain its effects and remedies

18. CALCULATE AND ESTIMATE THE COST OF WELD

18.1 Describe factors in estimating cost of weld

18.2 Calculate cost of the welded joint

MW-262 **NON-FERROUS METALLURGY**

Total contact hours:	T	P	C
Theory 64 hours	2	0	2

Prerequisite: Basic knowledge of Metals and the treatments.

AIMS The student will be able to:-

1. Familiarize with the extraction, purification and uses of Non Ferrous Metals.
2. Acquaint with the nonferrous alloys commonly used in Industry.
3. Acquaint with the ferrous alloy (steel).

COURSE CONTENTS:

1. METALLURGY OF COPPER. 8HRS

1.1 Properties of copper

1.2 Copper ores and their formulas

1.3 Concentration of copper Ore

1.4 Extraction of Copper from its ores.

1.5 Fire refining.

1.6 Electrolytic refining.

1.7 Grades of copper

1.8 Uses of copper

1.9 Effect of impurities on copper.

2. BRASSES (COPPER BASE ALLOYS). 5HRS

2.1 Composition of Brasses

2.2 Mechanical properties of Brasses.

2.3 Common use of Brasses.

3. BRONZES (COPPER BASE ALLOYS). 4HRS

3.1 Composition of Bronzes (Tin Bronze, Aluminum Bronze)

3.2 Mechanical properties of Bronzes.

3.3 Common use of Bronzes.

4. COPPER NICKEL ALLOYS. 5HRS

4.1 Composition of Copper Nickel alloys.

4.2 Uses of Copper Nickel alloys.

5. METALLURGY OF ALUMINUM 6HRS

5.1 Properties of Aluminum

5.2 Aluminum Ores and their formulas

5.3 Extraction of Aluminum (Bayer's Process)

5.4 Electrolytic Reduction of Alumina (Hall-Heroult Process)

5.5 Uses of Aluminum.

6. ALUMINUM BASE ALLOYS. 6HRS

6.1 Classification of Aluminum Alloys

6.2 Wrought alloys of Aluminum

6.3 Cast Alloys(heat treated & non heat treated) of Aluminum

6.4 Aluminum base copper alloys

6.5 Aluminum base Silicon alloys

6.6 Aluminum base Magnesium alloys

7. METALLURGY OF ZINC. 6HRS

7.1 Properties of Zinc

7.2 Occurrence of Zinc Ores and their chemical formulas

7.3 Extraction of zinc

7.4 Uses of zinc.

7.5 Alloys of zinc

7.5.1 Die casting alloys, their composition and uses.

7.5.2 Sand casting alloys, their composition and uses.

8. METALLURGY OF LEAD. 6HRS

8.1 Occurrence of lead ores.

8.2 Properties of Lead

8.3 Uses of lead.

8.4 Alloys of Lead

8.4.1 Antimony alloys

8.4.2 Type or Printing Metal.

8.4.3 Fusible alloys.

9. METALLURGY OF NICKEL. 6HRS

9.1 Occurrence of Nickel ores.

9.2 Properties of Nickel

9.3 Uses of Nickel

9.4 Alloys of Nickel

9.4.1 Monel Metal

9.4.2 Inconel Metal

10. METALLURGY OF CHROMIUM. 6HRS

10.1 Occurrence of Chromium ores.

10.2 Properties of Chromium

10.3 Uses of Chromium

11. POWDER METALLURGY 6HRS

11.1 Introduction to powder metallurgy

11.2 Powder metallurgy processes (Mixing,Compacting& Sintering)

11.3 Application of powder metallurgy.

11.4 Advantages of powder metallurgy.

RECOMMENDED BOOKS

1-Introduction to Physical Metallurgy by Sidney H.Avner
2-Principal of Metal Casting by Heine & Rosenthal
3-Elementry Metallurgy and Metallography by ArthusM.Sharager
4-Process and Physical metallurgy by James E. Garside
5-Fundamentals of Powder Metallurgy by Ijaz Hussain Khan, Khalid Ahmad Qureshi and Javed Iqbal Minhas

MW-262 **NON-FERROUS METALLURGY**

INSTRUCTIONAL OBJECTIVES.

1. KNOW ABOUT THE METALLURGY OF COPPER.

1.1 Describe Properties of copper

1.2 Name different copper ores and their formulas.

1.3 Describe concentration process of copper Ore……U

1.4 Describe extraction process of copper.

. 1.5 State fire refining of copper

1.6 State electrolytic refining.

1.7 List different grades of copper.

1.8 List various uses of copper.

1.9 Describe effect of impurities on copper.

2. KNOW ABOUT BRASSES.

2.1 Describe composition of Brasses.

2.2 Enlist mechanical properties of Brasses.

2.3 State uses of Brasses.

3. KNOW ABOUT BRONZES.

3.1 State composition of bronzes (tin bronzes, Aluminum bronzes)

3.2 Enlist mechanical properties of bronzes.

3.3 Enlist uses of bronzes.

4. KNOW ABOUT COPPER NICKEL ALLOY.

4.1 State Composition of copper nickel alloys.

4.2 Enlist various uses of copper nickel alloys.

5. UNDERSTAND METALLURGY OF ALUMINUM.

5.1 Enlist properties of Aluminum.

5.2 Enlist different Aluminum ores and their chemical formulas

5.3 Explain Extraction of Aluminum (Bayer's Process)

5.4 Explain the electrolytic reduction of alumina (Hall-Heroult Process)

5.5 Enlist uses of Aluminum.

6. UNDERSTAND THE ALUMINUM BASE ALLOYS.

6.1 Enlist aluminum alloys

6.2 State wrought alloys of Aluminum.

6.3 State cast alloys (heat treated & non heat treated) of Aluminum

6.4 Explain Aluminum base copper alloys

6.5 Explain Aluminum base Silicon alloys

. 6.6 Explain Aluminum base Magnesium alloys.

7. UNDERSTAND THE METALLURGY OF ZINC.

7.1 Enlist Properties of Zinc

7.2 Enlist Zinc Ores and their chemical formulas.

7.3 State distillation process for the Extraction of zinc.

7.4 Enlist various uses of zinc

7.5 Enlist Alloys of zinc

7.5.1 Explain compositions & uses of die casting alloys.

7.5.2 Explain compositions & uses sand casting alloys.

8. UNDERSTAND THE METALLURGY OF LEAD.

8.1 Enlist lead ores and their chemical formulas.

8.2 Enlist mechanical properties of lead.

8.3 State various uses of lead.

8.4 Enlist alloys of lead

8.4.1 Explain lead antimony alloys.

8.4.2 Explain about type/printing metal.

8.4.3 Explain fusible alloys.

9. KNOW ABOUT THE METALLURGY OF NICKEL.

9.1 Enlist nickel ores and their chemical formulas.

9.2 Enlist properties of nickel.

9.3 State uses of nickel.

9.4 Enlist Alloys of Nickel

9.4.1 State properties & composition of Monel metal.

9.4.2 State properties & composition of Inconel metal

10. UNDERSTAND THE METALLURGY OF CHROMIUM.

10.1 Enlist Chromium ores and their chemical formulas.

10.2 State properties of chromium.

10.3 Enlist uses of chromium

11. KNOW ABOUT THE POWDER METALLURGY

11.1 State powder metallurgy

11.2 Powder metallurgy processes (Mixing, Compacting & Sintering)

11.3 Explain application of powder metallurgy.

11.4 Enlist advantages of powder metallurgy

MW-202 **MACHINE ELEMENTS**

TOTAL CONTACT HOURS:	T	P	C
Theory 64 hours	2	0	2

COURSE CONTENTS:

1. INTRODUCTION **3HRS**

1.1. Introduction to the subject, need and its importance

1.2 Fastening devices, types temporary and permanent

2. RIVETS AND RIVETED JOINTS **5HRS**

2.1 Definition, Rivet parts

2.2 Classification of rivets

2.3. Types of riveted joints and terminology

2.4 Riveting processes and devices

3. KEYS AND COTTER JOINTS **4HRS**

3.1 Keys- cotter, size properties

3.2 Material

3.3 Types

3.4 Uses

4. THREADS **4HRS**

4.1 Types of threads

4.2 Terminology

4.3 Uses

5. SCREWS **5HRS**

5.1 Classification of screws

5.2 Common locking devices for general machines and automatic components

6. SHAFT AND AXELS **4HRS**

6.1 Difference between shaft and axels

6.2. Materials

6.3 Types and uses

6.4 Shaft strength factors

7. WASHERS **3HRS**

7.1 Types

7.2 Locking and locking devices arrangement

7.3 Types of locking devices

8. COUPLING AND CLUTCHES **4HRS**

8.1 Definition

8.2 Types of coupling and clutches

8.3 Uses

9. SHRINKAGE AND PRESS FIT JOINTS **4HRS**

9.1 Types of fits

9.2 Definition of Tolerance and allowance

9.3 Types of tolerance, limits and its types

10. BEARINGS **4HRS**

10.1 Definition

10.2 Classification according to load

10.3 Classification according to friction

10.4 Construction

10.5 Bearing maintenance.

11. GEARS AND GEAR TRANSMISSION 4HRS

11.1 Terminology used in spur gear

11.2 Typesof gears and gear transmission

11.3 Material, maintenance and care

11.4 Calculation for Spur Gear

12. FLEXIBLE TRANSMISSION DEVICES 9HRS

12.1 Describe flexible transmission devices

12.1.1Sprocket and chains

12.1.2 Types of chains

12.1.3Material, construction of roller chains

12.1.4 Maintenance

12.2 Belt drives

12.2.1 Types of belt drives

12.2.2 Assembly instructions

12.2.3 Length calculations

12.3 Wire ropes

12.3.1 Wire rope construction

12.3.2 Specification of wire ropes and core material

13. LUBRICANTS AND LUBRICATING SYSTEMS 4HRS

13.1 Needs and purpose of lubrication

13.2 Kinds of lubricants and their uses

13.3 Methods of lubricants

14. SEALS AND SEALINGS 3HRS

14.1 Needs and purpose of seals

14.2 Materials,

14.3 sealing devices and sealing methods

15. SPRINGS AND DAMPERS 2HRS

15.1 Definition, types (load & Shape) and uses of springs

15.2 Types of spring ends

15.3 Material of springs

15.4 Dampers, Types, uses and their materials

16. LINKS, CAMS, ECCENTRICS 2HRS

16.1 Definition of inks, cams and eccentrics

16.2 Construction of inks, cams and eccentrics

16.3 Uses

16.4 Terminology and types of cams follow with drawing exercises.

RECOMMENDED BOOKS

1-Machine Design by Khurmi

2-First year Engineering drawing by A.s.Parkinson

3-Machine Element S.P.I.T Mannual

MW-202 **MACHINE ELEMENTS**

INSTRUCTIONAL OBJECTIVES

1. INTRODUCTION

1.1. Introduction to the subject, need and its importance

1.2 Explain different Fastening devices and its types(temporary and permanent)

2. UNDERSTAND RIVETS AND RIVETED JOINTS

2.1 Definition Riveting

2.2 Sketch rivet and label its parts

2.3 Describe Classification of rivets

2.4. Explain Types of riveted joints and terminology

2.5 Explain Riveting processes and devices

3. UNDERSTAND KEYS AND COTTER JOINTS

3.1 Define Key and cotter

3.2 Enlist Material used

3.3 Explain different Types of keys

3.4 Explain uses of keys and cotter

4. UNDERSTAND THREADS

4.1 Explain Types of threads

4.2 Describe thread Terminology

4.3 Explain Uses of threads

5. UNDERSTAND SCREWS

5.1 Describe Classification of screws

5.2 Explain Common locking devices for general machines and automatic components

6. UNDERSTAND SHAFT AND AXELS

6.1 Differentiate between shaft and axels

6.2. State shaft Materials

6.3 Describe different Types of shafts and uses

6.4 State factors on which Shaft strength based

7. UNDERSTAND WASHERS

7.1 Describe Types of washers

7.2 Locking and locking devices arrangement

7.3 Types of locking devices

8. UNDERSTAND COUPLING AND CLUTCHES

8.1 Define coupling and clutches

8.2 Describe Types of coupling and clutches

8.3 Explain Uses of coupling and clutches

1. UNDERSTAND SHRINKAGE AND PRESS FIT JOINTS

9.1 Explain Types of fits

9.2 Definition of Tolerance and allowance

9.3 Explain Types of tolerance, limits and its types

10. UNDERSTAND BEARINGS

10.1 Define bearing

10.2 Classify bearing according to load

10.3 Classify bearing according to friction

10.4 Describe Construction of bearing

10.5 Describe about Bearing maintenance.

11. UNDERSTAND GEARS AND GEAR TRANSMISSION

11.1 Define Terminology used in spur gear

11.2 Describe Typesof gears and gear transmission

11.3 Describe Material used in Gear, maintenance and care

11.4 Compute formula for Spur Gear calculation

12. UNDERSTAND FLEXIBLE TRANSMISSION DEVICES

12.1 Describe flexible transmission devices

12.1.1 Describe Sprocket and chains

12.1.2 Describe Types of chains

12.1.3 Explain Material used and construction of roller chains

12.1.4 Explain Maintenance procedure for chains

12.2 Define Belt drives

12.2.1 Describe Types of belt drives

12.2.2 State Assembly instructions

12.2.3 Derive formula for calculation of belt Length

12.3 Define Wire ropes

12.3.1 Describe Wire rope construction

12.3.2 Explain Specification of wire ropes and core material

13. UNDERSTAND LUBRICANTS AND LUBRICATING SYSTEMS

13.1 Describe Needs and purpose of lubrication

13.2 Describe Kinds of lubricants and their uses

13.3 Explain Methods of lubricants

14. UNDERSTAND SEALS AND SEALINGS

14.1 Describe Needs and purpose of seals

14.2 Describe Materials used in seals

14.3 Explain sealing devices and sealing methods

15. UNDERSTAND SPRINGS AND DAMPERS

15.1 Describe types of springs according to load and shape and uses of springs

15.2 Describe Types of spring ends

15.3 Describe Material of springs

15.4 Describe Dampers, Types, uses and their materials

16. UNDERSTAND LINKS, CAMS, ECCENTRICS

16.1 Define links, cams and eccentrics

16.2 Describe construction of links, cams and eccentrics

16.2 Explain Uses

16.3 Describe Terminology and types of cams follow with drawing exercises.

MW-212	MACHINE AND TOOLS	T	P	C
Total Contact Hours 64 HR		2	0	2

COURSE CONTENTS:

1. **INTRODUCTION TO MACHINIST TRADE** **2HRS**
   - 1.1 Classification of Hand Tools (Measuring Tools, Layout Tools, Cutting Tools, Assembly Tools)
   - 1.2 Introduction of machines used in Bench work
2. **MEASURING TOOLS** **2HRS**
   - 2.1 Steel rule
   - 2.2 Try square
   - 2.3 Inside Caliper
   - 2.4 Outside caliper
3. **LAYING OUT TOOLS** **3HRS**
   - 3.1 Metal surface preparation
   - 3.2 Surface plate
   - 3.3 Angle plate
   - 3.4 Scriber
   - 3.5 Divider
   - 3.6 Surface gauge
   - 3.7 Combination set
   - 3.8 Beam Trammel
4. **CUTTING TOOLS** **2HRS**
   - 4.1 Introduction to hand Hack sawing
   - 4.2 Principle parts of hand hack saw
   - 4.3 Types of Hack saws and their uses
   - 4.4 Hack saw blades, types, uses, setting
   - 4.5 Selection of blades for different jobs and materials
5. **FILES** **2HRS**
   - 5.1 Files and Filing
   - 5.2 Parts of a File
   - 5.3 Classification of files and their uses according to the shape, grade, cut and size

5.4 Cares of Files

5.5 Precautions during filing

6. PUNCHES **2HRS**

6.1 Definition and uses of punches

6.2 Centre Punch

6.3 Prick Punch

6.4 Drift Punch

6.5 Automatic center Punch / Self Centering punch

7. CHIESELS AND CHISELING **3HRS**

7.1 Types of Chisels with respect to shape and their uses

7.2 Flat chisel

7.3 Round nose Chisel

7.4 Cape or cross cut chisel

7.5 Diamond point chisel

7.6 Types of chisel (Hot or Cold)

7.7 Heat treatment of chisel

7.8 Grinding the angle of Flat chisel

7.9 Precautions during chiseling

8. INTRODUCTION TO TINNER'S SNIP OR SHEAR **2HRS**

8.1 Straight snip

8.2 Universal shears

8.3 Pipe snip

8.4 Bench shear

9. SCREW DRIVERS **2HRS**

9.1 Definition and use of Light duty screw driver

9.2 Heavy duty screw driver

9.3 Phillips screw driver

9.4 Double ended Offset screw Driver

10. PLIERS **2HRS**

10.1 Definition and use of slip joint or Combination pliers

10.2 Needle nose or Long nose pliers

10.3 Diagonal (side cutting Pliers)

11. WRENCHES **2HRS**

11.1	Single ended wrench
11.2	Double ended wrench
11.3	Closed ended wrench
11.4	Twelve point Box wrench
11.5	Adjustable open ended wrench (Monkey wrench)
11.6	Lever jaw wrench
11.7	Pin hook wrench/ Spanner
11.8	Adjustable hook spanner wrench
11.9	Adjustable pin face wrench
11.10	Tee socket wrench
11.11	Offset socket wrench
11.12	Allen wrench or Hex Key
11.13	Strap wrench
11.14	Ratchet wrench
11.15	Pipe wrench

12. HAMMERS (DEFINITION AND USES) **2HRS**

12.1	Types of Machinist hammer
12.2	Ball peen hammer
12.3	Cross peen hammer
12.4	Straight peen hammer
12.5	Claw hammer
12.6	Black smith hammer
12.7	Hand hammer
12.8	Heavy ball peen hammer
12.9	Heavy cross peen hammer
12.10	Flat faced sledge hammer
12.11	Straight peen sledge hammer

13. VICES,CLAMPS AND BLOCKS (CONSTRUCTION AND USES) **2HR**

13.1	Bench vice
13.2	Pipe vice
13.3	Leg vice

14. DRILLS **3HRS**

14.1 Main parts of drills and their function

14.2 Types of drills

14.3 Taper shank

14.4 Straight shank

14.5 Counter sink drill

14.6 Drill point and lip clearance angle for different materials

14.7 Calculation of the R.P.M and feeds of Twist drill

15. DRILL MACHINES **3HRS**

15.1 Drill press, parts of a standard drill press

15.2 Types of Drill press

15.3 Standard drill press (Floor type)

15.4 Standard drill press (Bench type)

15.5 Radial drill press

15.6 Gang drill press

16. REAMERS **2HRS**

16.1 Fluted Chucking reamer

16.2 Rose Reamer

16.3 Shell Reamer

16.4 Taper pin Reamer

16.5 Jobber's Reamer

17. TAPS AND DIES **2HRS**

17.1 Types

17.2 Uses

17.3 Cares of taps and dies during operation

18. DRIFTS **2HRS**

18.1 Pin drifts

18.2 Key drifts

19. MEASURING INSTRUMENTS **4HRS**

19.1 Vernier Caliper (Metric System)

19.2 Metric system micrometer

20. LATHE MACHINE **4HRS**

20.1 Introduction to Centre lathe, size and capacity of lathe

20.2 Principle parts of lathe, their functions, care maintenance and precautions

20.3 Lathe accessories

20.4 Face plate

20.5 Dog carrier

20.6 Centers

20.7 Four jaw chuck, three jaw chuck, collets, mandrills, types and their uses

21. LATHE CUTTING **3HRS**

21.1 Types of cutting tools e.g turning tools, parting off, boring, knurling tools

21.2 Tool material, high carbon steel, high speed steel, tungsten carbide tipped tools and their cutting ability

21.3 Tool angles and their effects in cutting

21.4 Tool holders

21.5 Tool grinding procedures and precautions

22. LATHE OPERATIONS **5HRS**

22.1 Facing

22.2 Centering

22.3 Parallel turning step turning

22.4 Taper turning

22.5 Knurling

22.6 Drilling

22.7 Reaming

22.8 Boring and countersinking

23. CUTTING SPEED AND FEED **3HRS**

23.1 Factors governing speed, feed and depth of cut

23.2 Calculation of cutting speeds, R.P.M for different materials

24. TAPERS AND TAPER TURNING **2HRS**

24.1 Standard tapers e.g Brown and Sharp jame & Morso

24.2 Taper calculation

24.3 Methods of taper turning

25. THREAD CUTTING **2HRS**

25.1 Calculation for single pitch threads

25.2 Machine set up

25.3 Finishing and checking of threads

26. PEDESTAL GRINDER **1HR**

26.1 Introduction to pedestal grinder

26.2 Safety precautions

RECOMMENDED BOOKS

1. Machine Tool Operation, Vol I and II by Henry D. Burghard Aeron Azerlad & james Anderson (McGraw Hill)
2. Machine shop Operation and Set ups by Porter LawsheLascod
3. Shop Theory by H.Ford Trade School
4. Shop Theory by James Anderson & Earl E Tatro 6th Edition Tata McGRAW-HILL

MW-212 MACHINE & TOOLS

INSTRUCTIONAL OBJECTIVES

1. KNOW MACHINIST TRADE

1.1 Describe Hand Tools (Measuring Tools, Layout Tools, Cutting Tools, Assembly Tools)

1.2 Describe Bench work & Machinist work

2. UNDERSTAND MEASURING TOOLS

2.1 Enlist types of Steel rule

2.2 Explain each type of Steel rule

2.3 State use of Try square

2.4 Compare use of Inside Caliper & Outside caliper

3. UNDERSTAND LAYING OUT TOOLS

3.1 Explain use of Metal surface preparation

3.2 Explain use of Surface plate

3.3 Explain use of Angle plate

3.4 Explain use of Scriber

3.5 Explain use of Divider

3.6 Explain use of Surface gauge

3.7 Explain use of Combination set

3.8 Explain use of Beam Trammel

4. UNDERSTAND CUTTING TOOLS

4.1 State Principle parts of hand hack saw

4.2 State Types of Hack saws and their uses

4.3 Explain uses of the various Types of Hand saw

4.4 Explain types and uses of Hack saw blades

4.5 Explain term setting of the blade

4.6 Apply method of cutting by Hand hack saw

4.7 Explain Selection of blades for different jobs and materials

4.8 Observe precautions during Hack sawing

5. UNDERSTAND FILES

5.1 Sketch File and label its parts

5.2 State Classification and uses of Files according to the shape, grade, cut and size

5.3 Explain Cares of Files

5.4 Observe Precautions during filing

6. UNDERSTAND PUNCHES

6.1 Definition and uses of punches

6.2 Explain Centre Punch

6.3 Explain Prick Punch

6.4 Explain Drift Punch

6.5 Explain Automatic center punch / Self Centering punch

7. UNDERSTAND METHODS & PROCEDURE OF CHIESELS AND CHISELING

7.1 Classify Chisels

7.2 State use of Flat chisel

7.3 State use of Round nose Chisel

7.4 State use of Cape or cross cut chisel

7.5 State use of Diamond point chisel

7.6 Describe Hot Chisel

7.7 Describe Cold Chisel

7.8 Observe safety precautions during chipping

8. UNDERSTAND TINNER'S SNIP OR SHEAR

8.1 Define Tinner's Snip

8.2 State use of Straight snip

8.3 State use of Universal shears

8.4 State use of Pipe snip

8.5 State use of Bench shear

9. UNDERSTAND TYPES AND USES OF SCREW DRIVERS

9.1 Enlist Types of Screwdrivers

9.2 State use of Light duty screw driver, Phillips screw driver, Heavy duty screw driver Double ended Offset screw Driver

10. UNDERSTAND PLIERS

10.1 Enlist types of pliers

10.2 Explain function and use of slip joint pliers or combination pliers, Needle nose or long nose pliers, Diagonal (side cutting Pliers)

11. UNDERSTAND WRENCHES

11.1 Enlist types of wrenches

11.2 Explain the functions and use of each Wrench

12. UNDERSTAND HAMMERS AND ITS TYPES

12.1 Sketch Machinist hammer (Ball peen hammer, Cross peen hammer, Straight peen hammer)

12.2 State use of Ball peen hammer, Cross peen hammer and Straight peen hammer

12.3 Explain use of Claw hammer

12.4 Explain use of Black smith hammer or Hand hammer

12.5 Explain use of Heavy cross peen Sledge

12.6 Explain use of Heavy Straight peen Sledge

12.7 Explain use of Flat faced sledge hammer

12.8 Straight peen sledge hammer

13. UNDERSTAND VICES,CLAMPS AND BLOCKS

13.1 Explain construction of Bench vice

13.2 Explain construction of Pipe vice

13.3 Explain construction of Leg vice

14. UNDERSTAND DRILLS AND DRILLING PROCEDURE

14.1 Sketch Different parts of drills and their function

14.2 Explain Function of each part of drill

14.3 State use of Taper shank

14.4 State use of Straight shank

14.5 State use of Counter sink drill

14.6 State Drill point and lip clearance angle for different materials

14.7 Describe formula to Calculate R.P.M of Twist drill

14.8 Calculate feed of Twist drill

15. UNDERSTAND TYPES OF DRILL MACHINES

15.1 Enlist parts of Standard Drill press

15.2 State Types of Drill press

15.3 Describe and use of Standard drill press (Floor type)

15.4 Describe and use Standard drill press (Bench type)

15.5 Describe and use Radial drill press

15.6 Describe and use Gang drill press

16. UNDERSTAND REAMERS AND REAMING

16.1 Enlist Types of Reamers

16.2 State use of Fluted Chucking reamer

16.3 State use of Rose Reamer

16.4 State use of Shell Reamer

16.5 State use of Taper pin Reamer

16.6 State use of Jobber's Reamer

17. UNDERSTAND TAPS AND DIES

17.1 Define Taps and Dies

17.2 Differentiate between Taps and Dies

17.3 State use of Taps and Dies

17.4 Apply Care of taps and dies during operation

18. UNDERSTAND DRIFTS

18.1 Describe Drift

18.2 Enlist types of Drifts

18.3 Explain function of Drifts

18.4 State use of Pin drift

18.5 State use of Key drift

19. UNDERSTAND PRECISION MEASURING INSTRUMENTS

19.1 Describe working principle of Vernier Caliper (Metric System)

19.2 Describe working principle of micrometer (Metric system)

19.3 State talking of reading on Vernier caliper and Micro meter

20. UNDERSTAND LATHE MACHINE

20.1 Sketch main parts of a Centre Lathe

20.2 State size and capacity of lathe

20.3 Explain functions of main parts of a Lathe

20.4 Enlist Lathe accessories

20.5 Describe function of accessories used in Lathe

20.6 Observe precautions in Lathe

21. UNDERSTAND LATHE CUTTING TOOLS

21.1 Enlist Types of cutting tools e.g turning tools, parting off, boring, knurling tools

21.2 Enlist Tool material, high carbon steel, high speed steel, tungsten carbide tipped tools and their cutting ability

21.3 Describe Tool materials

21.4 Explain Tool angles and their effects in cutting

21.5 State use of Tool holders

21.6 Practice grinding procedure of Lathe tool

21.7 Observe precautions during tool grinding

22. UNDERSTAND LATHE OPERATIONS

22.1 Explain Facing

22.2 Explain Centering

22.3 Explain Parallel turning step turning

22.4 Explain Taper turning

22.5 Explain Knurling

22.6 Explain Drilling

22.7 Explain Reaming

22.8 Explain Boring and countersinking

22.9 Observe safety in Lathe operation

23. UNDERSTAND CUTTING SPEED AND FEED

23.1 Enlist Factors governing speed, feed and depth of cut

23.2 Calculate cutting speeds, R.P.M for different materials

24. UNDERSTAND TAPERS AND APPLY TAPER TURNING

24.1 Describe types of Standard tapers (Brown and Sharp, jarno & Morse)
24.2 Describe method of Taper turning by tail stock offset method
24.3 Describe method of Taper turning by Compound rest Methods
24.4 Describe method of Taper turning by taper turn attachment
24.5 Calculate taper turning elements

25. UNDERSTAND AND APPLY THREAD CUTTING

25.1 Calculate gear train for single pitch thread

25.2 Set Machine for thread cutting

25.3 Finish and check the thread

26. UNDERSTAND PEDESTAL GRINDER

26.1 Explain the proper use of pedestal grinder

26.2 Observe Safety during grinding and wheel dressing

MW-272 PIPE LAOUT

Total Contact hours:

		T	P	C
Theory	**32 hours**			
Practical	**96 hours**	**1**	**3**	**2**

COUERSE CONTENTS

1. TYPES OF PIPES **2HRS**

1.1 G.I Pipe

1.2 C.I pipe

1.3 Steel pipes

1.4 Cement Pipes

1.5 Copper pipe and tubes

1.6 PVC pipes

1.7 PPR pips

2. TOOLS IN PIPE LAYOUT **2HRS**

2.1 Pipe cutting by hacksaw

2.2 Pipe cutting by a pipe cutter

2.3 Types of pipe wrenches

2.4 Types of dies for pipe threading

2.5 Adjustable dies

2.6 Pipe measuring tapes

2.7 Pipe fitting tools

2.8 Pipe joining heater

3. PIPE FITTING PROCEDURE **2HRS**

3.1 Fitting of an elbow with G.I pipe

3.2 Use of union in pipe fitting

3.3 Fitting of pipe bends, nipples and barrel nipple

3.4 To connect cross and tee with a G.I pipe

4. LAYOUT OF A SYSTEM IN PIPE FITTING 3HRS

4.1 Preparing the layout for hot and cold lines in pipe fittings

4.2 Pipe bending methods up to 4 inch dia

4.3 Methods of pipe joining of 6 inch dia and above

4.3.1 Joining through socket

4.3.2 Joining with flanges

4.3.3 Joining by welding

5. INSPECTION OF THE ASSEMBLED SYSTEM 2HRS

5.1 Visual inspection

5.2 Testing with air pressure

5.3 Testing with water pressure and other liquid materials and its remedy

6. PIPE DRAFTING AND SYMBOLS 4HRS

6.1 Different symbols used in pipe fittings

6.2 Pipe holding devices such as clamps, stands, fixtures etc.

6.3 Pattern development of pipes 35^{o} with a flat plate

6.4 Methods used in pattern development

7. FABRICATION OF PIPES 5HRS

7.1 Methods of pipe fabrication

7.2 Fabrication by gas welding

7.3 Fabrication by arc welding

7.4 Fabrication of pipe furniture

8. PLASTIC PIPES 2HRS

8.1 Use of plastic pipes in building construction

8.2 Use of plastic pipes in electrification and installation

8.3 Use of plastic pipes in telephone installation and telephone industry

8.4 Plastic pipes / glass pipes for gas and petroleum transportation

8.5 PVC Pipes

8.6 PPR Pipes

9. PIPE LAYOUT CALCULATION 2HRS

9.1 Pipe mensuration

9.2 Pipe insulation from heat, coldness and electrical equipment and appliances

10. WELDING OF PIPES 3HRS

10.1 Welding pipes of gas lines

10.2 Welding pipes of water line

10.3 Welding pipes of petroleum products such as furnace oil, crude oil petrol etc.

11. PIPING ASME CODES AND STANDARDS 5HRS

11.1 Power piping (B31.1) (Aboveground)

11.2 Fuel gas piping (B31.2) (Aboveground)

11.3 Process piping (B31.3) (Aboveground)

11.4 Liquid Hydrocarbon Transportation piping Oil cross Country pipelines (B31.4) (Buried)

11.5 Refrigeration piping (B31.5) (Aboveground)

11.6 Chemical plant piping (B31.6) (Aboveground)

11.7 Nuclear power piping (B31.7) (Aboveground)

11.8 Gas transportation piping cross country gas pipelines (B31.8) (Buried)

11.9 Building Services Piping (B31.9) (office building hot water heating and air conditioning) (Aboveground)

11.10 Cryogenic Piping, never issued as a separate document, folded into B31.3(B31.10) (Aboveground)

11.11 Slurry Transportation Piping (cross country coal/water slurries) (B31.11) (Buried)

RECOMMENDED BOOKS:

1. Fundamentals of Pipe Drafting by CHARLES H. THOMPSON
2. ASME Piping Codes & Standards

MT-272 PIPE LAYOUT

INSTRUCTIONAL OBJECTIVES

1. UNDERSTAND DIFFERENT TYPES OF PIPES

1.1 State and use of G.I Pipe

1.2 State and use of C.I pipe

1.4 State and use of Steel pipes

1.5 State and use of Cement Pipes

1.6 State and use of Copper pipe and tubes

1.7 State and use of PVC pipes

1.8 State and use of PPR pipes

2. UNDERSTAND LAYOUT TOOLS IN PIPE LAYOUT

2.1 Describe Pipe cutting by hacksaw

2.2 Describe Pipe cutting by a pipe cutter

2.3 Enlist Types of pipe wrenches

2.4 Enlist Types of dies for pipe threading

2.5 Describe Adjustable dies

2.6 State Pipe measuring tapes

2.7 Describe Pipe fitting tools

2.8 State Pipe joining heater

3. UNDERSTAND PIPE FITTING PROCEDURE

3.1 Describe Fitting of an elbow with G.I pipe

3.2 Describe Use of union in pipe fitting

3.3 Describe Fitting of pipe bends, nipples and barrel nipple

3.4 Describe connections of cross and tee with a G.I pipe

4. UNDERSTAND LAYOUT OF A SYSTEM IN PIPE FITTING

4.1 Preparing the layout for hot and cold lines in pipe fittings

4.2 Explain Pipe bending methods up to 4 inch dia

4.3 Explain Methods of pipe joining of 6 inch dia and above

4.3.1 Describe joining through socket

4.3.2 Describe joining with flanges

4.3.3 Describe joining by welding

5. UNDERSTAND INSPECTION OF THE ASSEMBLED SYSTEM

5.1 State Visual inspection

5.2 State Testing with air pressure (Pneumatic Pressure Method)

5.3 Explain testing with water pressure (Hydro pressure Testing) and other liquid materials and its remedies.

6. UNDERSTAND PIPE DRAFTING AND SYMBOLS

6.1 State Different symbols used in pipe fittings

6.2 Enlist and uses of Pipe holding devices such as clamps, stands, fixtures etc.

6.3 Describe Pattern development of pipes 35^{o} with a flat plate

6.4 Describe Methods used in pattern developments

7. UNDERSTAND FABRICATION OF PIPES

7.1 Enlist Methods of pipe fabrication

7.2 Explain Fabrication by gas welding

7.3 Explain Fabrication by arc welding

7.4 Explain Fabrication of pipe furniture

8. UNDERSTAND PLASTIC PIPES

8.1 Explain use of plastic pipes in building construction

8.2 Explain use of plastic pipes in electrification and installation

8.3 Explain use of plastic pipes in telephone installation and telephone industry

8.4 Explain Plastic pipes / glass pipes for gas and petroleum transportation

8.5 Explain PVC Pipes

8.6 Explain PPR Pipes

9. PIPE LAYOUT CALCULATION

9.1 State Pipe mensuration

9.2 State Pipe insulation from heat, coldness and electrical equipment and appliances

10. UNDERSTAND WELDING OF PIPES

10.1 Explain Welding pipes of gas lines

10.2 Explain Welding pipes of water line

10.3 Explain Welding pipes of petroleum products such as furnace oil, crude oil petrol etc.

11. UNDERSTAND PIPING ASME CODES AND STANDARDS

11.1 State Power piping (B31.1) (Aboveground)

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11.11 State Slurry Transportation Piping (cross country coal/water slurries) (B31.11) (Buried)

MW-272 PIPE LAYOUT

LIST OF PRACTICAL **96 HRS**

1 Introduction to pipe cutting tools and their respective uses in pipe layout.
2 Pipe (GI&PPR) cutting by a pipe cutter, using pipes of various diameters
3 Pipe (GI&PPR) cutting by hacksaw and PPR cutter
4 Threading of GI pipe by a pipe threading die
5 Pipe threading on a GI pipe by an adjustable die
6 To connect a (GI&PPR) Elbow, Tee, Union with (GI&PPR) Pipes
7 Layout of a system of all pipe fittings
8 Inspection(Pneumatic & Hydro Testing) of the Assembled system and its remedies
9 Pattern development of pipes at 35 degree by a GI sheet
10 Fabrication of development of pipes at 35 degree on a MS sheet by Gas welding
11 Pattern development of pipes of same diameters at 60 degree by a GI sheet
12 Pattern development of pipes of same diameters at 60 degree on MS sheet by gas welding
13 Pattern development of pipes of same diameters at 90 degree by a GI sheet
14 Pattern development of pipes of same diameters at 90 degree on MS sheet by gas welding
15 Pattern development of two pipes of different diameters at 90 degree on GI sheet
16 Pattern development of two pipes of different diameters at 90 degree on MS sheet by gas welding
17 Pipe bending at 90 degree by bending device and vice
18 Pipe Butt joint (1G, 2G, 3G, 5G) on Schedule-40 by SMAW Process

MW-285 WORKSHOP PRACTICE-II

		T	P	C
Practical	**480 hours**	**0**	**15**	**5**

LIST OF PRACTICALS

	Sr. No	Name of Joints	Practical Hours
ARC WELDING	1	Square butt joint horizontal position M.S Flat 200x50x6mm 2pcs	**180 HRS**
	2	Lap joint horizontal position 0r 2-F M.S Flat 200x50x6mm 2pcs	
	3	Tee joint horizontal position 0r 2-F M.S Flat 200x50x6mm 2pcs	
	4	Corner joint horizontal position 0r 2-F M.S Flat 200x50x6mm 2pcs	
	5	Single V Butt joint Flat position or I-G M.S Flat 200x50x8mm 2pcs	
	6	Single V Butt joint Horizontal position or 2-G M.S Flat 200x50x8mm 2pcs	
	7	Single V Butt joint Vertical position or 3-G M.S Flat 200x50x8mm 2pcs	
	8	Square butt joint Vertical position M.S Flat 200x50x6mm 2pcs	
	9	Tee joint vertical position 0r 3-F M.S Flat 200x50x6mm 2pcs	
	10	Corner joint vertical position 0r 3-F M.S Flat 200x50x6mm 2pcs	
	11	Pipe to pipe weld 1-G Schedule 40 Ø 6inch 2pcs (L=6" Each Piece)	
	12	Pipe to pipe weld 1-G Schedule 60 Ø 6inch 2pcs (L=6" Each Piece)	

	13	Pipe to pipe weld 1-G Schedule 40 Ø 8inch 2pcs (L=6" Each Piece)	
	14	Pipe to pipe weld 1-G Schedule 60 Ø 8inch 2pcs (L=6" Each Piece)	
	15	Pipe to pipe weld 2-G Schedule 40 Ø 6inch 2pcs (L=6" Each Piece)	
	16	Pipe to pipe weld 2-G Schedule 60 Ø 6inch 2pcs (L=6" Each Piece)	
	17	Pipe to pipe weld 2-G Schedule 40 Ø 8inch 2pcs (L=6" Each Piece)	
	18	Pipe to pipe weld 2-G Schedule 60 Ø 8inch 2pcs (L=6" Each Piece)	
	19	Pipe to pipe weld 5-G Schedule 40 Ø 6inch 2pcs (L=6" Each Piece)	
	20	Pipe to pipe weld 5-G Schedule 60 Ø 6inch 2pcs (L=6" Each Piece)	
	21	Pipe to pipe weld 5-G Schedule 40 Ø 8inch 2pcs (L=6" Each Piece)	
	22	Pipe to pipe weld 5-G Schedule 60 Ø 8inch 2pcs (L=6" Each Piece)	
GAS WELDING	1	Lap joint Horizontal position fore hand technique M.S Flat 200x50x3mm 2pcs	**140 HRS**
	2	Butt joint Horizontal position fore hand technique M.S Flat 200x50x3mm 2pcs	
	3	Tee joint Horizontal position fore hand technique M.S Flat 200x50x3mm 2pcs	
	4	Corner joint Horizontal position fore hand technique M.S Flat 200x50x3mm 2pcs	
	5	Brazing (M.S) flat position down hand technique M.S Flat 200x50x3mm 2pcs	
	6	Stainless steel square butt flat position down hand technique	

		S.S Plate 200x50x3mm 2pcs	
	7	Copper welding (square butt joint) down hand technique Copper Plate200x50x3mm 2pcs	
	8	Gas cutting practice of different materials	
SHEET METAL WORK	1	Development of Two piece 90^0-Elbow G.I Sheet	**96 HRS**
	2	Development of Three piece 90^0 -Elbow G.I Sheet	
	3	Development of Funnel G.I Sheet	
	4	Development of Y-Joint G.I Sheet	
	5	Pipe to Pipe connection G.I Sheet	
	6	Pipe to Plate connection(in word fold) G.I Sheet	
	7	Pipe to Plate connection(out word fold) G.I Sheet	
	8	Tee-Joint of similar diameter of pipes G.I Sheet	
	9	Tee-Joint of dis-similar diameter of pipes G.I Sheet	
MACHINE WORK	1	Facing M.S Rod Ø 1 inch x10 inch	**64 HRS**
	2	Turning M.S Rod Ø 1 inch x10 inch	
	3	Step Turning M.S Rod Ø 1 inch x10 inch	
	4	Parting off M.S Rod Ø 1 inch x10 inch	
	5	Taper turning	

		M.S Rod Ø 1 inch x10 inch	
	6	Knurling M.S Rod Ø 1 inch x10 inch	
	7	Boring	
	8	Thread cutting	

اسلامیات/مطالعہ پاکستان

نصاب (سال سوم)

		ٹی	پی	سی
حصہ اول	اسلامیات Gen 311	1	0	1

حصہ دوم مطالعہ پاکستان

موضوعات کل وقت 20 گھنٹے

1 قرآن مجید

سورۃ الفاتحہ۔آیۃ الکرسی ۔سورۃ البقرہ کی آخری آیات از امن الرسول تا آخراور سورہ اخلاص معہ ترجمہ وتشریح

2 دس منتخب احادیث معہ ترجمہ وتشریح

- بنی الاسلام علی خمس شهادة ان لا اله الا الله و اقام الصلوة و ايتاء الزكوة و حج البيت وصوم رمضان
- الدين النصيحه
- المستشار الموتمن
- للمومن على المومن ست خصال يعوده اذا مرض و يشمته اذا مات ويجيبه اذا دعاه ويسلم عليه اذالقيه و يشمت اذا عطس و ينصح له اذاغاب او شهد لا تخن من خانک
- لا يدخل الجنة قاطع
- ان الله حرم عليكم عقوق الامهات و اضاعة المال
- يسرا ولا تعسرا بشراً ولا تنفرا
- ذاق طعم الايمان من رضى بالله و بالاسلام دينا و بمحمدنبياً
- افضل الذكر لااله الا الله

3 حقوق وفرائض

حصول تعلیم بطور فرض ، والدین اور اولاد کے حقوق وفرائض، ہمسایہ کے حقوق

4 اسلام کی اخلاقی اقدار

صبر واستقلال۔عفوودرگزر۔ایفائے عہد۔اخوت۔ایثار وقربانی

نصاب اخلاقیات (غیر مسلم طلباء کے لئے)

ٹی	پی	سی
1	0	1

سال سوم Gen-311

کل وقت 20 گھنٹے

موضوعات

- احساس ذمہ داری
- مثبت ذہن
- عدل وانصاف
- قومی خدمت کا جذبہ
- فکر ونظر کی پاکیزگی
- احترام آدمیت
- شائستگی
- عفوودرگذر
- بردباری
- خودانحصاری
- اثر ونفوذ
- جامعیت
- اپنی ذات کا معرفت (بذریعہ ہم عصر طلباء اساتذہ اہم شخصیات وغیرہ)

منتخب احادیث

عمومی مقصد۔ احادیث کی روشنی میں اسلامی تعلیمات پر عمل پیرا ہو سکے۔

خصوصی مقاصد

- احادیث کا ترجمہ بیان کر سکے۔
- احادیث کی تشریح کر سکے۔
- معاشرتی اور انفرادی زندگی میں احادیث سے راہنمائی حاصل کر سکے۔

حقوق و فرائض

عمومی مقصد ۔ اسلامی معاشرے کا ایک اچھا فرد بن سکے۔

خصوصی مقاصد

- والدین کے حقوق وفرائض بیان کر سکے۔

نصاب (سال سوم)

مطالعہ پاکستان	Gen-311	ٹی	پی	سی
		1	0	1

حصہ دوم

کل وقت 12 گھنٹے

قیام پاکستان

موضوعات

- باؤنڈری کمیشن
- ریڈکلف ایوارڈ
- تقسیم بنگال وکلکتہ
- تقسیم پنجاب
- مسئلہ مہاجرین
- ریاستوں کا الحاق
- ریاست جموں وکشمیر
- نہری پانی کا تنازعہ
- قرارداد مقاصد
- علماء کے بائیس نکات
- 1956 - 1962 اور 1973 کے دساتیر کی اسلامی دفعات
- پاکستان کا محل وقوع اور اس کی جغرافیائی اہمیت
- قدرتی وسائل (تیل، گیس، کوئلہ)

مطالعہ پاکستان

حصہ دوم

قیام پاکستان

تدریسی مقاصد

عمومی مقصد: قیام پاکستان کے بعد درپیش مسائل سے آگاہی حاصل کرے اور بیان کرے۔

خصوصی مقاصد

- باؤنڈری کمیشن کی تشکیل اور اس کے فرائض بیان کر سکے۔
- ریڈکلف اور اس کے ایوارڈ کے بارے میں بیان کر سکے۔
- بنگال اور کلکتہ کی تقسیم کی وجوہات بیان کر سکے۔
- پنجاب کی تقسیم کی تفصیل بیان کر سکے۔
- مہاجرین کی آمد سے جو مسائل پیدا ہوئے انہیں بیان کر سکے۔
- ریاستوں کے الحاق کے بارے میں تفصیل بیان کر سکے۔
- ریاست جموں کشمیر کے بارے میں بیان کر سکے۔
- نہری پانی کے تنازعہ کو بیان کر سکے۔
- قرارداد مقاصد کی تفصیلات بیان کر سکے۔
- 22 علماء کے متفقہ اسلامی نکات بیان کر سکے۔
- قیام پاکستان کے بعد نفاذ اسلام کی کوششوں کو بیان کر سکے۔
- پاکستان کے محل وقوع اور اس کی جغرافیائی اہمیت بیان کر سکے۔
- پاکستان میں قدرتی وسائل (تیل، گیس، کوئلہ) کے بارے میں بیان کر سکے۔

IMH-311 **INDUSTRIAL MANAGEMENT AND HUMAN RELATIONS**

Total Contact Hours		**T**	**P**	**C**
Theory	**32**	**1**	**0**	**1**

AIMS The study of this subject will enable the student to develop the management skill, acquaint him with the principles of management and human relations and develop psychological approach to solve the labor problems

Course Contents:

1.	**Industrial Psychology**	**2 Hrs**
2.	**Industrial Management**	**2 Hrs**
3.	**Planning**	**3Hrs**
4.	**Human Resource Management**	**2 Hrs**
5.	**Industrial Fatigue and Boredom**	**2 Hrs**
6.	**Industrial Prejudice**	**2 Hrs**
7.	**Human Relations**	**3Hrs**
8.	**Job Evaluation**	**3 Hrs**
9.	**Leadership**	**2Hrs**
10.	**Motivation**	**2 Hrs**
11.	**Guidance and Counseling**	**2Hrs**
12.	**Working Conditions**	**2 Hrs**
13.	**Budget as Controlling Technique**	**3Hrs**
14.	**Role of foremaninManagement**	**2 Hrs**

Detail of Contents:

1. Industrial Psychology **2 Hrs**
- 1.1 History and definition
- 1.2 Application and Importance

2. Industrial Management **2 Hrs**
- 2.1 Introduction
- 2.2 Functions of management
- 2.3 Subdivisions of management
- 2.4 Objectives of industrial management.
- 2.5 General principles of management

3. Planning **3Hrs**

3.1 Definition
3.2 Steps of Planning
3.3 Advantages

4. Human Resource Management **2 Hrs**
4.1 Recruitment and orientation of employees
4.2 Training
4.3 Effects of training on production and product cost

5. Industrial Fatigue and Boredom **2 Hrs**
5.1 Definition and distinction
5.2 Psychological causes
5.3 Objective causes
5.4 Prevention

6. Industrial Prejudice **2 Hrs**
6.1 Causes and Effects
6.2 Remedies

7. Human Relations **3 Hrs**
7.1 Importance and Roles
7.2 Functions

8. Job Evaluation **3 Hrs**
8.1 Importance
8.2 Job description and specification
8.3 Performance evaluation and job satisfaction
8.4 Work simplification

9. Leadership **2Hrs**
9.1 Definition and types
9.2 Qualities of a good leader

10. Motivation **2 Hrs**
10.1 Definition
10.2 Types
10.3 Conflict of motives
10.4 Effects of motivation on morale

11. Guidance and Counseling **2 Hrs**
11.1 Importance
11.2 Choice of job
11.3 During service

12. Working Conditions **2 Hrs**
12.1 Importance and consideration
12.2 Effects on efficiency and per unit cost

13. Budget as Controlling Technique **3Hrs**
13.1 Definition
13.2 Types
13.3 Importance

14. Role of Foreman in Management **2 Hrs**

14.1 Foreman's abilities
14.2 Duties and functions

Recommended Textbooks:

1 **Industrial PsychologybyC.S. Meyers (Publisher:Oxford University Press, London)**
2. **Psychology of Industrial Behaviors by Smith Wakley(Publisher: Mc-Graw Hill, New York)**
3. **The Process of Management by Andrew R. Megill (Publisher:William M New Man)**
4. **Management of Industrial Enterprises by Richard N Omen**

IMH-311 **INDUSTRIAL MANAGEMENT AND HUMAN RELATIONS**

Instructional Objectives:

At the completion of this course, the students will be able to:

1. **Know Industrial Psychology**
   - 1.1 Describe brief history of industrial psychology
   - 1.2 Describe in detail definition of industrial psychology
   - 1.3 State application and important of industrial psychology
2. **Understand Industrial Management**
   - 2.1 Define management
   - 2.2 State functions of management
   - 2.3 Enlist subdivision of management
   - 2.4 Explain objectives of industrial management
   - 2.5 Explain general principles of management
3. **Understand Planning**
   - 3.1 Define planning
   - 3.2 Describe step of planning
   - 3.3 Describe advantages of planning
4. **Understand Human Resource Management**
   - 4.1 Describe the recruitment procedure of employees in an industrial concern
   - 4.2 Explain training
   - 4.3 Identify the kinds of training
   - 4.4 Explain the effects of training on production and product cost
5. **Understand Industrial Fatigue and Boredom**
   - 5.1 Define fatigue and boredom
   - 5.2 Describe psychological causes of fatigue and boredom
   - 5.3 Describe objective causes of fatigue and boredom
   - 5.4 Explain measures to prevent fatigue and boredom
6. **Understand Industrial Prejudice**
   - 6.1 Define prejudice
   - 6.2 Explain causes and effects of industrial prejudice
   - 6.3 Explain remedies of industrial prejudice
7. **Understand the Human Relations**
   - 7.1 Explain importance and role of public/human relations
   - 7.2 Explain functions of public/human relations
8. **Understand Job Evaluation**
   - 8.1 Explain importance of job evaluation
   - 8.2 Explain job description and job specification

8.3 Explain performance evaluation and job satisfaction
8.4 Explain work simplification

9. Know Leadership

9.1 Define leadership
9.2 Describe types of leadership
9.3 State qualities of a good leader

10. Understand Motivation

10.1 Define motivation
10.2 Describe financial and non financial motives
10.3 Explain conflict of motives
10.4 Explain effects of motivation on moral

11. Understand the Need for Guidance and Counseling

11.1 State importance of guidance and counseling
11.2 Explain the role of guidance and counseling in choosing the job
11.3 Describe help of guidance and counseling during service

12. Understand the Effects of Working Conditions on Efficiency

12.1 Explain importance of working conditions
12.2 Describe air-conditioning, ventilation, lighting and noise
12.3 State the effects of good working conditions on efficiency and per unit cost

13. Understand Budget as Controlling Techniques

13.1 Explain budget as controlling techniques
13.2 Explain types of budgets
13.3 Explain the importance of budget as controlling technique

14. Understand the Role of foreman in Management

14.1 Explain abilities of a foreman
14.2 Enlist duties of foreman
14.3 Describe functions of foreman as middle management

Mgm-321 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 for:

1. Development of communication skills.
2. Understanding basic principles of good and effective business letter 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 of 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-321 BUSINESS COMMUNICATION.

INSTRUCTIONAL OBJECTIVES

1. **UNDERSTAND THE COMMUNICATION PROCESS.**

   1.1 Explain basic terminology of business communication

   1.2 State the benefits of two way communication.

   1.3 Describe a model of communication process.

   1.4 Explain the major communication methods used in organization.

   1.5 Identify the barriers to communication and methods of overcoming these barriers.

   1.6 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.

   2.8 Letters writing skill.

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.

8.6 Writing skill of minutes of meeting.

Ch-313 APPLIED CHEMISTRY

	T	P	C
Total Contact Hours	1	6	3
Theory 32 Hours			
Practical 192 Hours.			

Pre-requisite: The student must have studied the subject of chemistry (Ch. 112) in Ist year class.

AIM The students will be able to understand the important concepts of Chemistry of elements used in the field of Welding and Metallurgy.

COURSE CONTENTS

1. ATOMIC WEIGHT. — **3 Hours**
- 1.1 Definition and importance.
- 1.2 Determination.
- 1.3 Calculations of atomic weight.

2. MOLECULAR WEIGHT. — **3 Hours**
- 2.1 Definition.
- 2.2 Determination.
- 2.3 Calculations of Molecular Weight.

3. EQUIVALENT WEIGHT. — **3 Hours**
- 3.1 Definition.
- 3.2 Determination by oxidation method.
- 3.3 Numerical problems.

4. THERMO-CHEMISTRY. — **4 Hours**
- 4.1 General.
- 4.2 Exothermic and Endothermic Reactions.
- 4.3 Heat of combustion and calorific value.

5. HEAT AND TEMPERATURE. — **3 Hours**
- 5.1 Introduction.
- 5.2 Thermometer; scales and inter-conversion.
- 5.3 Calorimetry, specific heat.
- 5.4 Temperature measuring instruments.

6. METALLIC COATINGS. — **4 Hours**
- 6.1 General.
- 6.2 Hot dipping & spraying & tinning.
- 6.3 Electroplating, galvanization.

7. FUEL GASES.
- 7.1 General.
- 7.2 Natural Gas, Hydrogen, water-gas, producer gas, coke-oven Gas, their nature and uses.

7.3 Advantages of Gaseous fuels.

CHEMISTRY OF CARBON. **3 Hours**

8.1 Introduction.
8.2 Classification.
8.3 Chemical and physical properties.
8.4 Important uses.

CHEMISTRY OF SULPHUR. **3 Hours**

9.1 Introduction.
9.2 Extraction and its allotropic forms.
9.3 Chemical of physical properties.
9.4 Important uses.

CHEMISTRY OF PHOSPHORUS. **3 Hours**

10.1 Introduction.
10.2 Chemical & Physical properties.
10.3 Important Uses.

COMMENDED BOOKS

Chemistry Text-Book for Intermediate classes (I & II).
Polytechnic chemistry by J.N.Ready.
Ilmi applied Science, by Sh. Ata Mohammad.
Engineering Chemistry by M.A.Usmani.

Ch-313 APPLIED CHEMISTRY

INSTRUCTIONAL OBJECTIVES

1. UNDERSTAND ATOMIC WEIGHT.
   - 1.1 Define atomic weight.
   - 1.2 Describe different methods of determination of At. Wt.
   - 1.3 Solve problems on the At. Wt.

2. UNDERSTAND METHODS TO CALCULATE MOLECULAR WEIGHT.
   - 2.1 Define molecular weight.
   - 2.2 Describe methods of determination of Molecular weight.
   - 2.3 Calculate molecular weight of compounds.

3. UNDERSTAND METHODS TO DETERMINE EQUIVALENT WEIGHT.
   - 3.1 Define equivalent weight.
   - 3.2 Enlist methods of determination of Eq. Wt.
   - 3.3 Explain oxidation method.
   - 3.4 Calculate equivalent weight from the given data.

4. UNDERSTAND THE SIGNIFICANCE OF THERMO-CHEMISTRY.
   - 4.1 Define thermo-chemistry.
   - 4.2 Define heat of formation, heat of reaction and heat of combustion.
   - 4.3 Describe Hess's law of constant heat summation.
   - 4.4 Solve problems using Hess's Law.

5. UNDERSTAND SIGNIFICANCE OF HEAT AND TEMPERATURE.
   - 5.1 Define heat and temperature.
   - 5.2 Describe thermometer, temperature measuring scales and inter conversion of scales.
   - 5.3 Define calorimetry and specific heat.
   - 5.4 Describe the construction and operation of temperature measuring instruments.

6. UNDERSTAND THE PROCESS OF METALLIC COATINGS.
   - 6.1 Define the significance of metallic coatings.
   - 6.2 Describe the process of hot dipping, spraying and tinning.
   - 6.3 Explain the process of electro plating and galvanization.

7. UNDERSTAND THE NATURE AND USE OF FUEL GASES.
   - 7.1 Define fuel and fuel gases.
   - 7.2 Describe the nature of fuel gases.
   - 7.3 State the uses of fuel gases.
   - 7.4 Describe the advantages of gaseous fuels.

8. UNDERSTAND THE ROLE OF CARBON IN THE FIELD OF METALLURGY.
   - 8.1 Explain the occurrence of carbon.
   - 8.2 Give classification of carbons.
   - 8.3 State uses of carbon.
   - 8.4 Describe properties of carbon.
   - 8.5 Illustrate the Fe-C alloy diagram.

9. UNDERSTAND THE ROLE OF SULPHUR IN METALLURGY.
   - 9.1 Explain occurrence of sulphur.
   - 9.2 Give classification of sulphur.
   - 9.3 Describe properties of sulphur.
   - 9.4 State uses of sulphur.

10. UNDERSTAND THE CHEMISTRY OF PHOSPHORUS.
   - 10.1 Explain the occurrence of Phosphorus
   - 10.2 Give in detail the Physical and Chemical properties of Phosphorus.
   - 10.3 Describe important uses of Phosphorus.

Ch-313 APPLIED CHEMISTRY

LIST OF PRACTICALS

1.	Introduction to the lab and equipment.	6
2.	Units of weight and measurement of volumes.	6
3.	Construction, operation and use of analytical balance.	12
4.	Metallurgical analysis of Ni in Steel Alloy	24
5.	Metallurgical analysis of Mn in Steel Alloy.	24
6.	Metallurgical analysis of Cr in Steel Alloy	24
7.	Metallurgical analysis for Commercial Brass.	24
8.	Metallurgical analysis of Cartridge Brass.	24
9.	Metallurgical analysis of Muntz Metal.	24
10.	Metallurgical analysis of German Silver.	

MW-333 **MATERIALS TESTING**

Total contact hours:		**T**	**P**	**C**
Theory:	**32 Hours**	**1**	**3**	**2**
Practical	**96 Hours**			

COURSE CONTENTS:

1. INTRODUCTION TO THE SUBJECT. 2HRS

1.1. Physical properties of metals.

1.2 Mechanical properties of metals

1.3 Importance of material testing in industry.

2. BRINELL HARDNESS TEST. 2HRS

2.1 Hardness testing principles and procedure.

2.2 Types of indenter and measurement of indentation.

2.3 Advantages and limitation of test

3. ROCKWELL HARDNESS TEST 2HRS

3.1 Hardness testing principle and procedure.

3.2 Types of Rock well hardness testing machine.

3.3 Rockwell scale

3.4 Advantages and limitations of test

3.5 Accuracy check of machine

4. VICKER HARDNESS TEST. 2HRS

4.1 Working principle and procedure.

4.2 Measurement of indentation.

4.3 Comparison among Brinell, Rockwell and Vickers hardness tests.

5. UNIVERSAL TESTING MACHINE. 3HRS

5.1 Define Universal Testing Machine

5.2 Types of Universal Testing Machine

5.3 Essential features of Universal Testing Machine.

5.4 Accessories of Universal Testing Machine

5.5 Extensometers.

6. TENSILE TEST 4HRS

6.1 Specimens for tensile test

6.2 Procedure of tensile test

6.3 Construction of Stress and strain diagram.

6.3.1 Proportional limit

6.3.2 Yield point.

6.3.3 Yield strength.

6.3.4 Ultimate stress.

6.3.5 Necking.

6.3.6 Breaking stress.

6.3.7 Elastic range.

6.3.8 Plastic range.

7. COMPRESSION TEST. 2HRS

7.1 Procedure of Compression test.

7.2 Suitability of test.

7.3 Specimens for compression test

7.4 Compression test for Concrete Block.

7.5 Compression test for Cast Iron.

8. TORSION TEST. 2HRS

8.1 Procedure & working principle of machine

8.2 Specimen for torsion test.

9. DYE-PENETRANTTESTING. 2HRS

9.1 Specimen for Dye-Penetrant test

9.2 Procedure of Dye-Penetrant test..

9.3Advantages of Dye-Penetrant Test

9.4 Disadvantages Dye-Penetrant Test

9.5 Applications of Dye-Penetrant Test

10. RADIOGRAPHIC EXAMINATION. 3HRS

10.1 Radiographic examination techniques.

10.2 Production of X-rays and gamma rays.

10.3 Working principle and procedure of radiographic examination.

10.4 Comparison between x-rays and gamma rays test.

11. MAGNETIC PARTICLE INSPECTION 3HRS

11.1 Requirements of magnetic test

11.2 Magnetic testing methods.

11.3 Magnetizing and demagnetizing methods.

12. ULTRA-SONIC TESTING. 3HRS

12.1 Introduction of Ultrasonic testing.

12.2 Methods of Ultrasonic inspection.

13. EDDY CURRENT INSPECTION 2HRS

13.1 Introduction of Eddy current test.

13.2 Working procedure for eddy current inspection.

RECOMMENDED BOOKS

1. Testing and inspection of Engineering Material.

2. Elements of heat treatments.

3. Strength of Materials by Breneman.

4. Introduction to physical metallurgy by S. H. Avner.

5. Testing of metals by Dr. FazalKarim.

MW-333 MATERIALS TESTING

INSTRUCTIONAL OBJECTIVES:

1. KNOW ABOUT THE INTRODUCTION TO THE SUBJECT.

1.1. Define Physical properties of metals.

1.2 Define Mechanical properties of metals

1.3 Describe Importance of material testing in industry.

2. KNOW ABOUT THE BRINELL HARDNESS TEST.

2.1 State Hardness testing principles and procedure.

2.2 Explain types of indenter and measurement of indentation.

2.3 Enlist advantages and limitations of test

3. KNOW ABOUT THE ROCKWELL HARDNESS TEST

3.1 Explain Hardness testing principle and procedure.

3.2 Describe types of Rock well hardness testing machine.

3.3 State Rockwell scale.

3.4 Enlist Advantages and limitations of test

3.5 State Accuracy check of machine

4. KNOW ABOUT THE VICKER HARDNESS TEST.

4.1 Describe Working principle and procedure.

4.2 State measurement of indentation.

4.3 Explain comparison among Brinell, Rockwell and Vicker hardness tests.

5. KNOW ABOUT THE UNIVERSAL TESTING MACHINE.

5.1 Define Universal Testing Machine

5.2 Describe Types of Universal Testing Machine

5.3 Enlist Essential features of Universal Testing Machine.

5.4 Enlist Accessories of Universal Testing Machine

5.5 State Extensometer.

6. KNOW ABOUT THE TENSILE TEST

6.1 Describe Specimens for tensile test.

6.2 Explain Procedure of tensile test.

6.3 Draw and labeling of Stress and strain diagram.

6.3.1 Define Proportional limit

6.3.2 Define Yield point.

6.3.3 Define Yield strength.

6.3.4 Define Ultimate stress.

6.3.5 Define Necking.

6.3.6 Define Breaking stress.

6.3.7 Define Elastic range.

6.3.8 Define Plastic range.

7. KNOW ABOUT THE COMPRESSION TEST.

7.1 Explain Procedure of Compression test.

7.2 Describe Suitability of test.

7.3 State Specimens for compression test

7.4 Describe Compression test for Concrete Block.

7.5 Describe Compression test for Cast Iron.

8. KNOW ABOUT THE TORSION TEST.

8.1 Discuss procedure and working principle of machine.

8.2 Describe specimen for torsion test.

9. KNOW ABOUT DYE PENETRANT TESTING.

9.1 Describe Specimen for Dye-Penetrant test

9.2 Explain Procedure of Dye-Penetrant test..

9.3 EnlistAdvantages of Dye-Penetrant Test

9.4 Enlist Disadvantages Dye-Penetrant Test

9.5 Explain Applications of Dye-Penetrant Test

10. KNOW ABOUT THE RADIOGRAPHIC EXAMINATION.

10.1 Describe Radiographic examination techniques.

10.2 Explain Production of X-rays and gamma rays.

10.3 Explain Working principle and procedure of radiographic examination.

10.4 Enlist Comparison between x-rays and gamma rays test.

11. KNOW ABOUT THE MAGNETIC PARTILE INSPECTION

11.1 State Requirements of magnetic test.

11.2 Explain Magnetic testing methods.

11.3 Describe Magnetizing and demagnetizing methods.

12. KNOW ABOUT THE ULTRA-SONIC TESTING.

12.1 Introduction of Ultrasonic testing.

12.2 Explain Methods of Ultrasonic inspection.

13. KNOW ABOUT THE EDDY CURRENT INSPECTION 13.1

Introduction of Eddy current test.

13.2 Explain Working procedure for eddy current inspection.

MW-333 **MATERIALS TESTING**

LIST OF PRACTICALS

1. Determination of Hardness of mild steel by using Brinell hardness tester.
2. Determination of Hardness of Gray cast iron by using Brinell hardness tester.
3. Determination of Hardness of mild steel by using Rock well hardness tester.
4. Determination of Hardness of high carbon steel by using Rock well hardness tester.
5. Determination of tensile properties of mild steel specimen with the help of universal testing machine
6. To perform shear test of mild steel specimen with the help of universal testing machine
7. To perform bend test of mild steel specimen with the help of universal testing machine
8. To perform Compression test on cast iron specimen with the help of universal testing machine

9 To perform torsion test on mild steel specimen with the help of Torsion testing machine

. 10 To perform following Non- destructive tests on welded joints.

a) Dye-Penetration test. b) Magnetic particle test. c) Ultrasonic test.

MW-343 METALLOGRAPHY AND HEAT TREATMENT

Total contact hours:		**T**	**P**	**C**
Theory:	**64 Hours**	**2**	**3**	**3**
Practical	**96 Hours**			

COURSE CONTENTS:

1. INTRODUCTION TO MICRO EXAMINATION OF THE METALS. 2HRS

1.1 Metallography

1.2 Microstructure and Macrostructure

1.3 Study of microstructure

1.4 Define grain and grain boundary

1.5 Application of Metallography

2. SPECIMEN PREPARATION FOR METALLOGRAPHIC EXAMINATON. 8HRS

2.1 Sampling.

2.2 Rough grinding

2.3 Mounting.

2.3.1 Mounting Press

2.3.2 Mounting processes (compression Mounting, Cold mounting).

2.4 Fine grinding/Intermediate polishing

2.5 Fine polishing

2.5.1 Mechanical Polishing.

2.5.2 Electrolytic Polishing

2.5.3 Chemical polishing

2.6 Etching

2.6.1 Function of etching reagents.

2.6.2 Etching reagents for micro examination (Steel, Cast iron, Copper, Aluminum)

3. METALLURGICAL MICROSCOPE. 2HRS

3.1 Construction of metallurgical Microscope

3.2 Operation and working Principle of microscope.

3.3 Magnification system

3.4 Steps to set the microscope.

4. METAL STRUCTURES AND CRYSTALIZATIONS. 6HRS

4.1 Define crystal, unit cell and space lattice

4.2 Define crystal structure

4.3 Classification of crystal structure

4.3.1 Body centered cubic (BCC)

4.3.2 Face centered cubic (FCC)

4.3.3 Close packed hexagonal (CPH)

4.4 Solid solution

4.4.1 Types of solid solution

5. CONSTITUTIONAL/PHASE DIAGRAMS 10HRS

5.1 Define phase

5.2 Classification of phases

5.3 Cooling curves (pure metal and alloys)

5.4 Define phase diagram

5.5 Importance of phase diagram

5.6 Variables of phase diagram

5.7 Method of data determination for phase diagram

5.8 Phase diagram type-I (Two metals completely soluble in liquid and solid state)

5.9 Phase diagram type-II (Two metals completely soluble in liquid but insoluble in solid state)

6 ALLOTROPY OF IRON. 2HRS

6.1 Define allotropy

6.2 Define Polymorphism

6.3 Allotropy of iron/cooling curve of pure iron

7 IRON-IRON CARBIDE EQUILIBRIUM DIAGRAM. 1 0HRS

7.1 Construction and labeling of iron carbon diagram.

7.2 Study of diagram.

7.3 Definition of structures.

7.4 Transformation of hypo and hyper eutectoid steel

7.5 Transformation of hypo and hyper eutectic cast iron

8. HEAT TREATMENT FURNACES. 4HRS

8.1 Furnace requirements

8.2 Types of heat treatment furnaces

8.2.1 Hardening furnaces.

8.2.2 Annealing furnaces.

8.2.3 Bath furnaces.

9. HEAT TREATING EQUIPMENT. 2HRS

9.1 Temperature measuring instruments.

9.2 Thermo meter and Pyrometer

9.3 Types of pyrometer

9.3.1 Optical pyrometers.

9.3.2 Thermo electric pyrometer.

9.3.3 Radiation pyrometers

10. HEAT TREATING OPERATIONS. 4HRS

10.1 Annealing.

10.2 Spheroidizing

10.3 Normalizing.

10.4 Hardening.

10.5 Tempering.

11. CASE HARDENING/SURFACE HEAT TREATMENT. 6HRS

11.1 Define case hardening.

11.2 Methods of case hardening

11.2.1 Carburizing

11.2.2 Nitriding.

11.2.3 Cyaniding/Carbo-Nitriding.

11.2.4 Flame hardening

11.2.5 Induction hardening

12. HEAT-TREATMENT OF ALLOY STEELS. 2HRS

12.1 Heat treatment of stainless steel.

12.2 Heat treatment of tool steels.

12.3 Heat treatment of high seeped steel.

12.4 Heat treatment of spring steel.

13. HEAT TREATMENT OF NONFERROUS. 2HRS

13.1 Methods of hardening

13.2 Cold working

13.3 Age hardening

13.3.1 Solution Treatment

13.3.2 Aging

14. HEAT TREATMENT OF CAST IRON. 2HRS

14.1 Heat treatment of Grey cast iron.

14.3 Heat treatment of White Cast iron to produce malleable cast iron

RECOMMENDED BOOKS:

1 Elementary Metallurgy and Metallography by Arthur M. Sharager
2 Metallurgy for Engineers by E.C Rollason
3 Physical Metallurgy by Garside
4 Physical Metallurgy by Vajendra Singh

MW-343 METALLOGRAPHY AND HEAT TREATMENT

INSTRUCTIONAL OBJECTIVES

COURSE CONTENTS:

1. INTRODUCTION TO MICRO EXAMINATION OF THE METALS.

1.1 Define Metallography

1.2 State Microstructure and Macrostructure

1.3 Study of microstructure

1.4 Define grain and grain boundary

1.5 Describe Application of Metallography

2. KNOW ABOUT SPECIMEN PREPARATION FOR METALLOGRAPHIC EXAMINATON

2.1 Describe Sampling.

2.2 Describe Rough grinding

2.3 Define Mounting.

2.3.1 Describe Mounting Press

2.3.2 Explain Mounting processes (compression Mounting, Cold mounting).

2.4 Describe Fine grinding/Intermediate polishing

2.5 Define Fine polishing

2.5.1 Describe Mechanical Polishing.

2.5.2 Describe Electrolytic Polishing

2.5.3 Describe chemical polishing

2.6 Define Etching

2.6.1 State function of etching reagents.

2.6.2 Enlist etching reagents for micro examination (Steel, Cast iron, Copper, Aluminum)

3. KNOW ABOUT METALLURGICAL MICROSCOPE.

3.1 Construction of metallurgical Microscope

3.2 Explain operation and working Principle of microscope.

3.3 State magnification system

3.4 Enlist steps to set the microscope.

4. UNDERSTAND METAL STRUCTURES AND CRYSTALIZATIONS.

4.1 Define crystal, unit cell and space lattice

4.2 Define crystal structure

4.3 Classify of crystal structure

4.3.1 Describe Body centered cubic (BCC)

4.3.2 Describe Face centered cubic (FCC)

4.3.3 Describe Close packed hexagonal (CPH)

4.4 Define Solid solution

4.4.1 Explain types of solid solution

5. KNOW ABOUT CONSTITUTION/PHASE DIAGRAMS

5.1 Define phase

5.2 State Classification of phases

5.3 Describe Cooling curves (pure metal and alloys)

5.4 Define phase diagram

5.5 Describe Importance of phase diagram

5.6 State Variables of phase diagram

5.7 Describe methods of data determination for phase diagram

5.8 Explain Phase diagram type-I (Two metals completely soluble in liquid and solid state)

5.9 Explain Phase diagram type-II (Two metals completely soluble in liquid but insoluble in solid state)

5.10 Explain Phase diagram type-III(Two metals completely soluble in liquid but partially soluble in solid state)

6 **KNOW ABOUT ALLOTROPY OF IRON.**

6.10 Define allotropy

6.11 Define Polymorphism

6.12 Explain allotropy of iron/cooling curve of pure iron

7 **KNOW ABOUT IRON-IRON CARBIDE EQUILIBRIUM DIAGRAM.**

7.1 Describe the construction and labeling of iron carbon diagram.

7.2 Study of diagram.

7.3 Definition of structures.

7.4 Explain transformation of hypo and hyper eutectoid steel

7.5 Explain transformation of hypo and hyper eutectic cast iron

8. KNOW ABOUT HEAT TREATMENT FURNACES.

8.1 Describe furnace requirements

8.2 Enlist types of heat treatment furnaces

8.2.1 Describe Hardening furnaces.

8.2.2 Describe Annealing furnaces.

8.2.3 Describe Bath furnaces.

9. KNOW ABOUT HEAT TREATING EQUIPMENT.

9.1 Describe temperature measuring instruments.

9.2 Explain thermo meter and Pyrometer

9.3 Enlist Types of pyrometer

9.3.1 Describe Optical pyrometers.

9.3.2 Describe Thermo electric pyrometer.

9.3.3 Describe Radiation pyrometers

10. KNOW ABOUT HEAT TREATING OPERATIONS.

10.1 Describe Annealing.

10.2 Describe Spheroidizing

10.3 Describe Normalizing.

10.4 Describe Hardening.

10.5 Describe Tempering.

11. KNOW ABOUT CASE HARDENING/SURFACE HEAT TREATMENT.

11.1 Define case hardening.

11.2 Enlist methods of case hardening

11.2.1 Describe carburizing

11.2.2 Describe nitriding.

11.2.3 Describe cyaniding/carbo-nitriding.

11.2.4 Describe flame hardening

11.2.5 Describe induction hardening

12. KNOW ABOUT HEAT-TREATMENT OF ALLOY STEELS.

12.1 Describe Heat treatment of stainless steel.

12.2 Describe Heat treatment of tool steels.

12.3 Describe Heat treatment of high seeped steel.

12.4 Describe Heat treatment of spring steel.

13. KNOW ABOUT HEAT TREATMENT OF NONFERROUS.

13.1 Describe Methods of hardening

13.2 Describe Cold working

13.3 Describe Age hardening

13.3.1 Describe Solution Treatment

13.3.2 Describe Aging

14. KNOW ABOUT HEAT TREATMENT OF CAST IRON.

14.1 Describe heat treatment of grey cast iron.

14.3 Explain heat treatment of White Cast iron to produce malleable cast iron

MW-343 METALLOGRAPHY AND HEAT TREATMENT

Total contact hours: 96 Hours

LIST OF PRACTICALS

1. Preparation of specimen for Metallography.
2. Practice for working of Metallurgical Microscope.
3. Study microstructure of low carbon steel specimen
4. Study microstructure of medium carbon steel specimen
5. Study microstructure of high carbon steel specimen
6. Study microstructure of grey cast iron specimen
7. Study microstructure of white cast iron specimen
8. Annealing Practice of carbon steel and study its effect on microstructure & hardness.
9. Normalizing Practice of carbon steel and study its effect on microstructure & hardness
10. Hardening Practice of carbon steel by quenching and Observe its effect on microstructure & hardness
11. Tempering Practice of steel and observe effect on hardness .

MW-322 ADVANCE WELDING

TOTAL CONTACT HOURS

THEORY 64 HRS

T	**P**	**C**
2	**0**	**2**

1. FUSION WELDING **15HRS**

1.1 Carbon arc welding. CAW

1.2 TIG/GTAW welding

1.3 MIG/MAG welding

1.4 Submerged arc welding SAW

1.5 Atomic Hydrogen welding AHW

1.6 Arc stud welding ASW

1.7 Electron Beam welding EBW

1.8 Thermit welding TW

1.9 Flux cored arc welding FCAW

2. PRESSURE WELDING **10HRS**

2.1 Forge welding

2.2 Resistance welding

2.3 Flash welding

2.4 Spot welding

2.5 Seam welding

2.6 Projection welding

2.7 Percussion welding

3. HARD FACING **5HRS**

3.1 Define hard facing

3.2 Economics of hard facing

3.3 Hard facing materials

3.4 Hard facing procedure for steel

3.5 Material that can be hard faced

3.6 Quality of surfacing deposits.

3.7 Heat treatment & finishing of deposits.

4. WELDING STEEL PIPES **6HRS**

4.1 Lind's Steel welding process

4.2 Advantages of these processes.

4.3 Positions for pipe welding

4.4 Pipe fixed (2G, 5G, 6G)

4.5 Rotation welding of pipe(Pipe Rotates -1G)

5. STANDARD WELDING SYMBOLS FOR WELDS & WELDING JOINTS

5HRS

5.1 Basic symbols for different types of joints & welds.

5.2 Bead welds.

5.3 Groove welds

5.4 Fillet welds

5.5 Plug welds

5.6 Spot welds

5.7 Seam welds

5.8 Projection and upset welds

6. WELDING DEFECTS & THEIR REMEDIES. **5HRS**

6.1 Cracks

6.2 Blow holes

6.3 Porosity

6.4 Slag inclusions

6.5 Under cut

6.6 Lack of fusion

6.7 Poor and excess penetration

6.8 Overlap

6.9 Arc Strikes

7. TESTING AND INSPECTION OF WELDS ACCORDING TO ASME SECTION-V (DESTRUCTIVE & NON DESTRUCTIVE TESTS)

6HRS

7.1 Bend test According to ASME sec IX (QW.160-163)

7.2 Impact test According to ASME sec IX (QW.170-172.3)

7.3 Visual examination test According to ASME sec Article-9

7.4 Magnetic particle test ASME secVArticle-7

7.5 Dye penetration test ASME sec V Article-6

7.6 Ultra sonic test ASME sec V Article-4

7.7 Radiographic test ASME sec V Article-2

8. INTRODUCTION TO ASME CODES AND STANDARDS 12HRS

8.1 Enlist ASME codes and standards

8.2 Introduction to ASME Section-II

8.2.1 ASME Section-IIA (Ferrous Materials)

8.2.2 ASME Section-IIB (Non-Ferrous Material)

8.2.3 ASME Section-IIC (Consumables)

8.2.4 ASME Section-IID (Properties & Composition)

8.3 Introduction to ASME section-IX

8.3.1 Article-I Welding General Requirements

8.3.1.1 QW-100 General

8.3.1.2 QW-110 Weld Orientation

8.3.1.3 QW-120 Test Positions for Groove Welds

8.3.1.4 QW-130 Test Positions for Fillet Welds

8.3.1.5 QW-140 Types and Purposes of Tests and Examinations

8.3.1.6 QW-150 Tension Tests

8.3.1.7 QW-160 Guided-Bend Tests

8.3.1.8 QW-170 Notch-Toughness Tests

8.3.1.9 QW-180 Fillet-Weld Tests

8.3.1.10 QW-190 other tests and examination

8.3.2 Article II Welding Procedure Qualifications

8.3.2.1 QW-200 General

8.3.2.2 QW-210 Preparation of Test Coupon

8.3.2.3 QW-250 Welding Variables

8.3.2.4 QW-290 Temper Bead Welding

8.3.3 Article III Welding Performance Qualifications

8.3.3.1 QW-300 General

8.3.3.2 QW-310 Qualification Test Coupons

8.3.3.3 QW-320 Retests and Renewal of Qualification

8.3.3.4 QW-350 Welding Variables for Welders

8.3.3.5 QW-360 Welding Variables for Welding Operators

8.3.3.6 QW-380 Special Processes.

8.3.4 Article IV Welding Data

8.3.4.1 QW-400 Variables

8.3.4.2 QW-410 Technique

8.3.4.3 QW-420 Material Groupings

8.3.4.4 QW-430 F-Numbers

8.3.4.5 QW-440 Weld Metal Chemical Composition

8.3.4.6 QW-450 Specimens

8.3.4.7 QW-460 Graphics

8.3.4.8 QW-470 Etching — Processes and Reagents

8.3.4.9 QW-490 Definitions

8.3.5 Article V Standard Welding Procedure Specifications (SWPSs)

8.3.5.1 QW-500 General

8.3.5.2 QW-510 Adoption of SWPSs

8.3.5.3 QW-520 Use of SWPSs Without Separate Demonstration

8.3.5.4 QW-530 Forms

8.3.5.5 QW-540 Production use of SWPSs

MW-322 ADVANCE WELDING

INSTRUCTIONAL OBJECTIVES

1. UNDERSTAND DIFFERENT TYPES OF FUSION WELDING PROCESSES

1.1 Explain the method of Carbon arc welding.

1.2 Explain the method of TIG welding

1.3 Explain the method of MIG welding

1.4 Explain the method of Submerged arc welding

1.5 Explain the method of Atomic Hydrogen welding

1.6 Explain the method of Arc stud welding

1.7 Explain the method of Electron Beam welding

1.8 Explain the method of Thermit welding

1.9 Explain the method of Flux cored welding

2 UNDERSTAND DIFFERENT TYPES OF PRESSURE WELDING PROCESSES

2.1 Explain Forge welding

2.2 Explain Resistance welding

2.3 Explain Flash welding

2.4 Explain Spot welding

2.5 Explain Seam welding

2.6 Explain Projection welding

2.7 Explain Percussion welding

3 UNDERSTAND HARD FACING

3.1 Define hard facing

3.2 Explain economics of hard facing

3.3 Explain Hard facing materials

3.4 Explain Hard facing procedure for steel

3.5 Describe materials that can be hard faced

3.6 Describe Quality of surfacing deposits.

3.7 Explain heat treatment & finishing of deposits.

4 UNDERSTAND WELDING STEEL PIPES

4.1 Explain process of Lind's Steel welding pipe

4.2 Describe advantages of these processes.

4.3 Describe different positions in welding steel pipes.

4.3.1 Describe Pipe fixed (2G,5G,6G)

4.3.2 Describe rotation welding of pipe (Pipe rotates-1G)

5. UNDERSTAND STANDARD WELDING SYMBOLS FOR WELDING JOINTS

5.1 Enlist & draw symbols used for Bead welds.

5.2 Enlist & draw symbols used for Groove welds.

5.3 Enlist & draw symbols used for Fillet welds.

5.4 Enlist & draw symbols used for plug welds.

5.5 Draw symbols of Spot welds.

5.6 Draw symbols of Seam welds.

5.7 Draw symbols of Projection & Upset welds.

5.8 Explain their applications.

6. UNDERSTAND WELDING DEFECTS & THEIR REMEDIES. Explain different welding defects(Cracks, Blow holes, Porosity, Slag inclusions),

6.1 Explain methods of repairing and correcting above welding defects.

6.2 Explain defect of undercut, Lack of fusion & poor and excess penetration, Overlap, Arc strikes

6.3 Discuss methods of repairing and correcting above welding defects.

7 UNDERSTAND TESTING AND INSPECTION OF WELDS ACCORDING TO ASME SECTION-V&IX (DESTRUCTIVE & NON DESTRUCTIVE TESTS)

7.1 Demonstrate Bend test According to ASME sec IX (QW.160-163)

7.2 Demonstrate Impact test According to ASME sec IX (QW.170-172.3)

7.3 Demonstrate Visual examination test According to ASME sec V Article-9

7.4 Explain Magnetic particle test ASME sec V Article-7

7.5 Explain Dye penetration test ASME sec V Article-6

7.6 Explain Ultra sonic test ASME sec V Article-4&5

7.7 Explain Radiographic test ASME sec V Article-2

8 INTRODUCTION TO ASME CODES AND STANDARDS

8.1 Enlist ASME codes and standards

8.2 Introduction to ASME Section-II

8.2.1 Discuss ASME Section-IIA (Ferrous Materials)

8.2.2 Discuss ASME Section-IIB (Non-Ferrous Material)

8.2.3 Discuss ASME Section-IIC (Consumables)

8.2.4 Discuss ASME Section-IID (Properties & Composition)

8.3 INTRODUCTION TO ASME SECTION-IX

8.3.1 Article-I Welding General Requirements

8.3.1.1 Demonstrate QW-100 General

8.3.1.2 Demonstrate QW-110 Weld Orientation

8.3.1.3 Demonstrate QW-120 Test Positions for Groove Welds

8.3.1.4 Demonstrate QW-130 Test Positions for Fillet Welds

8.3.1.5 Demonstrate QW-140 Types and Purposes of Tests and Examinations

8.3.1.6 Demonstrate QW-150 Tension Tests

8.3.1.7 Demonstrate QW-160 Guided-Bend Tests

8.3.1.8 Demonstrate QW-170 Notch-Toughness Tests

8.3.1.9 Demonstrate QW-180 Fillet-Weld Tests

8.3.1.10 Demonstrate QW-190 Other Tests and Examinations

8.3.2 Article II Welding Procedure Qualifications

8.3.2.1 Explain QW-200 General

8.3.2.2 Explain QW-210 Preparation of Test Coupon

8.3.2.3 Explain QW-250 Welding Variables

8.3.2.4 Explain QW-290 Temper Bead Welding

8.3.3 Article III Welding Performance Qualifications

8.3.3.1 Describe QW-300 General

8.3.3.2 Describe QW-310 Qualification Test Coupons

8.3.3.3 Describe QW-320 Retests and Renewal of Qualification

8.3.3.4 Describe QW-350 Welding Variables for Welders

8.3.3.5 Describe QW-360 Welding Variables for Welding Operators

8.3.3.6 Describe QW-380 Special Processes.

8.3.4 Article IV Welding Data

8.3.4.1 State QW-400 Variables

8.3.4.2 State QW-410 Technique

8.3.4.3 State QW-420 Material Groupings

8.3.4.4 State QW-430 F-Numbers

8.3.4.5 State QW-440 Weld Metal Chemical Composition

8.3.4.6 State QW-450 Specimens

8.3.4.7 State QW-460 Graphics

8.3.4.8 State QW-470 Etching — Processes and Reagents

8.3.4.9 State QW-490 Definitions

8.3.5 Article V Standard Welding Procedure Specifications (SWPSs)

8.3.5.1 Describe QW-500 General

8.3.5.2 Explain QW-510 Adoption of SWPSs

8.3.5.3 Demonstrate QW-520 Use of SWPSs without Separate Demonstration

8.3.5.4 State QW-530 Forms

8.3.5.5 Explain QW-540 Production use of SWPSs

MW-355 WORKSHOP PRACTICE-III

		T	P	C
Practical	**480 hours**	**0**	**15**	**5**

LIST OF PRACTICALS

	Sr. No	NAME OF JOINTS	Practical HOURS
ARC WELDING	1	Single V Butt joint Flat position or I-G M.S Flat 250x150x10mm 2pcs	**180 HRS**
	2	Single V Butt joint Horizontal position or 2-G M.S Flat 250x150x10mm 2pcs	
	3	Single V Butt joint Vertical position or 3G M.S Flat 250x150x10mm 2pcs	
	4	Single V Butt joint Overhead position or 4G M.S Flat 250x150x10mm 2pcs	
	5	Mild steel corner joint Flat position 1-F M.S Flat 200x50x6mm 2pcs	
	6	Mild steel corner joint Horizontal position 2F M.S Flat 200x50x6mm 2pcs	
	7	Mild steel corner joint Vertical position 3F M.S Flat 200x50x6mm 2pcs	
	8	Mild steel corner joint Overhead position 4F M.S Flat 200x50x6mm 2pcs	
	9	Mild steel Tee joint Flat position Or 1F M.S Flat 200x50x6mm 2pcs	
	10	Mild steel Tee joint Horizontal position Or 2F M.S Flat 200x50x6mm 2pcs	
	11	Mild steel Tee joint Vertical position Or 3F M.S Flat 200x50x6mm 2pcs	
	12	Mild steel Tee joint Overhead position Or 4F M.S Flat 200x50x6mm 2pcs	

	13	Cast iron Square butt joint Flat position C.I 250x50x6mm 2pcs	
	14	Stainless steel (SS-304 & SS-316) Square butt joint Flat position SS 250x50x6mm 2pcs	
	15	Aluminum Square butt joint Flat position Al 150x37x6mm 2pcs	
	16	Arc cutting of mild steel plate	
	17	Pipe to pipe weld 5-G Schedule 40 Ø 6inch 2pcs (6" Length 0f 1 piece)	
	18	Pipe to pipe weld 5-G Schedule 60 Ø 6inch 2pcs (6" Length 0f 1 piece)	
	19	Pipe to pipe weld 5-G Schedule 40 Ø 8inch 2pcs (6" Length 0f 1 piece)	
GAS WELDING	1	Lap joint Vertical position fore hand technique M.S Flat 200x37x3mm 2pcs	**64 HRS**
	2	Butt joint Vertical position fore hand technique M.S Flat 200x37x3mm 2pcs	
	3	Tee joint Vertical position fore hand technique M.S Flat 200x37x3mm 2pcs	
	4	Corner joint Vertical position fore hand technique M.S Flat 200x37x3mm 2pcs	
	5	Brazing (M.S) flat position down hand technique M.S Flat 200x37x3mm 2pcs	
	6	Stainless steel square butt flat position down hand technique S.S Plate 200x37x3mm 2pcs	
	7	Copper welding (square butt joint) down hand technique Copper Plate200x37x3mm 2pcs	
	8	Gas cutting practice of different materials	
TIG/MIG/SP OT		**TIG/GTAW**	**140 HRS**
	1	Aluminum Square butt joint Flat position Al 150x37x6mm 2pcs	
		Copper Square butt joint Flat position	

		C 150x37x6mm 2pcs	
	2	Mild steel Square butt joint Flat position MS flat 150x37x2mm	
	3	Mild steel Square Tee joint Flat position MS flat 150x50x2mm	
	4	Stainless steel (SS304,SS316) Square butt joint Flat position SS 150x50x6mm 2pcs	
	5	Stainless steel (SS304,SS316) Tee joint Flat position SS 150x50x6mm 2pcs	
	6	Stainless steel (SS304,SS316) Corner joint Flat position SS 150x50x6mm 2pcs	
	7	Stainless steel (SS304,SS316) Square butt joint Vertical position SS 250x50x6mm 2pcs	
	8	Stainless steel (SS304,SS316) Tee joint Vertical position SS 150x50x6mm 2pcs	
	9	Stainless steel (SS304,SS316) Corner joint Vertical position	
		MIG/MAG/FCAW JOINTS	**96 HRS**
	1	Mild Steel Square butt joint Flat position MS 200x50x6mm	
	2	Mild Steel Tee joint Flat position MS 200x50x6mm	
	3	Mild Steel Corner joint Flat position MS 200x50x6mm	
	4	Mild steel Single V butt joint Flat position 1G MS 200x50x10mm	
	5	Mild steel Single V butt joint Horizontal position 2G MS 200x50x10mm	
	6	Mild steel Single V butt joint Vertical position 3G	

		MS 200x50x10mm	
	7	Mild steel Double V butt joint Vertical position 3G MS 200x50x12mm	
	8	Mild steel Single V butt joint Flat position 1G MS 200x50x10mm	
	9	Mild steel Single V butt joint Horizontal position 2G MS 200x50x10mm	
	10	Mild steel Single V butt joint Vertical position 3G MS 200x50x10mm	
	11	Mild steel Single V butt joint Overhead position 4G MS 200x50x10mm	
		SPOT WELDING	
	1	Spot welding of Mild Steel MS flat 150x37x2mm	
	2	Spot welding of Stainless Steel SS flat 150x37x2mm	

Minimum Qualification of Teacher/ Instructor

- **M.Sc. in Mechanical Engg.**
- **B.Sc. in Mechanical Engg. with 2-Years' relevant experience in teaching/ industry**
- **B-Tech / B.Sc. Tech. with 4-Years' relevant experience in teaching/ industry**
- **DAE in Mechanical Technology with 6-Years' relevant experience in teaching/ industry**

Employability of the pass-outs/Graduates

The pass outs of this course may find job / employment opportunities in the following areas / sectors:

- Foundry Industry
- Manufacturing Industry
- Automobile Industry
- Cement Plants
- Repairing workshop of Chemical Industry
- Repairing workshop of Cement Industry
- Pakistan Railways
- P.O.F Wah Cantt.
- Pakistan atomic energy commission
- Tractor manufacturing units Packages.
- Heavy Mechanical Complex / Heavy Forge Foundry, Taxila.