MECHANICAL TECHNOLOGY SPECIALIZATION IN FOUNDRY & PATTERN MAKING

SCHEME OF STUDIES

FIRST YEAR			**T**	**P**	**C**	**Page**
Gen	111	Islamiat & Pakistan Studies	1	0	1	
Eng	112	English	2	0	2	
Math	113	Applied Mathematics-I	3	0	3	
Ch	112	Applied Chemistry	1	3	2	
Phy	113	Applied Physics	2	3	3	
Comp	142	Computer Applications	1	3	2	
MT	122	Engineering Drawing and CAD-1	1	3	2	
FP	113	Foundry Technology-I	2	3	3	
FP	131	Wood Working hand tools	1	0	1	
FP	142	Ferrous Metallurgy	2	0	2	
FP	152	Basic Pattern Making	1	3	2	
Mech	141	Safety practice and Procedures	1	0	1	
FP	162	Basic Metal Work	1	3	2	
		T O T A L:	**19**	**21**	**26**	
SECOND YEAR			**T**	**P**	**C**	
Gen	211	Islamiat& Pakistan Studies	1	0	1	
MGM	211	Business Communications	1	0	1	
Math	212	Applied Mathematics-II	2	0	2	
MGM	221	Business Management and Industrial Economics	1	0	1	
Elect	202	Applied electricity and electronics	1	3	2	
MT	222	Engineering Drawing and CAD-II	1	3	2	
FP	214	Foundry Technology- II	2	6	4	
FP	224	Advance Pattern Making	2	6	4	
FP	252	Non-Ferrous metallurgy	2	0	2	
FP	244	Workshop practice	2	6	4	
		A) Machine shop 0 3				
		B) Basic Welding and Forging 0 3				
		T O T A L:	**15**	**24**	**23**	

THIRD YEAR			**T**	**P**	**C**
Gen	311	Islamiat & Pakistan Studies	1	0	1
IHM	311	Industrial Management and Human Relations	1	0	1
FP	314	Foundry Technology -III	2	6	4
FP	324	Wood Working Machines	2	6	4
FP	302	Product Lay Out and CAD	1	3	2
FP	372	Metallurgical Calculations	2	0	2
FP	343	Metallography and Heat-treatment	2	3	3
FP	382	Material testing.	1	3	2
FP	392	Materials Science	1	3	2
		T O T A L:	**13**	**24**	**21**

اسلامیات/مطالعہ پاکستان

		ٹی	پی	سی
حصہ اول	اسلامیات Gen III	1	0	1

حصہ دوم 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- وعاشروهن بالمعروف

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 گا 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

3- منتخب احادیث نبویہ

عمومی مقصد۔　احادیث کی روشنی میں اخلاقی اقدار سے آگاہی حاصل کر سکے

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
- ☆ اسلامی عقائد و عبادات کے مطابق اپنی زندگی ڈھال کر ایک اچھا مسلمان بن سکے۔

نصاب اخلاقیات سال اول (غیر مسلم طلباء کیلئے)

حصہ اول اخلاقیات	Gen III	ٹی	پی	سی
		1	0	1

کل وقت: 20 گھنٹے

حصہ دوم مطالعہ پاکستان

موضوعات

اخلاقیات کی تعریف اور اہمیت

اخلاقیات کا معیار (قانون۔عقل۔الہامی کتب)

- نظم وضبط
- راست گوئی
- صبر واستقلال
- حوصلہ مندی
- وقت کی پابندی
- صفائی
- اعتماد
- باہمی احترام
- مصلحت

نصاب اخلاقیات سال اول

تدریسی مقاصد

عمومی مقصد۔ اعلیٰ اخلاق کی وجہ سے ملکی ترقی میں قابل قدر اضافہ کر سکے۔

خصوصی مقاصد۔ طالب علم اس قابل ہوگا کہ:

- موضوعات کا مطلب بیان کر 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 وجسمانی 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 مات، سید احمد شہید کی تحریک مجاہدین

- تعلیمی تحریکیں

علی گڑھ۔ ندوۃ العلماء۔ دیوبند۔ مدرسۃ الاسلام (سندھ) اسلامیہ کالج (پشاور) انجمن حمایت اسلام (لاہور)

- محمد بن قاسم کے ہندوستان پر حملہ کی وجہ بیان کر سکے
- 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۔

Eng-112 ENGLISH

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. Zahid Zahoor,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 central Angle
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, TahirHameed, 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 solving the 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, directionconsines 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

Ch-112 APPLIED CHEMISTRY

T	P	C
1	3	2

Total Contact Hours

Theory **32**

Practical **64**

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

AIMS : After 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 by Mr. 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 reactions resulting 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.

PHY-113 APPLIED PHYSICS

Total Contact Hours:

		T	P	C
Theory	64			
Practical	96			
		2	3	3

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

COURSE CONTENTS

1 **MEASUREMENTS. 2 Hours**.

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 Hours.**

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. 4 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 Hours

5.1 Review Hook'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 Hours

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 Hours

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 of light waves

8 OPTICAL FIBER. 2 Hours

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 Hours

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 Laser in medicine

10 HEAT. 4 Hours

10.1 Review of calorimetric and gas laws and mode of transfer of heat

10.2 Thermal expansion of solids, liquids and gases

10.3 Heat of fusion, vaporization

10.4 Humidity, absolute and relative

10.5 Law of cooling

10.6 Thermoelectricity

10.7 Thermocouple.

11 THERMODYNAMICS. 4 Hours

11.1 Heat energy and internal energy

11.2 First law of thermodynamics & applications

11.3 Isometric and adiabatic processes

11.4 Efficiency of heat engine

11.5 Second law of thermodynamics (both statements)

11.6 Heat engine and refrigerator.

12 TRANSFER OF HEAT.

5 Hours

12.1 Review: Modes of transfer of heat

12.2 Emission and absorption of heat

12.3 Black body radiation

12.4 Laws of energy distribution

12.5 Planck’s quantum theory

12.6 The photoelectric effects

12.7 X-ray, production, properties and uses

13 ELECTROMAGNETIC WAVES.

3 Hours

13.1 Magnetic held around a current carrying conduction

13.2 Electric field induced around a changing magnetic flux

13.3 Moving fields

13.4 Types of electromagnetic waves

13.5 Generation of radio waves

13.6 Spectrum of electromagnetic waves

14 ATOMIC NUCLEUS.

5 Hours

14.1 Structure of the nucleus

14.2 Radioactivity

14.3 Radioactive series

14.4 Transmutation of elements

14.5 The fission reaction

14.6 The fusion reaction

14.7 The nuclear reactor

15 NUCLEAR RADIATIONS.

5 Hours

15.1 Properties and integration with matter

15.2 Radiations detector

15.3 Radiation damage and its effects

15.4 Radiation therapy

15.5 Radioactive tracers

15.6 Application of radiation techniques in archeology, agriculture, chemical industry,

polymerization, sterilization, food preservation, gauging and control, radiography

16 ARTIFICIAL SATELLITES.

2 Hours

16.1 Review law of gravitation

16.2 Escape velocity

16.3 Orbital velocity

16.4 Geosynchronous and geostationary satellites

16.5 Use of satellites in data communication.

17 MAGNETIC MATERIALS. **2 Hours**

17.1 Magnetism

17.2 Domains theory

17.3 Para and ferromagnetism and magnetic materials

17.4 B.H. curve and hysterisis loop.

18 SEMI CONDUCTOR MATERIALS.

2 Hours

18.1 Crystalline structure of solids

18.2 Conductors, semiconductors, insulators

18.3 P-type and N-type materials

18.4 P-N junction

18.5 P-N junction as a diode

18.6 Photovoltaic cell (solar cell)

RECOMMENDED BOOKS:

1. Tahir Hussain, Fundamentals of physics Vol-I, II
2. FaridKhawaja, Fundamentals of Physics Vol-I and II
3. Wells and Slusher, Schaum's Series Physics .
4. Nelkon and Oyborn, Advanced Level Practical Physics
5. MehboobIlahi Malik and Inam-ul-Haq, Practical Physics
6. Wilson, Lasers - Principles and Applications
7. M. Aslam Khan and M. AkramSandhu, Experimental Physics Note Book

PHY-113 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 of forces

2.2 Describe method of resolution of a vector into components

2.3 Describe method of addition of vectors by head & tail rule

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 OF 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 & longitudinal waves.

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 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 and its application

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, cameras.

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.

10. UNDERSTAND THE STRUCTURE, WORKING AND USES OF LASERS.

10.1 Explain the stimulated emission of radiation

10.2 Explain the laser principle

10.3 Describe the structure and working of lasers

10.4 Distinguish between types of lasers

10.5 Describe the applications of lasers in the fields mentioned in the course contents.

11. UNDERSTAND CONCEPTS OF HEAT.

11.1 Explain calorimetric and modes of transfer of heat

11.2 Explain Gas laws giving mathematical expressions

11.3 Explain Thermal expansion of solids, liquids and gases

11.4 Distinguish between absolute and relative humidity

11.5 Distinguish between heat of fusion, vaporization

11.6 Explain Law of cooling

11.7 Explain basic concepts of Thermoelectricity

11.8 Describe Thermocouple, giving its principle, structure and working.

12. UNDERSTAND LAWS OF THERMODYNAMICS.

12.1 Distinguish between heat energy and internal energy

12.2 Explain first law of thermodynamics giving its applications by defining Isothermal and adiabatic process

12.3 Distinguish between isometric and adiabatic processes

12.4 Explain second law of thermodynamics describing alternate statements

12.4 Distinguish between work of heat engine and refrigerator.

13. UNDERSTAND LAWS OF ENERGY DISTRIBUTION AND EMMISION RADIATION.

13.1 Explain modes of transfer of heat

13.2 Explain black body radiation and laws of energy distribution

13.3 Describe Planck's Quantum theory

13.4 Explain photoelectric effects

13.5 Explain production, properties and uses of x-rays

14. UNDERSTAND NATURE, TYPES, GENERATION AND SPECTRUM OF ELECTROMMAGNETIC WAVES.

14.1 Explain magnetic field due to current and electric field due to changing magnetic flux
14.2 Explain moving fields
14.3 Describe types of electromagnetic waves
14.4 Explain generation of ratio waves
14.5 Explain spectrum of electromagnetic waves

15. UNDERSTAND THE STRUCTURE OF THE ATOMIC NUCLEUS AND RELEVANT ACTIVITIES.

15.1 Describe the structure of the nucleus
15.2 Explain Radioactivity and Radioactive series
15.3 Explain transmutation of elements
15.4 Distinguish between fission reaction and fusion reaction
15.5 Explain the structure and working of the nuclear reactor

16. UNDERSTAND NUCLEAR RADIATIONS THEIR EFFECTS AND USES.

16.1 Describe properties of nuclear radiations and their interaction with matter

16.2 Explain working of radiations detectors

16.3 Explain damaging effects of nuclear radiation

16.4 Explain radiations therapy

16.5 Describe radioactive tracers

17. UNDERSTAND TYPES AND USES OF ARTIFICIAL SATELLITES.

17.1 Explain escape velocity

17.2 Explain orbital velocity

17.3 Distinguish between geosynchronous and geostationary satellite

17.4 Describe uses of artificial satellite in data communications

18. UNDERSTAND BASIC CONCEPTS AND CLASSIFICATION OF MAGNETIC MATERIALS.

18.1 Explain domains theory of magnetism

18.2 Distinguish between Para, dia and ferromagnetism and magnetic materials

18.3 Distinguish between B and H

18.4 Describe B.H. Curve

18.5 Describe hysterisis loop.

19. UNDERSTAND BASIC CONCEPTS OF SEMI-CONDUCTOR MATERIALS AND THEIR USES.

19.1 Explain crystalline structure of solids

19.2 Distinguish between conductors, semi conductors and insulators

19.3 Describe semi conductors giving example with reference to their structure

19.4 Distinguish between P-type and N-type materials

19.5 Explain working of P-N junction as a diode

19.6 Explain working of solar cell

PHY-113 APPLIED PHYSICS

LIST OF PRACTICAL 96 Hours

1. Draw graph representing the functions:
   a) Y= mx for m=0, 0.5, 1, 2
   b) Y= X2
   c) Y= 1/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
11. Find the weight of a given body using principle of moments
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 Hook’s Law using helical spring.
15. Study of frequency of stretched string with length
16. Study of variation of frequency of stretched spring with tension
17. Study resonance of air column in 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 effects of plane mirror on reflection
22. Compare the reflective 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 reflective index of glass by apparent depth
27. Find reflective index of glass by spectrometer
28. Find focal length of converging lens by plane mirror
29. Find focal length of converging lens by displacement methods
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

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 3 Hrs

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

MT-122 ENGINEERING DRAWING & CAD-I

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

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.

COURSE CONTENTS

PART-A MANUAL DRAWING

1 APPLICATION OF TECHNICAL DRAWING 1HRS

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 AND 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 3HRS

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 1HRS

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 1HRS

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 AUTO CAD – I

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 Official Training Courseware(AOTC) Volume1
9. Autodesk Official Training 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-112 ENGINEERING DRAWING AND CAD-I

INSTRUCTIONAL OBJECTIVES

PART-A MANUAL DRAWING

1. KNOW ABOUT 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 ABOUT 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 UNDERSTAND THE APPLICATIONS OF 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 1^{st} and 3^{rd} angle projections
10.4 State six principal views

PART- B AUTO CAD - I

15 INTRODUCTION OF AUTO CAD
15.1 Introduction to Auto CAD
15.2 Enlist Importance and uses of Auto CAD
15.3 State System requirements
15.4 How to Install Auto CAD
15.5 Describe User interface
15.6 Explain Coordinate system
15.7 State Function keys

16 KNOW ABOUT DRAWING AND EDITING
16.1 State Standard tools bar
16.2 Describe Draw Commands (Line, polyline, Arc, Circle, Polygon, Ellipse)

16.3 State Modify Commands (Erase, Copy, Move, Mirror, Trim)
16.4 Describe Edit Commands
16.5 State File menu
16.6 What is Help command

17 UNDERSTAND DRAWING LAYOUT

17.1 Introduction of drawing layout and working area
17.2 State Layout commands (Limits, units, ortho, grid, snap, Osnap)

18 UNDERSTAND DIMENSIONS AND LETTERING

18.1 Introduction to dimensioning
18.2 State Create Dimensioning
18.3 Describe Edit Dimensioning
18.4 Introduction to lettering
18.5 State Lettering Font and styles

MT-112 **ENGINEERING DRAWING & CAD-I**

LIST OF PRACTICAL **Hrs. 96**

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

FP-113 **FOUNDRY TECHNOLOGY-I**

Total Contact Hours		T	P	C
Theory	64 Hours	2	3	3
Practical	96 Hours			

AIM Produce the castings of simple regular machine parts and select the most suitable process.

COURSE CONTENTS

1. INTRODUCTION TO FOUNDRY TECHNOLOGY **2 HOURS**

1.1 Early History

1.2 Importance in Industrial development

1.3 Basic casting operation

1.4 Molding

1.5 Melting

1.6 Pouring and feeding

1.7 Classification of foundries

1.8 Major Foundries is Pakistan

2. BASIC MOLDING MATERIALS

2.1 SAND.

2.1.1 Classification of sand with respect to grain shape (Round, sub angular, Angular, Compound)

2.1.2 Classification of sand with respect to grain size (very course, medium, fine, very fine/silt)

2.1.3 Effect of sand grain size and shape on the properties of moulding sand

2.2 Definition of clay

2.2.2 Common clays.

2.3.3 Effect of clay contents on the properties of molding sand

2.4 Effect of water percentage on the properties of molding sand

3. HAND MOULDING TOOLS. **3 HOURS**

3.1 Shovel

3.2 Riddle

3.3 Sprinkler

3.4 Molding Box (Flask)

3.5 Top & Bottom Board

3.6 Bench

3.7 Bench Rammer

3.8 Strike off bar

3.9 Dust Bag

3.10 Sprue Pin

3.11 Sprue Cutter

3.12 Vent Wire/Vent

3.13 Swab

3.14 Draw out spike

3.15 Bellow

3.16 Slick and Spoon

3.17 Lifter

3.18 Different types of Trowels.

4. MOLDING SAND. 2 HOURS

4.1 Composition of Silica Sand

4.2 General ingredients of molding sand (Sand, Clay, Water)

4.3 Function of ingredients of moulding sand

5. PHYSICAL PROPERTIES OF MOULDING SAND. 3 HOURS

5.1 Adhesiveness
5.2 Cohesiveness
5.3 Permeability
5.4 Green Strength
5.5 Dry Strength
5.6 Refractoriness

6. BINDERS

6.1 Definition.

6.2 Types of binder (organic and inorganic)

6.3 Types of Organic and inorganic binders.

7. SAND ADDITIVES 1 HOUR

7.1 Definition

7.2 Types of additives and their Function.

8. PARTING POWDERS

8.1 Definition.

8.2 Types of Parting Powders (Dried Silica, Flour Burnt Sand, Lime Stone Dust, Dolomite Dust, Lycopodium, Paraffin Oil)

9. SURFACE DRESSING. 3 Hrs

9.1 Need for surface dressing of mould/core
9.2 Water base coatings (for cast iron, steel, Aluminum, brass)
9.3 Spirit base coating (far cast iron, steel, Al, brass)

10. MOLDING FLASKS. 2 HOURS

10.1 Parts of Common Flasks
10.2 Accessories of flasks (pin, socket, clamp)
10.3 Types of flasks (Permanent Flask and removable Flasks)
10.4 Types of removable Flasks(Slip flask, Snap Flasks,Tapered Flasks.)

11. SAND CONDITIONING EQUIPMENT. 2 HOURS

11.1 Magnetic Separator
11.2 Sand Riddle
11.3 Sand Mixer/Muller
11.4 Sand aerator/Lump Crushing

12. INTDRODUCTION TO MOULD 1 HOUR

12.1 Parts of simple Mold (Cope, Drag, Cheek)
12.2 Parts of gating system (sprue, pouring basin, runner, in gate, pattern cavity or mold cavity, riser)

13. SAND MOLDING. 3 HOURS

13.1 Green Sand Molding
13.2 Dry sand molding
13.3 Skin dry molding
13.4 Molasses sand molding
13.5 Cement bonded molding
13.6 Open sand molding
13.7 Pit molding
13.8 Loam moulding
13.9 Stacked moulding

14. CORE MAKING. 3 HOURS

14.1 Core (Definition)
14.2 Types of Core
14.3 Properties of core sand
14.4 Composition of Molasses sand
14.5 State the composition of oil sand core
14.6 Simple core making
14.7 Daubing and pasting of sand core
14.8 Daubing and pasting of cores
14.9 Blacking of core
14.10 Reinforcement of sand cores

15. METAL MELTING FURNACES. 3 HOURS

15.1 Types of Crucible Furnace (Bale out, Tilting, Stationery)

15.1.1 Oil fired Crucible Furnace

15.1.2 Gas Fired Crucible furnace

15.1.3 Care and maintenance of crucible furnace

15.1.4 Construction and operation of oil fired Crucible Furnace.

15.2 Rotary furnace and its operation

16. CRUCIBLES 3 Hrs

16.1 Shape and Material

16.2 Number and holding capacity of crucibles

16.3 Care and maintenance of crucibles

17. FETTLING OPERATIONS. 4 Hr

17.1 Chipping

17.2 Purpose of chipping operation

17.3 Tools used for chipping operation

(Hand chisel and pneumatic chisel)

17.4 Parting off

17.5 Purpose of parting off operation, tools used for parting off operation (power saw, hand saw, gas touch cut-off, wheels)

18. SURFACE CLEANING. 3 Hr

18.1 Tools used for surface cleaning (portable grinder, pedestal grinder steel wire brush)

18.2 Tumbling barrel

18.3 Sand blasting

18.4 Short blasting

18.5 Hydro blasting

BOOKS RECOMMENDED:

1. William H. Salmon Eric N. Simons - Foundry Practice

2. Richard W. Roesenthal - Principal of Metal Casting

FP-113 FOUNDRY TECHNOLOGY-I

INSTRUCTIONAL OBJECTIVES:

1. KNOW ABOUT FOUNDRY WORK.

1.1 State early history of Foundry

1.2 State importance of foundry in industrial development

1.3 Enlist basic casting operations

1.4 Define moulding

1.5 Define melting

1.6 Define pouring and feeding

1.7 Describe the classes of foundries in respect of the nature of work

1.8 Name major foundries in Pakistan

2. UNDERSTAND BASIC MOLDING MATERIALS

2.1 Define SAND.

2.1.1 What is classification of sand with respect to grain shape (Round, sub angular, Angular, Compound)

2.1.2 What is classification of sand with respect to grain size (very course, medium, fine, very fine/silt)

2.1.3 What is effect of sand grain size and shape on the properties of mouldingsand

2.2 Definition of clay

2.2.2 Name of common clays.

2.3.3 Describe effect of clay contents on the properties of molding sand

2.4 Describe of effect of water percentage on the properties of molding sand

3. UNDERSTAND TOOLS USED FOR HAND MOULDING.

4.1 Describe the uses of each hand tool used in sand moulding

4.2 Sketch each hand tool used in sand molding

4.3 Explain tools required for finishing and repair of sand mould.

4. MOLDING SAND.

4.1 What is composition of Silica Sand

4.2 What are general ingredients of molding sand (Sand, Clay, Water)

4.3 Function of ingredients of moulding sand

5. PHYSICAL PROPERTIES OF MOULDING SAND.

Describe the physical properties of moulding sand (Adhesiveness, Cohesiveness, Permeability , Green Strength, Dry Strength,Refractoriness)

6. BINDERS

6.1 Definition.

6.2 Types of binder (organic and inorganic)

6.3 Types of Organic and inorganic binders.

7. UNDERHAND SAND ADDITIVES.

7.1 Define additives

7.2 State the types of special additives

7.3 Enlist each type of special additive

7.4 Explain cereal additives

7.5 Explain sea coal additives

7.6 Describe silica flour

7.7 Explain wood flour as an additive

8. UNDERSTAND PARTING POWDERS.

9.1 Define the parting powder

9.2 Explain dried silica flour as parting material

9.3 Explain burnt sand

9.4 Describe limestone dust

9.5 Explain dolomite

9.6 Explain fire clay

9.7 Explain Ashes

9.8 Explain lycopodium

9.9 Explain paraffin oil as parting material

9. UNDERSTANDS SURFACE DRESSING.

9.1 Define surface dressing

9.2 Explain black lead as surface dresser

9.3 Explain fire clay as surface dresser

10. UNDERSTAND MOULDING FLASKS.

10.1 Name the parts of flask

10.2 Enlist the accessories of flasks

10.3 Describe pin and socket

10.4 Describe clamps

10.5 Explain the different types of flask, permanent flask, snap flask, flask with bar and jacket flask

11. UNDERSTAND SAND CONDITIONING EQUIPMENT.

11.1 Describe lump crushing

11.3 Describe sand riddling

11.3Explain magnetic separator
11.4 State the composition of green sand for gray iron

Describe sand disintegrator

12. INTDRODUCTION TO MOULD **1 HOUR**

12.1 Parts of simple Mold (Cope, Drag, Cheek)
12.2 Parts of gating system (sprue, pouring basin, runner, in gate, pattern cavity or mold cavity, riser)

13. UNDERSTAND SAND MOULD.

13.1Describe the green sand mould,
13.2Compare green, dry and skin dry mould

13.3Describe loam moulding

13.4 Describe stacked moulding

14. UNDERSTAND CORE MAKING.

14.1 Define Core

14.2 Describe the functions of Core

14.3 Describe various types of sand core

14.4 Explain the properties of core sand

14.5 State the composition of oil sand

14.6 State procedure of making simple sand core

14.7 Describe baking of sand core, doubling and pasting of sand core, blacking of core

14.8 Describe reinforcement of sand core

15. UNDERSTAND METAL MELTING FURNACES.

15.1 Enlist the types of crucible furnaces

15.2 Describe coke fired crucible furnace

15.2.1 Describe oil fired crucible furnace

15.2.2 Describe the grass fired crucible furnace

15.2.3 Explain the construction and operation of oil fired crucible furnace.

15.2.4 Sketch the oil fired crucible furnace

15.4 Describe rotary furnace and its operation

16. KNOW ABOUT CRUCIBLES

16.1 Definition of Crucible.

16.8 Describe Shape and Material

16.9 Definition of Crucible.

16.10 Describe Number and holding capacity of crucibles

16.11 State Care and maintenance of crucible

17. UNDERSTAND FETTLING OPERATIONS. 4 Hr

17.1 Describe Chipping

17.2 Describe Purpose of chipping operation

17.3 Describe Tools used for chipping operation

(Hand chisel and pneumatic chisel)

17.4 Describe Parting off

17.5 Describe Purpose of parting off operation, tools used for parting off operation (power saw, hand saw, gas touch cut-off, wheels)

18. UNDERSTAND SURFACE CLEANING. 3 Hr

18.1 Describe Tools used for surface cleaning (portable grinder, pedestal grinder steel wire brush)

18.2 Describe Tumbling barrel

18.3 Describe Sand blasting

18.4 Describe Short blasting

18.5 Describe Hydro blasting

PRACTICAL **FP-113** **Hrs. 96**

i. MOULDING SAND AND MIXING

1. Introduction to Silica sand and Sieve analysis of silica sand for grain sizes (AFS) standard.
2. Introduction of Screening and Riddle of moulding sand.
3. Mixing of moulding sand ingredients with the help of Sand mixing Muller.
4. Tempering of moulding sand and determination of moisture content in sand.

ii. **MOULDING**

5. Determination of clay content in moulding.
6. Introduction to parting materials
7. Practice of mould making of solid pattern
8. Practice of mould making of complex shaped pattern
9. Practice of mould making of Self core pattern
10. Practice of mould making of split pattern
11. Practice of mould making of hanging core
12. Practice of mould making of irregular parting
13. Practice of mould dressing

iii. CORE

14. Introduction to core
15. Introduction of ingredient of core sand with composition
16. Preparation of sand for core making.
17. Preparation of a simple core
18. Preparation a split core
19. Preparation of a core having venting
20. Preparation of Re-inforcement core
21. Preparation of a core by using a frame on core boxes
22. Practice of baking a simple core
23. Practice of core making by baking, sizing, finishing, dressing, and placement of core.
24. Practice of Making a core with a self-setting resin (no bake system)

MELTING PRACTICE

25. Melting practice of Al and alloys using flux, grain refiner and degasser
26. Melting in crucible furnace
27. Use of covering flux, de-gasification, and pouring in moulds

CLAEANING OF CASTING

28. Fettling of mould and cleaning practice of casting

FP-131 **WOOD WORKING HAND TOOLS**

Total Contact Hours	T	P	C
Theory: 32 Hrs	1	0	1

AIM Students will be able to Select and use the different tools and equipment for making measurement and layout of jobs, and make wood work jobs and patterns. Students will be required to maintain the tools/equipment in proper and safe working conditions.

COURSE CONTENTS

1. MEASURING AND LAY-OUT TOOLS **6 HRS**

1.1 Measuring tools (Steel rule, Caliper rule, Shrink rule, Flexible Tape, Try square, T - Bevel, Caliper Steel square)

1.2 lay-out tools (Marking gauge, Panel gauge, Mortise gauge, Divider, Surface plate, Angle plate, V – block, Surface gauge)

2. SAWING TOOLS. **6 HRS**

2.1 Classification of saws (Pull type, Push type)
2.2 Types of saws (General purpose, special purpose)
2.3 General purpose saws (Rip saw, Cross-cut saw, Back saw)
2.4 Special purpose saws (Coping saw, Compass saw, Panel saw, Dove tail saw, Miter box, Key hole saw, Turning saw)

3. PLANING TOOLS. **6 HRS**

3.1 Classification of Planes
3.2 General purpose planes (Jointer plane, Fore plane, Jack plane, Smooth plane)
3.3 Special purpose planes (Block plane, , Rabbet plane, Router plane, Circular plane, Core-box plane, Spoke shave, Dado plane)

4. CLAMPING TOOLS. **2 HRS**

4.1 Bench vice

4.2 C - clamp

4.3 Bar clamp

4.4 Hand screw

5. CHISELING TOOLS **2 HRS**

5.1 Definition of chisel

5.2 Classification of chisels (Socket, Tang, Mortise, and Firmer)

6. FILES. **2 HRS**

6.1 Definition of File

6.2 Parts of files

6.3 Common shapes (Flat, Round, Half round, Tri-angular, square).

6.4 Cuts (Single cut, Double cut, Rasp cut)

6.5 Classification of files (Bastard, Rough, Smooth, Dead smooth)

6.6 Operations (Flat filing, Draw filing)

6.7 File card

6.8 precautions

7. HAMMERS. **2HRS**

7.1 Functions

7.2 Main parts

7.3 Types (Ball peen, cross peen, straight peen, Claw hammer)

8. MISCELLANEOUS TOOLS. **2 HRS**

8.1 Mallet

8.2 Nail set

8.3 Screw driver

8.4 Pincer

8.5 Nail puller

9. MICRO METER. **2 HRS**

9.1 Working principle

9.2 Main parts

9.3 Types (Inside, outside, depth)

9.4 Least count (inch, mm)

9.5 Reading.

9.6 Use and care of micrometer

10. VERNIER CALIPER **2 HRS**

10.1 Principles

10.2 Main parts

10.3 Least count

10.4 Reading

10.5 Use and care of micrometer

RECOMMENDED BOOKS:

1. Exploring Pattern making and Foundry by Harvey D. Miner and John G. Miller

2. Principles of wood working By Herman H .Jorth
3. Metal work Technology and practice By Victor E Repp Ed. D
4. Engineering Inspections measurement and Testing by H.C. Town R Gole Bourne.
5. Metal working by Lud vid
6. Wood working by Willis H. Wagner
7. Wood work made Simple by Tompettit, FRSA, and MRST
8. The wood working Bible by Percy W. Blandford

FP-131 **WOOD WORKING HAND TOOLS**

INSTRUCTIONAL OBJECTIVES

1. UNDERSTAND MEASURING AND LAY-OUT TOOLS

1.1 Describe measuring tools (Steel rule, Caliper rule, Shrink rule, Flexible Tape, Try square, T - bevel Caliper Steel square)

1.2 Explain lay-out tools (Marking gauge, Panel gauge, Mortise gauge, Divider, Surface plate, Angle plate, V – block, Surface gauge)

2. UNDERSTAND SAWING TOOLS.

2.1 State classification of saws (Pull type, Push type)

2.2 Describe types of saws (General purpose, special purpose)

2.3 Explain with sketch general purpose saws (Rip saw, Cross-cut saw, Back saw)

2.4 Explain with sketch Special purpose saws (Coping saw, Compass saw, Panel saw,Dove tail saw, Miter box, Key Hole saw, turning saw)

3. UNDERSTAND PLANING TOOLS.

3.1 Enlist classification of Planes

3.2 Explain general purpose planes (Jointer plane, Fore plane, Jack plane, Smooth plane)

3.3 Explain Special purpose planes (Block plane,Rabbet plane, Router plane, Circular plane, Core-box plane, Spoke shave, Dado plane)

4. KNOW ABOUT CLAMPING TOOLS.

4.1 Describe Bench vice

4.2 State C - clamp

4.3 Describe bar clamp

4.4 State Hand screw

5. UNDERSTAND CHISELING TOOLS

5.1 Define chisel

5.2 Enlist Classification of chisels

5.3 Explain types of chisels (Socket, Tang, Mortise, and Firmer)

6. UNDERSTANT FILES.

6.1 Define File

6.2 Enlist Parts of files

6.3 Describe Common shapes (Flat, Round, Half round, Tri-angular, square).

6.4 State Cuts of file (Single cut, Double cut, Rasp cut)

6.5 Explain Classification of files (Bastard, Rough, Smooth, Dead smooth)

6.6 Describe Operations (Flat filing, Draw filing)

6.7 State File card

6.8 Enlist precautions for file

7. KNOW ABOUT HAMMERS.

7.1 State functions of hammer

7.2 Enlist Main parts

7.3 Describe types of hammer (Ball peen, crass peen, straight peen, Claw hammer)

8. UNDERSTANT MISCELLANEOUS TOOLS.

8.1 State Mallet

8.2 Describe Nail set

8.3 State Screw driver

8.4 Describe Pincer

8.5 State Nail puller

9. UNDERSTANT MICRO METER.

9.1 State working principle

9.2 Enlist main parts

9.3 Describe types of micrometer (Inside, outside, depth)

9.4 State least count (inch, mm)

9.5 State Reading.

9.6 Enlist uses and care of micrometer

10. UNDERSTANT VERNIER CALIPER

10.1 Describe principles of Vernier caliper

10.2 Enlist main parts

10.3 State least count

10.4 Describe Reading.

10.5 Enlist use and care of micrometer

FP-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. 3 HRS

1.1 Define (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. 2 HRS

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) 8 HRS

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 Reduction and oxidation reactions

3.9 Pre- smelting processes

3.9.1 Concentration

3.9.2 Agglomeration (Briquetting, Palletizing, Nodulizing, Sintering)

4. REFRACTORY MATERIALS 2 HRS

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.

5. BLAST FURNACE 10 HRS

5.1 Construction of blast furnace.

5.2 Charge of blast furnace

5.3 Operation of blast furnace.

5.4 Zones of blast furnace

5.5 Chemistry of iron ore refining.

5.6 Products of blast furnace and their uses.

6. WROUGHT IRON 3 HRS

6.1 Construction of puddling furnace.

6.2 Charge of puddling furnace

6.3 Simple operation of furnace.

6.4 Uses of wrought iron.

7. STEEL AND ITS CLASSIFICATION. 4 HRS

7.1 Define Steel (Carbon Steel, Alloy steel)
7.2 Classification of Carbon Steel and Alloy steel.
7.3 Applications of carbon and alloy steels.

8. OPEN HEARTH FURNACE 4 HRS

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. 4 HRS

9.1 Construction of Bessemer converter.
9.2 Charge of Bessemer Convector.
9.3 Operation of Bessemer converter.
9.4 Advantages of Bessemer process

10. ELECTRIC ARC FURNACE. 8 HRS

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
10.5 Charging
10.6 Oxidation period
10.7 De-oxidation period
10.8 Addition of alloying element
10.9 Tapping
10.10 Duplex operation.

11. INDUCTION FURNACE. 4 HRS

11.1 Construction of induction Furnace.

11.2 Working Principle.

11.3 Operation of furnace.

12. STEEL CASTINGS. 2 HRS

12.1 Ingot Casting.

12.2 Slab

12.3 Billets.

12.4 Blooms

13. INDUSTRIAL SHAPING OF METALS AND ALLOYS 10 HRS

13.1 Mechanical properties (Ductility, Malleability, Hardness, Brittleness, Toughness, Elasticity, Plasticity)

13.2 Hot working process

13.3 Rolling

13.3.1 Types of Rolling Mils

13.3.2 Rolling Products.

13.4 Forging

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

13.4.2- Forging products.

13.5 Extrusion

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

13.5.2- Extrusion products.

13.6 Heading

13.7 Hot Pressing

13.8 Drawing

13.9 Cold Working processes

13.9.1 Rolling

13.9.2 Forging

13.9.3 Drawing

13.9.4 Spinning process.

13.9.5 Blanking and Piercing.

13.9.6 Coining

13.9.7 Pipe production

RECOMMENDED BOOKS:

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 Ltd. 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

FP-142 **FERROUS METALLURGY**

INSTRUCTIONAL OBJECTIVES:

1. KNOW ABOUT BASIC TERMINOLOGY OF METALLURGY.

1.1 Define the following (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

2.2 State extent of each Iron ore in nature.

2.3 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 methods

3.3 State grinding of 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 Define Reduction and oxidation reactions

3.9 Enlist Pre smelting processes

3.9.1 State Concentration

3.9.2 Describe agglomeration, Briquetting, Palletizing, Nodulizing and Sintering

4. KNOW THE 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

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

5.1 Sketch and explain construction of blast furnace

5.2 State Charge of blast furnace

5.3 Describe operation of blast furnace

5.4 Describe zones of blast furnace

5.5 State chemistry of iron ore refining

5.6 State products of blast furnace and their uses.

6. WROUGHT IRON

6.1 Sketch and describe Construction of puddling furnace.

6.2 Charge of puddling furnace

6.3 Simple operation of furnace.

6.4 Uses of wrought iron.

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 Sketch and describe construction of Open-hearth furnace

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

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

9. UNDER THE BESSEMER PROCESS.

9.1 Sketch and 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 STEEL MELTING IN ELECTRIC ARC FURNACES.

10.1 Define and classify an Arc furnace.

10.2 Sketch and describe construction of direct electric arc furnace.

10.3 sketch and describe construction of In-direct electric arc furnace

10.4 Differentiate direct and indirect arc furnace.

10.5 State operation of direct and In-direct electric arc furnaces

10.5.1 Enlist charge material and state method of charging

10.5.2 State oxidation period

10.5.3 State de-oxidation period

10.5.4 State addition of alloying element and tapping

10.6 Explain duplex operation.

11. UNDERSTAND STEEL MELTING IN INDUCTION FURNACE.

11.1 Draw sketch of induction furnace and label its parts

11.2 Describe construction of induction Furnace.

11.3 State working Principle of induction furnace.

11.4 Describe operation of induction furnace.

12. KNOW ABOUT STEEL CASTINGS.

12.1 Define Ingot Casting.

12.2 State slab

12.3 Define billets.

12.4 State blooms

13. UNDERSTAND INDUSTRIAL SHAPING OF METALS AND ALLOYS

13.1 Define Mechanical properties (Ductility, Malleability, Hardness, Brittleness, Toughness, Elasticity, Plasticity)

13.2 State hot working process

13.3 Define Rolling

13.3.1 Describe types of Rolling Mils

13.3.2 Enlist rolling Products.

13.4 Define Forging

13.4.1 Describe types of Forging (Black smith forging, Drop forging, press Forging upset forging)

13.4.2 Enlist forging products.

13.5 Define Extrusion

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

13.5.2 Enlist extrusion products.

13.6 State heading

13.7 State Hot Pressing

13.8 State Drawing

13.9 State Cold Working processes

13.9.1 Define Rolling

13.9.2 Define Forging

13.9.3 Define drawing

13.9.4 Describe Spinning process.

13.9.5 State Blanking and Piercing.

13.9.6 State Coining

13.9.8 State Pipe production

FP-152 **BASIC PATTERN MAKING**

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

AIMS: Students will be able to understand pattern material such as manufacturing of various types of patterns, pattern allowances and color code

COURSE CONTENTS

1. TREES. 4 HRS

- 1.1 Classification of Trees
- 1.2 Growth of trees
- 1.3 Structure of trees
- 1.4 Cross-section of Tree Trunk
- 1.5 Timber calculation (Cubic foot, Board feet, Log)
- 1.6 Sawing of logs
  - 1.6.1 Tangential sawing
  - 1.6.2 Slab sawing
  - 1.6.3 Rift sawing
  - 1.6.4 Quarter sawing
  - 1.6.5 Modified quarter sawing

2. TIMBER DISEASES 2 HRS

- 2.1 Decay
- 2.2 Wet Rot
- 2.3 Dry Rot
- 2.4 Plethora
- 2.5 Drowsiness
- 2.6 Foxiness

3. DEFECTS OF TIMBER. 2 HRS

- 3.1 Cup shake
- 3.2 Heart shake

3.3 Star shake

3.4 Up-sets

3.5 Twisted grains

3.6 Wood worms

3.7 White Ants

3.8 Types of knots

4. SEASONING OF TIMBER 6 HRS

4.1 Purposes of seasoning

4.2 Types of wood seasoning

4.2.1 Water seasoning method of wood

4.2.2 Air seasoning method of wood

4.2.3 Artificial seasoning method of wood

4.3 Calculation of moisture contents

4.4 Defects caused by incorrect seasoning

4.4.1 Warping

4.4.2 Twisting

4.4.3 Case hardening

4.4.4 Surface cracking

4.4.5 Honey combing

4.4.6 Splitting

5. TIMBER SHRINKAGE AND ITS EFFECT 2 HRS

5.1 Longitudinal shrinkage

5.2 Radial shrinkage

5.3 Tangential shrinkage

6. TIMBER USE IN PATTERN MAKING 2 HRS

6.1 Deodar wood (Description, characteristic, source of supply

6.2 Kail wood (Description, Characteristic, source of supply

6.3 Red wood (Description, Characteristic, source of supply

6.4 Mohegan (Description, Characteristic, source of supply

7. PATTERN MATERIALS 3 HRS

7.1 Wood

7.1.1 Common woods, used for Pattern Making

7.1.2 Advantages

7.1.3 Limitations

7.2 Metals

7.2.1 Metals and alloys used for pattern making

7.2.2 Advantages and Limitations

7.3 Plastics

7.3.1 Types of plastics used for pattern making

7.3.2 Advantages and Limitations

8. PATTERNS **3 HRS**

8.1 Definition of pattern

8.2 Uses of patterns

8.3 Types of patterns (Solid / one piece pattern, Loose piece pattern, Split or two piece pattern)

9. PATTERN ALLOWANCES **2 HRS**

9.1 Definition of allowance

9.2 Types of allowances

9.2.1 Shrinkage allowance (cast iron, steel, Aluminum, Brass, Bronze)

9.2.2 Draft allowance

9.2.3 Machining allowance

10. CORE PRINTS AND CORE BOXES **2 HRS**

10.1 Definition of core box

10.2 Definition of core print

10.3 Types of Core prints (vertical, Bottom and top print Horizontal, balanced, hanging, cover core print, wing print)

11. PATTERN COLOURS. **2 HRS**

11.1 American color code/scheme

11.2 British color code/scheme

11.3 Swedish system color code/scheme

12. WOOD PRESERVATION **2 HRS**

8.1 Definition

8.2 Types of wood preservers

8.3 Application of preservers (By Brush, By Spray, By Pressure)

REFERENCE BOOKS:

1. Advance pattern making by L.L. Cox
2. Exploring pattern making & Foundry by Harvey D. Miner and John G. Miller
3. Pattern making by S.P.I.T. Gujrat
4. Wood working by Willis H. Wagner
5. Wood work made Simple Tompettit, FRSA, and MRST
6. The wood working Bible by Percy W. Blandford
7. General Wood working by Chrishgroneman
8. The Wood Work book by John Makepeace
9. Principles of wood working By Herman H .Jorth

FP-152 **BASIC PATTERN MAKING**

INSTRUCTIONAL OBJECTIVES

1. UNDERSTAND TREES.

1.1 State Classification of Trees

1.2 Describe Growth of trees

1.3 Explain Structure of trees

1.4 Describe Cross-section of Tree Trunk

1.5 State Timber calculation (Cubic foot, Board feet, Log)

1.6 Describe Sawing of logs

1.6.1 State Tangential sawing

1.6.2 Describe Slab sawing

1.6.3 Describe Rift sawing

1.6.4 State Quarter sawing

1.6.5 Describe Modified quarter sawing

2. UNDERSTAND TIMBER DISEASES

2.1 Describe Decay

2.2 Describe Wet Rot

2.3 State Dry Rot

2.4 State Plethora

2.5 State Drowsiness

2.6 Describe Foxiness

3. UNDERSTAND TIMBER DEFECTS

3.1 Describe Cup shakes

3.2 State Heart shake

3.3 Describe Star shake

3.4 state Up-sets

3.5 State Twisted grains

3.6 Describe Wood worms

3.7 State White Ants

3.8 state types of knots

4. UNDERSTAND SEASONING OF TIMBER

4.1 Describe purpose of seasoning

4.2 State types of wood seasoning

4.2.1 Explain water seasoning method of wood

4.2.2 Explain air seasoning method of wood

4.2.3 Explain Artificial seasoning method of wood

4.3 Describe Calculation of moisture contents

4.4 Enlist defects caused by incorrect seasoning

4.4.1 Describe Warping

4.4.2 State Twisting

4.4.3 State Case hardening

4.4.4 Describe Surface cracking

4.4.5 State Honey combing

4.4.6 Describe Splitting

5. KNOW ABOUT TIMBER SHRINKAGE AND ITS EFFECT

5.1 State Longitudinal shrinkage

5.2 State Radial shrinkage

5.3 State Tangential shrinkage

6. UNDERSTAND TIMBER USE IN PATTERN MAKING

6.1 Explain Deodar wood (Description, characteristic, source of supply)

6.2 Describe Kail wood (Description, Characteristic, source of supply)

6.3 State Red wood (Description, Characteristic, source of supply)

6.4 State Mohegan (Description, Characteristic, source of supply)

7. UNDERSTAND PATTERN MATERIALS

7.1 Wood

7.1.1 Describe Common woods used for Pattern Making

7.1.2 Enlist Advantages and Limitations

7.2 Metals

7.2.1 State Metals and alloys used for pattern making

7.2.2 Enlist Advantages and Limitations

7.3 Plastics

7.3.1 State types of plastics used for pattern making

7.3.2 Enlist Advantages and Limitations

8. KNOW ABOUT PATTERNS

8.1 Define pattern

8.2 Enlist Uses of patterns

8.3 Describe types of patterns (Solid / one piece pattern, Loose piece pattern, Split or two piece pattern)

9. UNDERSTAND PATTERN ALLOWANCES

9.1 Define allowance

9.2 Describe types of allowances

9.2.1 Enlist Shrinkage allowances for cast iron, steel, Aluminum, Brass, Bronze

9.2.2 Describe Draft allowance

9.2.3 State Machining allowance

10. KNOW ABOUT CORE PRINTS AND CORE BOXES

10.1 Define core print

10.2 State types of Core prints (vertical, Bottom and top print Horizontal, balanced, Hanging, cover core print, wing print)

10.3 Define core box

11. UNDERSTAND PATTERN COLOURS.

11.1 State American color code/scheme

11.2 State British color code/scheme

11.3 State Swedish system color code/scheme

12. KNOW ABOUT WOOD PRESERVATION

8.1 Define

8.2 Describe types of wood preservers

8.3 State method of application of preservers (By Brush, By Spray, By Pressure)

FP-152 **BASIC PATTERN MAKING**

LIST OF PRACTICALS **96 Hrs.**

INTRODUCTION & SAFETY

1. Layout of pattern shop
2. Introduction to pattern making hand tools
3. Safety precautions in pattern making shop

SAWING PRACTICE

1. Practice of Rip sawing
2. Practice of Cross cutting with hand saw
3. Practice of outside and inside curve cutting

PLANNING PRACTICE

1. Planning a wooden stock according to size with Hand plane
2. Face planning and Edge planning with jack plane
3. Planning practice with smooth plane

WOODEN JOINTS

Dado joint, cross lap joint, Dove tail Joint, Mortise and tannin joint, bridal joint.

TOOL GRINDING

Practice of Sharpening of plane iron, Hand saw and chisels.

PATTERNS

1. Prepare a pattern of rectangular plate using all allowances
2. Prepare a pattern of frame
3. Prepare a pattern of step block

Mech-141 SAFETY PRACTICE & PROCEDURES

Total Contact Hours	**T**	**P**	**C**
Theory: 32Hrs	**1**	**0**	**1**
Practical: 0 Hrs			

Pre-requisites: None

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

1. Adopt safety standards, codes, rules, etc., to be desired in Mechanical Workshop / Labs of Industries.
2. Understand methods of prevention of accident.
3. Provide first aid and rescue in case of any accident.

Detail of Contents:

1. Introduction and Importance of Safety 1Hr

1.1 Introduction to safety and House keeping
1.2 Importance in Institute workshops /labs
1.3 Importance in industry
1.4 Accident cost

2. Accidents in Chemical Industry 2 Hrs

2.1 Accidents in petroleum, paint and fertilizer industry
2.2 Explosive vapors and gases

3. Accidents in Mechanical Industry 3 Hrs

3.1 Due to material handling and transportation
3.2 Accidents due to hand tools
3.3 Accidents in machines shop
3.4 Accidents in Metal workshop
3.5 Accidents in wood working shop
3.6 Accidents in foundry, welding and forging shop
3.7 Safety in CNC machines operation

4. Accidents in Flow Production Industry 2 Hrs

4.1 Accidents in textile mills, paper mills & food Industries

5. Accidents in other Industries 2Hrs

5.1 Accidents in mines
5.2 Accidents in leather industries
5.3 Accidents in power plant (Steam)

6. Electric shocks & Earthling (Prevention and its remedy) 2Hrs

6.1 Electricity as danger
6.2 Electric shock phenomena
6.3 Reasons of electric shock
6.4 Prevention of electric shock
6.5 First aid in electric shock

7. Fire accidents and their prevention 3 Hrs

7.1 Fire accidents and their prevention
7.2 Fire hazard and their types

7.2.1 Causes of fire hazard
7.3 Fire fighting equipment, and fire extinguishers
7.4 Plant lay out for fire safety

8. Safety in plant Lay-out 2 Hrs

8.1 Safety in Plant lay out
8.2 Housekeeping for safety
8.3 Safety instruction during maintenance
8.4 Safety instruction in use of electricity

9. Personal Protective Equipment 2 Hrs

9.1 Useful protective device
9.2 Personal protective device and its importance
9.3 For protection from chemicals and gases

10. Environmental Safety 3 Hrs

10.1 Environmental Safety
10.2 Industrial ventilation
10.3 Exhaust systems
10.4 Industrial noise
10.5 Illumination for safety and comfort
10.6 Industrial hygiene and plant sanitation
10.7 Thermal radiation
10.8 Waste Disposal, Dust and fumes, Over Crowding, Lightings
10.9 The Artificial humidification
10.10 Drinking water

11. Pollution 2 Hrs

11.1 Atmosphere
11.2 Water pollution
11.3 Solid waste management

12. First Aid 2 Hours

12.1 Importance
12.2 Procedure and training
12.3 Extended medical services

13. Analyzing Causes of Accidents 3 Hrs

13.1 Accident prevention fundamentals
13.2 Plant inspections and accidents investigation
13.3 Safety inventory, auditing, records and annual reports

14. Promoting Safety Culture 2 Hrs

14.1 Employees training culture
14.2 Displays
14.3 Guidance

15. Safety Regulations & adherence to International Safety Standards 2Hrs

15.1 Safety Regulations & adherence to International Safety Standards
15.2 Pakistan Factory Act (laws concerning to safety)
15.3 Workman compensation act
15.4 Industrial insurance and social security
15.5 Legal aspects of safety

Mech-141 SAFETY PRACTICE & PROCEDURES

Instructional Objectives:

Note: (i) Practical's should be demonstrated during classes (Lectures) with the help of actual exercise, charts and video etc.
(ii) Safety lab should be established and the period should be conducted in the same lab

1. Know 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 theCost of accident

2. Know 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 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 wood working shop
- 3.6 Describe accidents in foundry, welding and forging shop
- 3.7 Describe Safety in CNC machines operation

4. Know causes and methods of prevention of accident in flow process industry
- 4.1 State the types of accident in flow process industry
  - 4.1.1 List the accident in textile mills, paper and board mills and food industry
  - 4.1.2 Describe the methods of prevention of accidents in above listed industries

5. Describe accidents and their remedy
- 5.1 Describe accidents in Mines
- 5.2 Describe accidents in Leather industries
- 5.3 Describe accidents in Power plant (Steam)

6. Electric shocks & Earthling (Prevention and its remedy)
- 6.1 Describe Electricity as danger
- 6.2 Describe Electric shock phenomena
- 6.3 Describe Reasons of electric shock
- 6.4 Describe Prevention of electric shock
- 6.5 Describe First aid in electric shock

7. Fire Accidents and their prevention

7.1 Describe prevention of fire accidents on plant

7.2 Know the causes of fire hazard

- 7.2.1 Identify fire hazard and their types
- 7.2.2 List the causes of accidents due to fire

7.3 Know Steps to control fire/fire fighting

- 7.3.1 Training of fire fighting with the help of Rescue 1122
- 7.3.2 Know the types of fire extinguishers and their use

7.4 Identify the fire safety points in plant layout

8. Know 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 to lay out machines and equipments by considering safety aspect

8.4 Explain the instructions use of electricity

9. Know principle method and importance of personal protective device

9.1 State useful protective devices

9.2 List personal protective devices and describe their importance

- 9.2.1 Describe protection devices protecting Hand, faces, Ear, Leg, Foot and Eyes
- 9.2.2 Describe protection
- 9.2.3 Describe personal safety equipments
- 9.2.4 Describe lather safety belt, fire ropes, chain, slings and other supports for precautions

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

10. Understands the environmental effect of accident and their remedies

10.1 Knows environmental effects on human beings and surroundings

10.2 Explain importance and purpose of industrial ventilation

10.3 Describe exhaust system in industry and their important

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

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

10.5 Identify the advantages of illumination for safety and comfort

10.6 Explain necessity of plant hygiene for safety and comfort

10.7 Explain causes of thermal radiation and its remedy

10.8 Explain causes and remedy of spittns dust, fumes, improper light and overcrowding accidents

10.9 Explain needs of artificial humidification

10.10 Explain effects of polluted water

11. Pollution

11.1 Describe different stages of Atmosphere i.e. stratosphere, mesosphere, ionosphere etc.

11.2 Describe the international standards of pure water

- 11.2.1 State how water get polluted
- 11.2.2 Describe methods of purification of polluted water at different Level

11.3 Describe the solid waste types and its management

- 11.3.1 State different methods of solid waste collection
- 11.3.2 Describe recycling and disposal of solid waste

12. Know the methods of providing first aid

12.1 Identify the importance of first aid
12.2 Explain the methods of providing fist aid and their training may be arranged to train the students in first aid procedure (a video)
12.3 Identify the step by step procedure of providing medical services
12.3.1 Describe protection of respiration system and methods of artificial respiration

13. Analyzing the causes of accidents

13.1 Understand the procedure of analyzing the causes of accidents
13.1.1 Identify the general causes of accident
13.1.2 Explain step by step procedure to analyze the accidents
13.2 Know the use of data for investigation and resident reports for analyzing the causes of accident
13.2.1 Record safety inventory, accident report and investigation reports, annual reports
13.2.2 Collect the data of accident for analyzing the root of accidents
13.3 Identify safety rules procedures in the light of annual accidents report for safe guard

14. Understand the methods and procedures for promoting safety culture

14.1 Identify the importance of safety
14.2 Describe methods of promoting safety concept by display charts, play cards, Banners and wall chalking; through guidance
14.3 List methods of promoting safety concepts

15. Understand Safety Regulations & adherence to International SafetyStandards

15.1 Explain safety Regulations & adherence to International Safety Standards
15.2 Describe clauses of Pakistan Factory Act related to safety
15.3 Describe Workman compensation Act
15.4 Identify the procedure for industrial insurance and social security
15.5 Describe legal procedure in case of serious accidents

FP-162 **BASIC METAL WORK**

Total Contact Hours

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

COURSE CONTENTS:

1. MEASURING TOOLS **2HRS**

1.1 Steel rule
1.2 Try square
1.3 Inside Caliper
1.4 Outside caliper

2. LAYING OUT TOOLS **2HRS**

2.1 Surface plate
2.2 Angle plate
2.3 Scriber
2.4 Divider
2.5 Surface gauge
2.6 Combination set
2.7 Beam Trammel

3. CUTTING TOOLS **2HRS**

3.1 Introduction to hand Hack sawing
3.2 Principle parts of hand hack saw
3.3 Types of Hack saws and their uses
3.4 Hack saw blades, types, uses, setting
3.5 Selection of blades for different jobs and materials

4. FILES **2HRS**

4.1 Files.
4.2 Parts of a File
4.3 Classification of files and their uses according to the shape, grade, cut and size
4.4 Cares of Files
4.5 Precautions during filing

5. PUNCHES **1HRS**

5.1 Definition and uses of punches
5.2 Centre Punch
5.3 Prick Punch
5.4 Drift Punch

Automatic center Punch / Self Centering punch

6. CHIESELS. **2HRS**

6.1 Types of Chisels with respect to shape and their uses
6.2 Flat chisel
6.3 Round nose Chisel
6.4 Cape or cross cut chisel
6.5 Diamond point chisel

6.6 Types of chisel (Hot or Cold)
6.7 Heat treatment of chisel
6.8 Grinding the angle of Flat chisel
6.9 Precautions during chiseling

7. INTRODUCTION TO TINNER'S SNIP OR SHEAR 2HRS

7.1 Straight snip
7.2 Universal shears
7.3 Pipe snip
7.4 Bench shear

8. SCREW DRIVERS 2HRS

8.1 Definition and use of Light duty screw driver
8.2 Heavy duty screw driver
8.3 Phillips screw driver
8.4 Double ended Offset screw Driver

9. PLIERS 2HRS

9.1 Definition and use of slip joint or Combination pliers
9.2 Needle nose or Long nose pliers
9.3 Diagonal (side cutting Pliers)

10. WRENCHES 2HRS

1. Single ended wrench
2. Double ended wrench
3. Closed ended wrench
4. Twelve point Box wrench
5. Adjustable open ended wrench (Monkey wrench)
6. Allen wrench or Hex Key
7. Pipe wrench

11. HAMMERS (DEFINITION AND USES) 2HRS

11.1 Types of hammer
11.2 Ball peen hammer
11.3 Cross peen hammer
11.4 Straight peen hammer
11.5 Claw hammer
11.6 Black smith hammer
11.7 Hand hammer
11.8 Heavy ball peen hammer
11.9 Heavy cross peen hammer
11.10 Flat faced sledge hammer
11.11 Straight peen sledge hammer

12. VICES,CLAMPS AND BLOCKS (CONSTRUCTION AND USES) 1Hrs

12.1Bench vice
12.2Pipe vice
12.3Leg vice

13. DRILLS 2HRS

1.1 Main parts of drills and their function
13.2Types of drills
13.3Taper shank
13.4Straight shank
13.5Counter sink drill
13.6Drill point and lip clearance angle for different materials
13.7Calculation of the R.P.M and feeds of Twist drill

14. DRILL MACHINES **4HRS**

1.1 Drill press, parts of a standard drill press
1.2 Types of Drill press
1.3 Safety precautions during drilling operation and drill grinding
1.4 Drill Machine Operations
1.5 Drilling
1.6 Counter sinking
1.7 Counter boring
1.8 Reaming
1.9 Spot facing
1.10 Tapping
1.11 Tool and Job holding devices used on drill machines
1.12 **Fasteners**
1.13 Introduction to Fasteners
1.14 Screws, Nuts, Bolts, Rivets,
1.15 Types and applications of related tools

15. REAMERS **1HRS**

8. Fluted Chucking reamer
9. Rose Reamer
10. Shell Reamer
11. Taper pin Reamer
12. Jobber's Reamer

16. TAPS AND DIES **1HRS**

16.1 Types
16.2 Uses
16.3 Cares of taps and dies during operation

17. MEASURING INSTRUMENTS **2HRS**

17.1 Vernier Caliper (Metric System)
17.2 Metric system micrometer

18. PEDESTAL GRINDER **1HR**

18.1 Introduction to pedestal grinder
18.2 Safety precautions
18.3 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

FP-162 BASIC METAL WORK

INSTRUCTIONAL OBJECTIVES

1. UNDERSTAND MEASURING TOOLS

1.1 Enlist types of Steel rule
1.2 Explain each type of Steel rule
1.3 State use of Try square
1.4 Compare use of Inside Caliper & Outside caliper

2. UNDERSTAND LAYING OUT TOOLS

2.1 Explain use of Metal surface preparation
2.2 Explain use of Surface plate
2.3 Explain use of Angle plate
2.4 Explain use of Scriber
2.5 Explain use of Divider
2.6 Explain use of Surface gauge
2.7 Explain use of Combination set
2.8 Explain use of Beam Trammel

3. UNDERSTAND CUTTING TOOLS

3.1 State Principle parts of hand hack saw
3.2 State Types of Hack saws and their uses
3.3 Explain uses of the various Types of Hand saw
3.4 Explain types and uses of Hack saw blades
3.5 Explain term setting of the blade
3.6 Apply method of cutting by Hand hack saw
3.7 Explain Selection of blades for different jobs and materials
3.8 Observe precautions during Hack sawing

4. UNDERSTAND FILES

4.1 Sketch File and label its parts
4.2 State Classification and uses of Files according to the shape, grade, cut and size
4.3 Explain Cares of Files
4.4 Observe Precautions during filing

5. UNDERSTAND PUNCHES

5.1 Definition and uses of punches
5.2 Explain Centre Punch
5.3 Explain Prick Punch
5.4 Explain Drift Punch
5.5 Explain Automatic center punch / Self Centering punch

6. UNDERSTAND METHODS & PROCEDURE OF CHIESELS AND CHISELING

6.1 Classify Chisels
6.2 State use of Flat chisel
6.3 State use of Round nose Chisel
6.4 State use of Cape or cross cut chisel
6.5 State use of Diamond point chisel
6.6 Describe Hot Chisel
6.7 Describe Cold Chisel
6.8 Observe safety precautions during chipping

7. UNDERSTAND TINNER'S SNIP OR SHEAR

7.1 Define Tinner's Snip
7.2 State use of Straight snip
7.3 State use of Universal shears
7.4 State use of Pipe snip
7.5 State use of Bench shear

8. UNDERSTAND TYPES AND USES OF SCREW DRIVERS

8.1 Enlist Types of Screwdrivers
8.2 State use of Light duty screw driver, Phillips screw driver, Heavy dutyscrew driver Double ended Offset screw Driver

9. UNDERSTAND PLIERS

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

10. UNDERSTAND WRENCHES

10.1 Enlist types of wrenches
10.2 Explain the functions and use of each Wrench

11. UNDERSTAND HAMMERS AND ITS TYPES

11.1 Sketch Machinist hammer (Ball peen hammer, Cross peen hammer, Straight peen hammer)
11.2 State use of Ball peen hammer, Cross peen hammer and Straight peen hammer
11.3 Explain use of Claw hammer
11.4 Explain use of Black smith hammer or Hand hammer
11.5 Explain use of Heavy cross peen Sledge
11.6 Explain use of Heavy Straight peen Sledge
11.7 Explain use of Flat faced sledge hammer
11.8 Straight peen sledge hammer

12. UNDERSTAND VICES,CLAMPS AND BLOCKS

12.1 Explain construction of Bench vice
12.2 Explain construction of Pipe vice
12.3 Explain construction of Leg vice

13. UNDERSTAND DRILLS AND DRILLING PROCEDURE

13.1 Sketch Different parts of drills and their function
13.2 Explain Function of each part of drill
13.3 State use of Taper shank
13.4 State use of Straight shank
13.5 State use of Counter sink drill
13.6 State Drill point and lip clearance angle for different materials
13.7 Describe formula to Calculate R.P.M of Twist drill
13.8 Calculate feed of Twist drill

14. UNDERSTAND TYPES OF DRILL MACHINES

14.1 Enlist parts of Standard Drill press
14.2 State Types of Drill press
14.3 Describe and use of Standard drill press (Floor type)
14.4 Describe and use Standard drill press (Bench type)

15. UNDERSTAND REAMERS AND REAMING

15.1 Enlist Types of Reamers
15.2 State use of Fluted Chucking reamer
15.3 State use of Rose Reamer
15.4 State use of Shell Reamer
15.5 State use of Taper pin Reamer
15.6 State use of Jobber's Reamer

16. UNDERSTAND TAPS AND DIES

16.1 Define Taps and Dies
16.2 Differentiate between Taps and Dies
16.3 State use of Taps and Dies
16.4 Apply Care of taps and dies during operation

17. UNDERSTAND PRECISION MEASURING INSTRUMENTS

17.1 Describe working principle of Vernier Caliper (Metric System)
17.2 Describe working principle of micrometer (Metric system)
17.3 State talking of reading on Vernier caliper and Micro meter

18. UNDERSTAND PEDESTAL GRINDER

18.1 Explain the proper use of pedestal grinder
18.2 Observe Safety during grinding and wheel dressing

FP-162 BASIC METAL WORK

List of Practical: **96 Hrs.**

1. Sawing exercise
2. Preparation of Square plate.
3. Drilling, Reaming and Tapping Practice.
4. Preparation of inside caliper
5. Preparation of Bottle opener
6. Preparation of dove-tail joint
7. Preparation of small size Try-square

اسلامیات/مطالعہ پاکستان

نصاب (سال دوم)

حصہ اول	اسلامیات	Gen 211	ٹی	پی	سی
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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 احد ث فی امرنا هذا ما لیس منه فهورد
- من حمل علینا السلاح فلیس منا
- اناو کا فل الیتیم فی الجنة هکذا
- لا یومن احد کم حتیٰ 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۔ حضورؐ 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۔

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 واجتماعی) 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 ومفہوم بیان کر سکے۔
- اسلامی معاشرہ کی امتیازی خصوصیات بیان کر سکے۔
- اسلامی معاشرہ میں عدل واحسان کی اہمیت بیان کر سکے۔
- تبلیغ کے لغوی معنی بیان کر سکے۔

نصاب اخلاقیات (غیر مسلم طلباء کیلئے)

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سال دوم

کل وقت 20 گھنٹے

موضوعات

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

سی	پی	ٹی
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سال دوم

کل وقت 12 گھنٹے

حصہ دوم

موضوعات

- دوقومی نظریہ
- تحریک پاکستان
- انڈین کانگرس
- مسلم لیگ
- تقسیم بنگال
- میثاق لکھنو

حصہ دوم

مطالعہ پاکستان

تدریسی مقاصد

تحریک پاکستان

عمومی مقصد قیام پاکستان کے اسباب ومحرکات کو بیان کر سکے۔

خصوصی مقاصد

- قومیت کے مفہوم کو بیان کر سکے۔
- دوقومی نظریہ کی تعریف وتوضیع کر سکے۔
- دوقومی نظریہ کی اہمیت بیان کر سکے۔
- ہندوستانی مسلمانوں کی محرومیوں کو بیان کر سکے۔
- قومی تشخص کو بحال رکھنے کے لئے مسلمانان ہند کی مساعی بیان کر سکے۔
- آزادی ہند اور قیام پاکستان کے لیے علامہ اقبال اور قائداعظم کی مساعی بیان کر سکے۔
- قیام پاکستان سے مستقبل میں اسلامی مملکت کے قیام کے لئے مسلم عوام کی کوششوں کو بیان کر سکے۔
- مسلم لیگ کی قیام پاکستان کے لئے جدوجہد بیان کر سکے۔

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 BOOKS

Applied Mathematics Math-212, by , Sana-ullah Khan, Syed Tanvi rHaider, Zaif-ullahKhan, Mushtaq Ahmed & Mr. Mazhar AbbasVol - 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 different ional 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 fromthe general form.
12.5 Derive equation of the circle passing through three given points.
12.6 Solve problems involving these equations

Mgm-221 BUSINESS MANAGEMENT AND INDUSTRIAL ECONOMICS

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. Saeed Nasir,Introduction to Business, Ilmi Kitab Khana, 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.

Mgm-211 BUSINESS COMMUNICATIONS

T	P	C
1	0	1

Total contact hours

Theory 32 Hrs.

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

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

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

COURSE CONTENTS

1. COMMUNICATION PROCESS. 6 Hours

1.1 Purposes of communication

1.2 Communication process

1.3 Distortions in communication

1.4 Consolidation of communique

1.5 Communication flow

1.6 Communication for self development

2. ORAL COMMUNICATION SKILLS. 6 Hours

2.1 Significance of speaking.

2.2 Verbal and non-verbal messages.

2.3 Strategic steps of speaking.

2.4 Characteristics of effective oral messages.

2.5 Communication Trafficking.

2.6 Oral presentation.

3. QUESTIONING SKILLS. 3 Hours

3.1 Nature of question.

3.2 Types of questions.

3.3 Characteristics of a good question.

3.4 Questioning strategy

4. LISTENING SKILLS. 5 Hours

4.1 Principles of active listening.

4.2 Skills of active listening.

4.3 Barriers to listening.

4.4 Reasons of poor listening.

4.5 Giving Feedback.

5. INTERVIEWING SKILLS. 3 Hours

5.1 Significance of interviews.

5.2 Characteristics of interviews.

5.3 Activities in an interviewing situation

5.4 Types of interviews.

5.5 Interviewing strategy.

6. REPORT WRITING. 3 Hours

6.1 Goals of report writing

6.2 Report format.

6.3 Types of reports.

6.4 Report writing strategy.

7. READING COMPREHENSION. 2 Hours

7.1 Reading problems.

7.2 Four Reading skills.

8. GROUP COMMUNICATION. 4 Hours

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

RECOMMENDED BOOKS

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

Mgm-211 BUSINESS COMMUNICATIONS.

INSTRUCTIONAL OBJECTIVES

1. **UNDERSTAND THE COMMUNICATION PROCESS.**

    1.1 State the benefits of two way communication.

    1.2 Describe a model of communication process.

    1.3 Explain the major communication methods used in organization.

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

    1.5 Identify misconceptions about communication.

2. **UNDERSTAND THE PROCESS OF ORAL.**

    2.1 Identify speaking situations with other peoples.

    2.2 Identify the strategy steps of speaking.

    2.3 Identify the characteristics of effective speaking.

    2.4 State the principles of one-way communication.

    2.5 State the principles of two-way communication.

    2.6 Identify the elements of oral presentation skills.

    2.7 Determine the impact of non-verbal communication on oral communication.

3. DETERMINE THE USES OF QUESTIONING SKILLS TO GATHER AND CLARIFY INFORMATION IN THE ORAL COMMUNICATION PROCESS.

    3.1 Identify different types of questions.

    3.2 Determine the purpose of each type of question and its application.

    3.3 Identify the hazards to be avoided when asking questions.

    3.4 Demonstrate questioning skills.

4. DEMONSTRATE THE USE OF ACTIVE LISTENING SKILL IN THE ORAL COMMUNICATION PROCESS.

    4.1 State the principles of active listening.

    4.2 Identify skills of active listening.

    4.3 Identify barriers to active listening.

    4.4 State the benefits of active listening.

    4.5 Demonstrate listening skills.

    4.6 Explain the importance of giving and receiving feed back.

5. Determine the appropriate interview type for the specific work-related situation and conduct a work-related interview.

5.1 State the significance of interviews.

5.2 State the characteristics of interviews.

5.3 Explain the activities in an interviewing situation.

5.4 Describe the types of interviews.

5.5 Explain the interviewing strategy.

5.6 Prepare instrument for a structured interview.

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

6.1 Identify the different types of reports.

6.2 Determine when to use an informal or formal report presentation.

6.3 Identify the stages of planning a report.

6.4 Identify the parts of a report and choose the parts appropriate for each type of report.

6.5 Draft a report outline.

7. DEMONSTRATE READING COMPREHENSION.

7.1 Identify major reading problems.

7.2 Identify basic reading skills.

7.3 State methods of previewing written material.

7.4 Identify methods of concentration when reading.

7.5 Demonstrate reading comprehension.

8. UNDERSTAND THE PRINCIPLES OF GROUP COMMUNICATIONS.

8.1 State the purpose and characteristics of major types of meeting.

8.2 Explain responsibilities of a meeting/committee.

8.3 Identify problems likely to be faced at meeting and means to overcome these problems.

8.4 Distinguish between content and process at meetings.

8.5 Explain the key characteristics of a good group facilitator.

Elect-202 APPLIED ELECTRICITY AND ELECTRONICS

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

Pre-requisites: Applied Physics (1st year)

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

Detail of Contents:

1. FUNDAMENTALS OF ELECTRICITY 3Hrs

1.1 Current, (AC and DC Supply) voltage and resistance, their units, single phase and three phase supply
1.2 Ohms law, simple calculations
1.3 Laws of resistance, simple calculations
1.4 Combination of resistances, simple calculations, capacitors and their combinations
1.5 Electrical and mechanical power, their conversion, units, horse power
1.6 Heating effect of current, joules law
1.7 Electrical energy, units, energy bill
1.8 Inductors
1.9 RLC circuits
1.10 Batteries and battery cells

2. PROTECTION DEVICES AND ELECTRICAL SAFETY 5 Hrs

2.1 Fuse and their types
2.2 Circuit breaker and their types
2.3 Relay and their types
2.4 Starter and their types
2.5 Switches and types
2.6 timers

3. MOTORS, GENERATORS AND TRANSFORMERS 5 Hrs

3.1 Faraday's law
3.2 Construction and working of AC and DC generators
3.3 Construction and working of transformers, emf and current equation types
3.4 Welding transformers, ratings
3.5 Types and working of motors
- 3.5.1 AC MOTORS
  - 3.5.1.1 1- Phase induction motor
  - 3.5.1.2 3- Phase induction motors
- 3.5.2 DC MOTORS
  - 3.5.2.1 Stepper motors
  - 3.5.2.2 Servo motors

4. (A) MEASURING INSTRUMENTS 4 Hrs

4.1 Types of instruments
4.2 Secondary type
4.3 Types of meter, potentiometer, bridge circuit
4.4 Calibration of meters

(B) DOMESTIC WIRING

4.5 Wiring and their types
4.6 Estimate of wiring

5. FUNDAMENTALS OF ELECTRONICS 3 Hrs

5.1 Semi conductor theory, doping, P & N type materials
5.2 PN Junction diode, potential barrier, forward and reverse bias
5.3 Use of PN Diode as rectifier
5.4 Half-wave, full-wave and bridge rectifiers
5.5 Filtering, invertors and stabilizers
5.6 Power supply

6. TRANSISTORS/AND SPECIAL DIODES 4 Hours

6.1 PNP & NPN transistors, biasing, working
6.2 Use of transistors as amplifies, gains in CE, CB and CC amplifiers
6.3 Zener diode
6.4 Photo diode, Diac, Triac as a regulator, photovoltaic cells, LED

7. PROGRAM LOGIC CONTROLER (PLC) and Logic Gates 5 Hrs

7.1 PLC advantage and disadvantages and its types
7.2 Basic PLC programming
7.3 Gate and types, Relay logic
7.4 k. maps, binary system
7.5 Design a control circuit

8. THYRISTORS 3 Hrs

8.1 SCR, working, uses as control devices
8.2 Phase control of SCR's
8.3 Speed control of AC and DC motors

Recommended Textbooks:

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

ET-202 APPLIED ELECTRICITY AND ELECTRONICS

Instructional Objectives:

1. UNDERSTAND BASIC CONCEPTS AND LAWS OF ELECTRICITY

1.1 Define units of current, voltage and resistance with respect to supply of single phase and three phase
1.2 Explain Ohm's Law with simple calculations
1.3 Solves simple problems on laws of resistance
1.4 Substitute two of the three variables to find the third unknown in equation V=I x R
  1.4.1 Calculate the equivalent resistances for resistors joined in series, parallel and combination
  1.4.2 Calculate the total capacitance in series and parallel
1.5 Calculate electrical and mechanical power and the inter relation between the two systems
1.6 Heating effect of current, Jowls Law
1.7 Calculate the electrical energy consumption in an installation and prepare the energy bill
1.8 Define the inductors and its uses
1.9 Define RLC circuit and its uses
1.10 Define the batteries and battery cell
  1.10.1 Define primary and secondary battery
  1.10.2 State the types of primary and secondary batteries

2. UNDERSTAND PROTECTION DEVICES AND ELECTRICAL SAFETY

2.1 Define rating, fusing factor, rewire -able fuse, HRC type fuse
2.2 Explain the working of circuit breaker, use of oil circuit breaker, gas circuit breaker
  2.2.1 Describe the types and construction of circuit breaker
2.3 Explain construction and working of relay
  2.3.1 State its types, working, construction and uses
2.4 Describe starter and its types
  2.4.1 Explain the working of starter, 3Point, 4Point and star delta starter and soft starter
  2.4.2 Understand personal safety
2.5 Define the switches and their types
2.6 Describe timers and its functions

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

3.1 Explain Faraday's law
3.2 State the construction of alternator and D.C. generator with its parts and working
3.3 Explain the working principal of transformers and emf equation
3.4 State various parts of a welding transformer and setting
3.5 Explain the working of single phase, three phase, and servo motors
3.6 Explain the working of stepper motors

4. INSTRUMENTS AND WIRING

4.1 Define primary and secondary types of instruments, calibration of instruments
4.2 Define secondary analog digital and working effect

4.3 Explain types of meters, there uses and connection in a circuit (Watt Meter, Volt Meter, Ampere Meter, Energy meter maximum indicator oscilloscope) and methods of calibration

4.4 Define wiring and describe batten wiring, conduit PVC, casing capping wiring and there uses

4.4.1 Describe advantages and disadvantages of each

4.5 Prepare the estimate sheet for wiring(Take of Sheet)

5. UNDERSTAND THE FUNDAMENTALS OF ELECTRONICS

5.1 State the Semi conductor theory

5.1.1. State how P type and N type material is produced

5.2 State the action of potential barrier in a PN junction and the effect of forward and reverse bias on the junction

5.3 Describe the use of PN junction diode as rectifier

5.4 Draw and explain the circuit diagram for half wave and full wave rectifier

5.5 Draw and explain the Bridge Rectifier circuit with filter circuit, invertors and stabilizer and its circuits

5.6 Explain Power supply

6. UNDERSTAND THE WORKING OF BIPOLAR JUNCTION TRANSISTOR AND F.E.T. TRANSISTOR

6.1 State the biasing working of N.P.N. and P.N.P. type of transistor

6.1.1 Draw the circuit indicating the method of biasing the NPN and PNP transistors

6.2 Draw the different types of amplifier connections (C.E., C.B., C.C.)

6.3 State the biasing working of zenor diodes

6.4 State the construction working and uses of photo diodes, Diac, Triac as a regulator

7. PROGRAM LOGIC CONTROLER (PLC) AND GATES

7.1 Define PLC, working, advantages and disadvantages

7.2 Describe Basic PLC programming

7.3 Explain Gate and Types

7.3.1 Define symbols truth able logic diagram (AND, OR, NOT, NAND, NOR, XOR, NXOR)

7.4 Define binary system decimal to binary, Hexa, octal system, K maps SOP,POS,

7.5 Explain pneumatic cylinder control, basic operation, charging control operation, connection I/O devices

8. UNDERSTAND THE APPLICATION OF THYRISTORS IN CONTROL CIRCUITS

8.1 Explain the construction, working, biasing and uses of SCR

8.2 Explain the phase control with the help of SCR for A.C. Loads

8.3 Explain the speed control of AC and DC motors with the help of SCR

ET-202 APPLIED ELECTRICITY AND ELECTRONICS

List of Practical:

1. **FUNDAMENTALS OF ELECTRICITY**
   - 1.1 Study of electrical measuring instruments, handling precautions, methods of connection and identification of AC & DC Meter
   - 1.2 Verification of Ohm's law
   - 1.3 Verification laws of combination; of resistance
   - 1.4 Measurement of power by Volt-ammeter and wattmeter
   - 1.5 Measurement of electrical energy
   - 1.6 Use of primary and secondary batteries

2. **PROTECTION DEVICES AND ELECTRICAL SAFETY**
   - 2.1 Application of various fuses in wiring
   - 2.2 Study of connection circuit breaker 2 pole, 3 pole with time setting

3. **MOTORS, GENERATORS AND TRANSFORMERS**
   - 3.1 Verification of faraday's laws of electro-magnetic induction
   - 3.2 Connection of star delta starter and timer
   - 3.3 Study of AC and DC generators
   - 3.4 Study of welding transformers
   - 3.5 Starting single-phase induction motors, reversal and forward
   - 3.6 Starting 3-phase induction motors, reversal and forward
   - 3.7 Connections of magnetic starters with motors

4. **INSTRUMENTS AND WIRING**
   - 4.1 Current carrying capacity of cables
   - 4.2 Wiring, PVC, casing Capping and Batten
   - 4.3 Use of oscilloscope
   - 4.4 Study of calibration of instruments using bridge circuits
   - 4.5 Study of using AVO meter and meggar analog and digital

5. **FUNDAMENTALS OF ELECTRONICS**
   - 5.1 Study and connections of PN diodes as rectifiers
   - 5.2 Connecting PN Diode as half-wave and full-wave rectifier
   - 5.3 Connecting PN Diode as bridge Rectifiers with filter
   - 5.4 Study of Power Supply

6. **TRANSISTORS AND SPECIAL DIODES**
   - 6.1 Connections and biasing of PNP and NPN transistors
   - 6.2 Study and connections of zener diode as voltage regulator
   - 6.3 Study and connections of Photodiode as light sensing device
   - 6.4 Study and connections of DIAC's and TRIAC's as switch circuits

7. PROGRAM LOGIC CONTROLER (PLC) AND GATES

7.1 Study of PLC system

7.2 Study and connection of gate AND, OR, NOT, NAND, NOR, XOR, NXOR

7.3 Study how to execute PLC

7.3.1 Basic commands and how to design control circuit

7.3.2 working of relays

8. THYRISTORS

8.1 Study and connections of SCR as a power switches

MT-222 ENGINEERING DRAWING AND CAD-II

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

Pre-requisites: BASIC ENGINEERING DRAWING AND CAD-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.

COURSE CONTENTS

PART-A MANUAL DRAWING

1. DRAWING SYMBOLS **3 HRS**

- 1.1 Machining Symbols
- 1.2 Welding symbols
- 1.3 Material Symbols
- 1.4 Thread Symbols
- 1.5 Conventional Breaks

2. SECTIONING **2 HRS**

- 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 **3 HRS**

- 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 **3 HRS**

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 **4 HRS**

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 **3 HRS**

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 AUTO CAD

1. CREATING AND EDITING **4 HRS**

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 **4 HRS**

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 4 HRS

3.1 Dimensioning 2D solids

3.2 Dimensioning 3D solids

3.3 Dimensioning Font/Styles

4. BILL OF MATERIALS, PARTS LISTS 2 HRS

5.1. Bill of Materials

5.2. Parts Lists

5.3. 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

MT-222 ENGINEERING DRAWING AND CAD-II

INSTRUCTIONAL OBJECTIVES

PART-A MANUAL DRAWING

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 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 AUTO CAD

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-222 ENGINEERING DRAWING AND CAD-II

LIST OF PRACTICAL **96 Hrs.**

PART-A MANUAL DRAWING

1. SYMBOLS

1.1 Draw Plumbing and Piping Symbols

1.2 Draw Welding Symbols and Threads Symbols

1.3 Draw Material symbols and Machining Symbols and Conventional Breaks

2. SECTIONING

2.1 Draw Full sectioning views
2.2 Draw Half sectioning views
2.3 Draw Off-set views

2.4 Draw Revolved views

2.5 Draw Broken views

3. FASTENERS

3.1 Draw hexagonal Nut and Bolt

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 Draw detail drawing showing part list, material list and Title block.

PART-B AUTO CAD

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

FP-214 **FOUNDRY TECHNOLOGY-II**

Total contact hours:		T	P	C
Theory	64 hours	2	6	4
Practicals	192 hours			

AIM. To develop the knowledge of Modern foundry, selection of different materials for molding, Core making and Casting

COURSE CONTENTS:

1. Cupola Furnace **6 Hrs**

1.1 Construction of Cupola furnace

1.2 Operation of cupola

1.2.1 charges of cupola

1.2.2 Sand bed

1.2.3 Coke bed

1.2.4 Shooting

1.2.5 Melting

1.2.6 Tapping

1.2.7 Slaging

1.2.8 Dropping of cupola charge

1.3 Precautions

1.4 Zones of cupola furnace

2. SPECIAL TYPES OF CUPOLA. **1 Hrs**

2.1 Hot blast cupola

2.1.1 Construction

2.1.2 Working

2.1.3 Advantages

2.2 Oxygen enriched cupola **1 Hrs**

2.2.1 Construction

2.2.2 Working

2.2.3 Advantages

3. REFRACTORY MATERIALS FOR CUPOLA LINING. 3 Hrs

3.1 Acid lining, material

3.2 Basic Lining and its material used

3.3 Shapes of the brick and blocks

3.4 Knocking out slag

3.5 Patching mixture

3.6 Patching tools

4. LADLES. 3 Hrs

4.1 Types of LADLES and their construction

4.2 Lip LADLES

4.3 Monorail ladle

4.4 Tea-pot Ladle

4.5 Mixing ladle

4.6 Bottom pouring Ladle

4.7 Shape and Material

4.8 Number and holding capacity of crucibles

4.9 Care and maintenance of crucibles

5. SKELETON MOLDING. 2 Hrs

5.1 Definition

5.2 Pattern and accessories

5.3 construction of mould

6. SWEEP MOLDING2 Hrs

6.1 Definition

6.2 Pattern and accessories

6.3 Construction of mould

6.4 Advantages & disadvantages.

7. PIT MOULDING 2 Hrs

7.1 Definition

7.2 Construction

7.3 Advantages and disadvantages.

8. Loam Moulding **1 Hrs**

8.1 Construction of Mould.

9. Co2 Process. **2 Hrs**

9.1 Mould Construction

9.2 Advantages & disadvantage

10. GATING SYSTEMS **3 Hrs**

10.1 Definition

10.2 Parts of gating system

10.3 Types of gating system

10.4 Top gate (pop gate, wedge gate finger gate)

10.5 Parting line gates (skin bob relief sprue gate, whirl gate branch gate, strainer core, splash core

10.6 Bottom gates (vertical bottom gate horn gate, bottom gate with slag trap

11. GATING & RISERING **5 Hrs**

11.1 Progressive solidification of molten metal

11.2 Liquid shrinkage

11.3 Semi-liquid shrinkage

11.4 Solid shrinkage

11.5 Improper solidification defects (cavity, piping, porosity

11.6 Methods to control the improper solidification of metal in a mould

11.7 Types of gates

11.8 Risers and their functions

11.9 Chills and their functions

11.10 Padding Materials and their Function.

11.11 Denser

11.12 Ratio between sprue, runner and in gate for ferrous and non-ferrous metals

12. DIE-CASTING: **2 Hrs**

12.1 Definition of Die casting and its uses

12.2 Gravity die casting
12.3 Permanent mould casting
12.4 Materials of dies
12.5 Die casting machines and their functions

13. COLD CHAMBER PRESSURE DIE CASTING. 2 Hrs

13.1 Definition
13.2 Working operation
13.3 Advantages and Disadvantages

14. HOT CHAMBER PRESSURE DIE CASTING. 2 Hrs

14.1 Definition

14.2 Working procedure

14.3 Advantages and disadvantages

15. MACHINE MOLDING. 6 Hrs

Operations involved in the construction of sand mould by hand

15.1 Operations performed by machine in the construction of sand mould
15.2 Comparison between hand and machine molding
15.3 Types of molding machines
15.4 Jolting machine
15.5 Squeezing machining
15.6 Jolting and squeezing machine
15.7 Diaphragm molding machine
15.8 Jolt squeeze stripper
15.9 Jolt roll over pattern draw
15.10 Jolt squeeze roll over
15.11 Sand slingers.

16. CORE MAKING. 3 Hrs

Core sand ingredients (Linseed oil pitch synthetic resin, dextrin, corn flour)

16.1 Core sand Mixture and their baking temp (for gray iron light and heavy
16.2 castings for steel light and heavy castings) for aluminum and other non-ferrous alloys
16.3 Core Reinforcement
16.4 Core venting, vent wire wax thread, piping
16.5 Gluing the core
16.6 Matching & sizing of core
16.7 Placement of core

17. CORE MAKING MACHINES 3 Hrs

Core blowing machine

17.1 Core extracting machine
17.2 Molding machine employed for core making

18. CORE BAKING OVENS. 3 Hrs

18.1 Heating media for core baking ovens (oil, gas,

Electricity)

18..2 Types of ovens (Batch type, continuous drier type, dielectric core oven

19. QUALITY CONTROL THROUGH SAND TESTING EQUIPMENT. 10 Hrs

19.1 Sand sample
19.2 Green sand mould hardness tester
19.3 Core shooter test.
19.4 Moisture testing (by baking oven, infra-red, moisture teller speedy moisture teller, electrical conductivity moisture tester
19.5 Specimen sand rammer.
19.6 Permeability meter
19.7 Universal sand strength testing machine
19.8 Rapid sand washer for clay content
19.9 Laboratory sifter (sieve)
19.10 Sintering furnace

REFERENCE BOOK:

1. Foundry practice by William H. Salmon & Eric N Simon

2. Foundry Technology by Dr. FazalKarim

FP-214 FOUNDRY Technology-II

INSTRUCTIONAL OBJECTIVES.

1.Understand Cupola Furnace

1.1 Describe Construction of Cupola furnace

1.2 Describe Operation of cupola

1.2.1 State charges of cupola

1.2.2 State Sand bed

1.2.3 State Coke bed

1.2.4 State Shooting

1.2.5 State Melting

1.2.6 State Tapping

1.2.7 State Slaging

1.2.8 State Dropping of cupola charge

1.3 State Precautions

1.4 Describe Zones of cupola furnace

2. UNDERSTAND SPECIAL TYPES OF CUPOLA.

2.1 Hot blast cupola

2.1.1 Construction

2.1.2 Working

2.1.3 Advantages

2.2 Oxygen enriched cupola

2.2.1 Construction

2.2.2 Working

2.2.3 Advantages

3. UNDERSTAND REFRACTORY MATERIALS FOR CUPOLA LINING

3.1 Acid lining, material

3.2 Basic Lining and its material used

3.3 Shapes of the brick and blocks

3.4 Knocking out slag

3.5 Patching mixture

3.6 Patching tools

4. UNDERSTAND LADLES.

4.1 Types of LADLES and their construction

4.2 Lip LADLES

4.3 Monorail ladle

4.4 Tea-pot Ladle

4.5 Mixing ladle

4.6 Bottom pouring Ladle

4.7 Shape and Material

4.8 Number and holding capacity of crucibles

4.9 Care and maintenance of crucibles

5. UNDERSTAND MOLDING OF SKELETON PATTERN.

5.1 Define skeleton pattern

5.2 Explain the pattern & accessories required

5.3 Describe the procedure for construction of mould

6. UNDERSTAND THE SWEEP MOLDING PROCESS.

6.1 Define sweep molding

6.2 Explain sweep pattern and accessories

6.3 Describe the procedure for mould construction

7. UNDERSTAND PIT MOULDING

7.1 Definition

7.2 Construction

7.3 Advantages and disadvantages.

8. UNDERSTAND LOAM MOULDING

8.1 Construction of Mould.

9. UNDERSTAND CO2 PROCESS

9.1 Mould Construction

9.2 Advantages & disadvantage

10. UNDERSTAND THE GATING SYSTEM.

10.1 Differentiate between gate and riser

10.2 List parts of gating system

10.3 Distinguish among three classes of gating system

10.4 Describe types of top gates i.e. pop gate, wedge gatering gate and jand finger gate

10.5 Explain the following terminology; skim pop, relief sprue gate, hire gate, branch gate strainer core, splash core

10.6 Classify bottom gates and distinguish among them i.e. vertical bottom gate harm gate bottom gate with slag trap

11. UNDERSTAND THE GATING & RISERING.

11.1 Define feeding

11.2 State the progressive solidification of molten metal

11.3 Distinguish liquid shrinkage, semi liquid shrinkage and solids shrinkage

11.4 State the defects due to improper solidification (i.e. cavity, piping, porosity)

11.5 Identify the methods to control the improper solidification in moulds

11.6 Define gates, risers/feeders, chills and densers

11.7 Determine ratio between sprue, runner & in gate

12. DIE-CASTING:

12.1 Definition of Die casting and its uses
12.2 Describe Gravity die casting
12.3 Describe Permanent mould casting
12.4 Describe Materials of dies
12.5 Describe Die casting machines and their functions

13. UNDERSTAND COLD CHAMBER PRESSURE DIE CASTING.

13.1 Define cold chamber die-casting

13.2 Explain Working of the machine

13.3 Enlist advantages & disadvantages

14. UNDERSTAND THE HOT CHAMBERPRESSURE DIE CASTING PROCESS.

14.1 Define the hot chamber process

14.2 Explain the procedure

14.3 List the advantages and disadvantages

15. UNDERSTAND MACHINE MOLDING.

Operations involved in the construction of sand mould by hand

15.1 Operations performed by machine in the construction of sand mould
15.2 Comparison between hand and machine molding
15.3 Types of molding machines
15.4 Jolting machine

15.5 Squeezing machining
15.6 Jolting and squeezing machine
15.7 Diaphragm molding machine
15.8 Jolt squeeze stripper
15.9 Jolt roll over pattern draw
15.10 Jolt squeeze roll over
Sand slingers.

16. UNDERSTAND CORE MAKING.

Core sand ingredients (Linseed oil pitch synthetic resin, dextrin, corn flour)

16.1 Core sand Mixture and their baking temp (for gray iron light and heavy
16.2 castings for steel light and heavy castings) for aluminum and other non-ferrous alloys
16.3 Core Reinforcement
16.4 Core venting, vent wire wax thread, piping
16.5 Gluing the core
16.6 Matching & sizing of core
16.7 Placement of core

17. UNDERSTAND CORE MAKING MACHINES

17.1 Core blowing machine
17.2 Core extracting machine
17.3 Molding machine employed for core making

18. UNDERSTAND CORE BAKING OVENS.

18.1 Heating media for core baking ovens (oil, gas,

Electricity)

18.2 Types of ovens (Batch type, continuous drier type, dielectric core oven

19. UNDERSTAND QUALITY CONTROL THROUGH SAND TESTING EQUIPMENT.

19.1 Sand sample
19.2 Green sand mould hardness tester
19.3 Core shooter test.
19.4 Moisture testing (by baking oven, infra-red, moisture teller speedy moisture teller, electrical conductivity moisture tester
19.5 Specimen sand rammer.
19.6 Permeability meter
19.7 Universal sand strength testing machine
19.8 Rapid sand washer for clay content
19.9 Laboratory sifter (sieve)
19.10 Sintering furnace

PRACTICALS **FP-214** **192 Hrs.**

HAND MOULDING

1. Mould making practice using different types of pattern with green sand.
2. Mould making practice using different types of pattern with CO2 process.
3. Mould making practice using different types of pattern with molasses sand.
4. Mould making practice using different types of pattern with self-setting resin.
5. Mould making practice using different types of pattern using Gaggers in green sand.
6. Determination of mold hardness with Green mould hardness tester.
7. Preparation of specimen with sand rammer
8. Determination of compression strength of molding sand

MACHINE MOULDING

9. Mould making practice using match plate pattern with green sand.
10. Mould making practice using match plate pattern with CO2 process.
11. Mould making practice with Sand Slinger.

CORE MAKING PRACTICE

12. Core making practice using oil core sand.
13. Core making practice using molasses core sand.
14. Core making practice using self-setting.
15. Core making with the help of core shooter.
16. Core making with the help of core making machines(Core blowing, Core extruding etc).
17. Practice of core baking.
18. Practice of core assembling and setting in mold.

CUPOLA MELTING.

19. Cupola preparation (lining, sand bed, coke bed etc.)
20. Cupola charge preparation.
21. Cupola firing and charging practice.
22. Cupola melting (tapping of slag and metal)
23. Poring practice of molten metal.
24. Closing of cupola.

CRUCIBLE MELTING PRACTICE

25. Melting practice of Al , Cu and alloys using flux, grain refiner and degasser
26. Melting in crucible furnace
27. Use of covering flux, de-gasification, and pouring in moulds

CLAEANING OF CASTING

28. Fettling of mould and cleaning practice of casting

FP-224 **ADVANCE PATTERN MAKING**

Total contact hours:	T	P	C
Theory: 64 hours	2	6	4
Practical: 192 hours			

AIM: Knowledge of pattern lay out construction of pattern with different material developed the skill to use the different types of machinery for construction of pattern.

COURSE CONTACTS:

1. WOOD TURNING LATHES **6 HRS**

1.1 Construction/ main parts

1.2 Lathes accessories

1.2.3 Dead center and live center.

1.2.4 Universal chuck

1.2.5 Screw chuck and Drill Chuck

1.2.6 Face plate

1.3 Types of operations

1.3.1 Spindle turning

6.3.2 Face turning

6.3.3 Cylinder Turning

6.4 Care and maintenance of machine

2. WOOD TURNING TOOLS **4 HRS**

2.1 Skin chisel

2.2 Parting chisel

2.3 Square Nose Chisel

2.4 Round Nose Chisel

2.5 Gouges.

2.6 Types of Gouges

3. DRILL PRESS MACHINE AND TOOLS **4 HRS**

3.1 Construction

3.2 Operations (Drilling, boring, Counter Sinking, Scalping)

3.3 Cutting speed

3.4 Drilling tools(Ratchet brace, Hand drill, Auger bit, Twist drill, counter sink,Bit gauge, Doweling jig)

3.5 care and maintenance of machine

4. TYPES OF PATTERNS BASED ON DESIGNS 4 HRS

4.1 Solid pattern

4.2 Split Pattern

4.3 Multi piece pattern

4.4 Loose piece pattern

4.5 Follow board pattern

4.6 Skeleton pattern

4.7 Sweep pattern

4.8 Master pattern

4.9 Gated Pattern

4.10 Match Plate Pattern

5. PATTERN TYPES BASED ON MATERIALS 8 HRS

5.1 Wooden pattern

5.1.1 Woods used for patterns

5.1.2 Allowances added

5.1.3 Pattern preservation

5.1.4 Use of metal on wooden patterns

5.2 Metal pattern

5.2.1 Metals used

5.2.2 Construction and Doweling techniques

5.2.3 Machines for metal pattern making

5.3 Plaster pattern

5.3.1 Materials used

5.3.2 Method of Preparation

5.4 Wax pattern

5.4.1 Mold for wax pattern

5.4.2 Wax Materials

5.4.3 Method of construction

5.5 Polystyrene pattern

5.5.1 Mould for pattern

5.5.2 Materials

5.5.3 Hardening and curing

5.5.4 Reinforcing with Glass wool Lamination of fibers

5.6 Uses, Advantages and limitations

6. PATTERN ACCESSORIES 2 HRS

6.1 Brass dowel with socket

6.2 Wooden dowel

6.3 Rapping and lifting plates

6.4 Pattern Letters

6.5 Pattern fillets and rounds

6.6 Pattern numbering and storing pattern shop planning

7. SETTING UP METHODS AND PATTERN CHECKING. 2 HRS

7.1 Setting up methods

7.2 Setting angles

7.3 Compound angles

7.4 Pattern Checking

8. CORE BOXES. 4 HRS

8.1 Types of Core boxes (Half core box, Dump, split, trickle left and right hand box, Loose piece core box)

8.2 Construction of core boxes

8.3 materials used for core boxes

8.4 Modifications

9. GLUING TECHNIQUE. 2 HRS

9.1 Lamination Gluing

9.2 Paper Gluing

9.3 Segments Gluing

10. ABRASIVES. 4 HRS

10.1 Sand paper

10.2 Emery Paper

10.3 Glass paper

10.4 Surface sanding

11. BOSSES AND WEBS. 2 HRS

11.1 Description

11.2 Preparation

11.3 Uses

12. WOOD FASTENERS. 4 HRS

12.1 Nail

12.2 Wood Screws

12.3 Nuts and Bolts

12.4 Hinges

12.5 Butt Hinges

12.6 Lift off Butt hinges

12.7 Continuous hinges

13. WOOD PRODUCTS 6 HRS

13.1 Veneer

13.2 Ply wood

13.3 Hard board

13.4 Soft board

13.5 Chip board

13.6 Laminated board

14. CARPENTARY/JOINTRY WORK: 8 HRS

14.1 Introduction,

14.2 Selection of wood for Art and design

14.3 Laying out,

14.4 Sawing of Lumber for jointry purpose.

14.5 Cabinet making work.

14.6 Furniture manufacturing.

14.7 Building casement,

14.8 Frame and Penal.

14.9 Interior decorating work.

14.10 Carving technique

14.10 1 Carving Tools.

14.10.2 Sketching and Designing of Carving.

14.10.3 Selection of wood.

14.11 Cost calculation for wood Products and Carpentry fret work.

15. WOOD FINISHES 4 HRS

15.1 Paints

15.2 Enamels

15.3 Polish

15.3.1 Spirit polish

15.3.2 Wax polish

15.3.3 Lacquer polish

15.3.4 Varnish

15.4 Pattern surface Preparation for color (Putty filler sanding, under coat, Final coat)

15.5 Surface Preparation and application of Polish and varnish

BOOKS RECOMMENDED:

1. Advance pattern making by L.L. Cox
2. Exploring pattern making & Foundry by Harvey D. Miner and John G. Miller
3. Pattern making by S.P.I.T. Gujrat
4. Wood working by Willis H. Wagner
5. Wood work made Simple Tompettit, FRSA, and MRST
6. The wood working Bible by Percy W. Blandford
7. General Wood working by Chrishgroneman
8. The Wood Work book by John Makepeace
9. Principles of wood working By Herman H .Jorth

FP-224 **ADVANCE PATTERN MAKING**

INSTRUCTIONAL OBJECTIVE:

1. UNDERSTAND WOOD TURNING LATHE

1.1 Explain construction/ main parts

1.2 Describe Lathes accessories

1.2.3 State Dead center and live center.

1.2.4 State Universal chuck

1.2.5 Describe Screw chuck and Drill Chuck

1.2.6 State Face plate

1.3 Explain types of operations

1.3.1 Describe spindle turning

6.3.2 State Face turning

6.3.3 Describe Cylinder Turning

6.4 State Care and maintenance of machine

2. UNDERSTAND WOOD TURNING TOOLS

2.1 State Skin chisels

2.2 Describe Parting chisels

2.3 state Square Nose Chisels

2.4 State Round Nose Chisels

2.5 Define Gouge.

2.6 Explain types of Gouges

3. UNDERSTAND DRILL PRESS MACHINE AND TOOLS

Explain Construction

3.2 Describe different Operations (Drilling, boring, Counter Sinking, and Scalping)

3.3 State Cutting speed

3.4 Describe Drilling tools(Ratchet brace, Hand drill, Auger bit, Twist drill, counter sink, Bit gauge, doweling jig)

3.5 State care and maintenance of machine

4. UNDERSTAND TYPES OF PATTERNS BASED ON DESIGNS

state Solid pattern

4.2 Describe Split Pattern

4.3 Describe Multi piece pattern

4.4 State Loose piece pattern

4.5 Describe Follow board pattern

4.6 Explain Skeleton pattern

4.7 Describe Sweep pattern

4.8 Describe Master pattern

4.9 Describe Gated Pattern

4.10 Describe Match Plate Pattern

5. UNDERSTAND PATTERN TYPES AND MAKING TECHNIQUES BASED ON MATERIALS

5.1 Understand wooden pattern

5.1.1 Enlist Woods used for patterns

5.1.2 Describe Allowances added

5.1.3 Describe Pattern preservation methods

5.1.4 Explain use of metal on wooden patterns

5.2 Understand Metal pattern

5.2.1 Enlist Metals used

5.2.2 Describe Construction and Doweling techniques

5.2.3 State Machines for metal pattern making

5.3 Understand Plaster pattern

5.3.1 State materials used

5.3.2 Describe Method of Preparation

5.4 Understand Wax pattern

5.4.1 Describe Mold for wax pattern

5.4.2 Enlist Wax Materials

5.4.3 Describe Method of construction

5.5 Understand Polystyrene pattern

5.5.1 State Mould for pattern

5.5.2 Enlist Materials

5.5.3 Describe Hardening and curing

5.5.4 State Reinforcing with Glass wool Lamination of fibers

5.6 Enlist Uses, Advantages and limitations of each type of pattern

6. KNOW ABOUT PATTERN ACCESSORIES

Describe Brass dowel with socket

6.2 State Wooden dowel

6.3 State Rapping and lifting plates

6.4 Describe Pattern Letters

6.5 State Pattern fillets and rounds

6.6 Describe Pattern numbering and storing pattern shop planning

7. KNOW ABOUT SETTING UP METHODS AND PATTERN CHECKING.

State Setting up methods

7.2 Describe Setting angles

7.3 Describe Compound angles

7.4 State Pattern Checking

8. UNDERSTAND CORE BOXES.

8.1 Describe types of Core boxes (Half core box, Dump, split, trickle left and right hand box, Loose piece core box)

8.2 Explain Construction of core boxes

8.3 State materials used for core boxes

8.4 Describe Modifications

9. UNDERSTAND GLUING TECHNIQUE.

9.1 Explain Lamination Gluing

9.2 Explain Paper Gluing

9.3 Describe Segments Gluing

10. KNOW ABOUT ABRASIVES

Describe Sand paper

10.2 Describe Emery Paper

10.3 State Glass paper

10.4 Describe Surface sanding

11. KNOW ABOUTBOSSES AND WEBS.

Describe bosses and webs

11.2 Explain method of Preparation

11.3 Enlist Uses

12. UNDERSTAND WOOD FASTENERS.

12.1 Describe Nails

12.2 State Wood Screws

12.3 State Nuts and Bolts

12.4 Define Hinges

12.5 Describe Butt Hinges

12.6 State Lift off Butt hinges

12.7 State Continuous hinges

13. UNDERSTAND WOOD PRODUCTS

13.1 Explain Veneer

13.2 Explain Ply wood

13.3 Describe hard board

13.4 Describe Soft board

13.5 Explain Chip board

13.6 Explain laminated board

14. CARPENTARY/JOINTRY WORK

14.1 Introduction,

14.2 Describe selection of wood for Art and design

14.3 state Laying out,

14.4 Describe Sawing of Lumber for jointry purpose.

14.5 State Cabinet making work.

14.6 Describe Furniture manufacturing.

14.7 State Building casement,

14.8 State Frame and Penal.

14.9 Describe Interior decorating work.

14.10 Define Carving technique

14.10 1 State Carving Tools.

14.10.2 State Sketching and Designing of Carving.

14.10.3 State Selection of wood.

14.11 Describe Cost calculation for wood Products and Carpentry fret work.

15. UNDERSTAND WOOD FINISHES

15.1 Describe Paints

15.2 State Enamels

15.3 Define Polish

15.3.1 Describe Spirit polish

15.3.2 State Wax polish

15.3.3 State Lacquer polish

15.3.4 State Varnish

15.4 Explain Pattern surface Preparation for color (Putty filler sanding, under coat, Final coat)

15.5 Describe Surface Preparation and application of Polish and varnish

FP-224 **ADVANCE PATTERN MAKING**

LIST OF PRACTICALS

Contact hours: 192

Construction of following patterns along with core boxes

1. **Scribing block**
   - i- Wood cutting
   - ii- Planning and sizing
   - iii- Assembly
   - iv- Painting

2. **Face plate**
   - i. Segmenting
   - ii. Sizing
   - iii. Assembly
   - iv. Painting

3. **Square cope**
   - i. Cutting of pieces
   - ii. Sizing by planner
   - iii. Gluing
   - iv. Coloring

4. **Anvil**
   - i. Planning of parting surface
   - ii. Paper gluing
   - iii. Doweling
   - iv. Finishing

5. **Cylinder**
   - i. Planning and paper gluing
   - ii. Turning on lathe machine
   - iii. Doweling and splitting
   - iv. Painting
   - v. Construction of core box

6. **Pulley**
   - i. Paper gluing
   - ii. Turning
   - iii. Construction of core box
   - iv. Painting of pattern and core box

FP-252 **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. 8 HRS

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). 4 HRS

2.1 Composition of Brasses
2.2 Mechanical properties of Brasses.
2.3 Common use of Brasses.

3. BRONZES (COPPER BASE ALLOYS). 4 HRS

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. 4 HRS

4.1 Composition of Copper Nickel alloys.

4.2 Uses of Copper Nickel alloys.

5. METALLURGY OF ALUMINUM **8 HRS**

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. **4 HRS**

6.1 Classification of Aluminum Alloys

6.2 Wrought alloys of Aluminum

6.3 Cast Alloys of Aluminum

6.4 Aluminum base copper alloys

6.5 Aluminum base Silicon alloys

6.6 Aluminum base Magnesium alloys

7. METALLURGY OF ZINC. **6 HRS**

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. **4 HRS**

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. 6 HRS

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. 6 HRS

10.1 Occurrence of Chromium ores.

10.2 Properties of Chromium

10.3 Uses of Chromium

11. POWDER METALLURGY 12 HRS

11.1 Introduction to powder metallurgy

11.2 Powder production methods

11.3 Powder metallurgy processes (Mixing, Compacting, and Sintering)

11.4 Application of powder metallurgy.

11.5 Advantages of powder metallurgy.

RECOMMENDED BOOKS

1. Introduction to Physical Metallurgy by Sidney S. H. Avner
2. Principal of Metal Casting by Heine & Rosenthal
3. Elementary Metallurgy and Metallography by Arthus M. 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

FP-252 **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.
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 Brass.

3. KNOW ABOUT BRONZES.

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

3.2 Enlist mechanical properties of bronzes.

3.3 State the uses 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 THE 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 State 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 mechanical properties.

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 nickel 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 production methods

11.3 Describe Powder metallurgy processes (Mixing, Compacting, and Sintering)

11.4 State application of powder metallurgy.

11.5 Enlist advantages of powder metallurgy.

FP-244 **WORK SHOP PRACTICE**

TOTAL CONTACT HOURS:	T	P	C
THEORY 64 Hrs	2	6	4

PRACTICALS:192Hrs

AIM: Basic knowledge of machining, welding and forging.

A. MACHINE SHOP	**T**	**P**	**C**
	1	3	2

B. WELDING AND FORGINE	**T**	**P**	**C**
	1	3	2

COURSE CONTENTS:

A. MACHINE SHOP

1. LATHE MACHINE 6HRS

1.1 Introduction to Centre lathe, size and capacity of lathe
1.2 Principal parts of lathe, their functions, care maintenance and precautions
1.3 Lathe accessories
1.4 Face plate
1.5 Dog carrier
1.6 Centers
1.7 Four jaw chuck, three jaw chuck, collets, mandrills, types and their uses

2. LATHE CUTTING 3HRS

2.1 Types of cutting tools (turning tools, parting off, boring, knurling tools)
2.2 Tool material(high carbon steel, high speed steel, tungsten carbide tipped tools) and their cutting ability
2.3 Tool angles and their effects in cutting
2.4 Tool holders
2.5 Tool grinding procedures and precautions

3. LATHE OPERATIONS 6HRS

3.1 Facing
3.2 Centering
3.3 Parallel turning/Straight turning
3.4 Step turning
3.5 Taper turning
3.6 Knurling
3.7 Drilling
3.8 Reaming
3.9 Boring and countersinking

4. CUTTING SPEED AND FEED 3HRS

4.1 Factors governing speed, feed and depth of cut

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

5. TAPERS AND TAPER TURNING 2HRS

5.1 Taper calculation
5.2 Methods of taper turning

6. THREAD CUTTING 2HRS

6.1 Calculation for single pitch threads
6.2 Machine set up
6.3 Finishing and checking of threads.

7. TOOL GRINDER 2 Hrs

7.1 Types of tool grinder
7.2 Pedestal grinder
7.3 Bench grinder

8. GRINDER WHEELS AND STANDARD MARKING SYSTEM 4 Hrs

8.1 Grinding wheel elements
8.2 Abrasive
8.3 Grain
8.4 Grade
8.5 Bond
8.6 Structure
8.7 Selection of grinding wheel
8.8 Grinding Wheels
8.9 Standard wheels shapes and their applications
8.10 Loading and glazing of grinding wheels
8.11 Turning and dressing method of grinding wheels
8.12 Inspection of grinding wheels
8.13 Safety precautions for tool grinding

9. SHAPER 4 Hrs.

9.1 Definition of Shaper.
9.2 Types of Shaper
9.3 Shaper stroke adjustment
9.4 Length of stroke
9.5 Position of stroke
9.6 No of strokes per minute
9.7 Forward and backward Stroke of Shaper
9.8 Lubrication of shaper
9.9 Shaper Operations
9.10 Vertical shaping
9.11 Horizontal shaping
9.12 Angular shaping

B. WELDING AND FORGINE

1. DETAIL OF FUSION WELDING (OXY ACETYLENE GAS WELDING, ARC WELDING)

1.1	Oxy acetylene gas welding	22 HRS
1.2	Explain Oxy acetylene gas welding tools/equipment with Their uses and Function.	
1.3	Arc welding	
1.4	Introduction to Arc welding machine	
1.5	List of Arc welding tools, equipments with their uses	
1.6	Welding Materials	
1.7	Flux	
1.8	Types of filler rod	
1.9	Types of Electrode	
1.10	Safety method in welding shop	
1.11	Flash back and its remedy	
1.12	Back fire and its remedy	
1.13	Welding Defects and their remedy	
1.14		

2. FORGING 10Hrs

2.1	Introduction to Forging
2.2	Forging tools/ Equipments
2.3	Classification of forging
2.4	Hand Forging
2.5	Machine Forging
2.6	Forging equipments
2.7	Machine
2.8	Furnaces
2.9	Forging operations
2.10	Drawing Down
2.11	Up Setting
2.12	Cutting
2.13	Swaging
2.14	Punching
2.15	Twisting

Recommended Textbooks:

7 Technology of Machine Tools by Steve F. Krar, Albert F. Check
8 Shop Theory by James Anderson, Earil E. Tatro
9 Production Machine Shop by John E. Neely
10 Machine Tool Technology by Willard J. McCarthy, Dr. Victor E. Reff
11 Machine Tool Metal Working by John L. Feirer
12 Technical Metal
13.Machine Tool Practices Welding and Forging

FP-244 WORKSHOP PRACTICE

LIST OF PRACTICALS

A) **Basic Machine Shop** 96 Hrs.

1. Practice of cleaning and oiling the lathe machine
2. Practice of centering the job by tool method
3. Practice of centering the job held in a four jaw chuck or face plate
4. Practice of facing
5. Practice of straight turning
6. Practice of center drilling
7. Practice of drilling on lathe
8. Practice of step turning
9. Practice of knurling
10. Practice of boring a straight hole
11. Practice of step or counter boring
12. Practice of reaming
13. Practice of tool grinding
14. Practice of taper turning by compound rest method
15. Practice of cutting metric threads on lathe machine

B) BASIC WELDING AND FORGING 96 Hrs

(OXY ACETYLENE WELDING)

1. Flame making gas welding
   (a) Harsh Flame (b) Carburizing Flame (c) Neutral Flame (d) oxidizing
2. Pool making
3. Bead making
4. Edge joint
5. Open square butt joint (MS Flat 3mm thick)
6. Open square butt joint (MS Flat 5mm thick)
7. Half 'V' butt joint (Flat Position)
8. 'V' Grove butt joint (Flat Position)
9. Corner joint
10. Open square brazing butt joint (MS Flat 3mm thick)

(ARC WELDING)

11. Types of Arc welding machines and their operation with current adjustment
12. Arc making
13. Bead making
14. Open square Butt joint (MS Flat 5mm thick)
15. 'V' Grove Butt joint
16. Lap joint
17. Corner Joint (Flat Position)
18. Corner joint (Vertical Position)

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 اذامات 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۔ایثاروقربانی

نصاب اخلاقیات (غیر مسلم طلباء کے لئے)

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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 کی معرفت (بذریعہ ہم عصر طلباء۔اساتذہ۔اہم شخصیات،ادارہ)

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 و فرائض بیان کر سکے۔
- ہمسائیوں کے حقوق بیان کر سکے۔
- اسلام میں حقوق و فرائض کی اہمیت بیان کر سکے۔
- حقوق و فرائض کی آگاہی کی صورت میں اپنے اندر خدمت خلق کا جذبہ پیدا کر سکے۔

اسلامی اقدار

عمومی مقصد ۔ طالب علم:

جان سکے گا کہ تعلیم کا مقصد حسن اخلاق سے متصف ہونا ہے

خصوصی مقاصد

- اخلاق کے معنی و مفہوم کو بیان کر سکے۔
- اسلام میں حسن اخلاق کی اہمیت بیان کر سکے۔
- قرآن و سنت کی روشنی میں صبر و استقلال کی اہمیت بیان کر سکے۔
- اسلام میں عفو و درگذر کی اہمیت بیان کر سکے۔
- ایفائے عہد کی اہمیت بیان کر سکے۔
- اخوت کے معنی و مفہوم کو بیان کر سکے۔
- اخوت اسلامی کی اہمیت بیان کر سکے۔
- اسلام کی اعلیٰ اقدار کو اپنا کر مثالی معاشرہ پیدا کر سکے۔

نصاب (سال سوم)

مطالعہ پاکستان	Gen-311	ٹی	پی	سی
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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 Psychology by C.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

FP-314 FOUNDRY TECHNOLOGY-III

Total contact hours:		T	P	C
Theory.	64 Hrs	2	6	4
Practicals:	192 Hrs			

AIM: Understand causes of casting defects use of different chemicals to control the casting defects. Study of steal in respect to moulding, gating and reassuring Techniques.

COURSE CONTENTS:

1. RECLAMATION OF SANDS AND THEIR APPLICATIONS. 2 hrs.

1.1 Dry reclamation.

1.2 Wet reclamation

1.3 Thermal reclamation.

1.4 Combined wet and thermal.

1.5 Equipment for fume and dust extraction.

2. CASTING DEFECTS.2 hrs.

2.1 Definition of casting defects (shift, Misrun, swell, fin, hot tear and cracks, blow hole gas hole, porosity, shrinkage cavity, cold shut, cuts and washer, dirt inclusion)

2.2 Causes of casting defects

2.3 Remedies of casting defects

3. FLUXES. 2 hrs.

3.1 Definition and purposes

3.2 Different fluxes (cover flux, degasser, grain refiner) used for Al. Cu, Zn, Brass, Grey . iron and steel during melting & pouring

4. MELTING ATMOSPHERE. 2 hrs.

4.1 Definition of furnace atmosphere, Types of atmospheres (oxidizing neutral, reducing)

4.2 Atmosphere needed during melting of cu, brass, Aluminium.

4.3 Functions of oxidizer and De-oxidizers.

4.4 Deoxidizers of common metals.

4.5 Inoculation and its effects.

3.6 Functions of scavengers

3.7 Scavengers used for different metals

5. MELTING CONDITIONS 4 hrs.

5.1 Different factors to be observed during melting g to remove the absorbed gases in Al, cu, brass, steal during melting.

6. CAST IRONS. 4 hrs.

6.1 Various grades of Pig Iron according to Carbon content with Physical Properties.

6.2 Types of cast iron (grey, white, Chilled, malleable, Ductile Iron (Nodular/SG, Acicular.)

6.3 Description and properties of each type

6.4 Effects of alloying elements on the properties of cast iron.

6.5 Melting and casting of gray and SG irons

6.6 Risering and gating system for cast irons.

7. STEEL CASTING. 4 hrs.

7.1 Moulding method for steel casting (dry sand mold, green sand mold, core sand, skin dry, cement bonded graphite, ceramics

7.2 Physical properties of molding sand for steel casting (Hardness and permeability)

7.3 Moulding Mixtures for steel castings and their standards

7.4 Steel facing materials

7.5 Mould coating materials

7.6 Core sand mixtures for steel castings

7.7 Gating and risering of steel castings.

7.8 Steel Casting alloys and their applications.

7.9 Slush Casting.

7.10 Continuous Casting(C-C Plant).

8. Fuels (characteristics and applications for various Furnaces.) **4 hrs.**

8.1 Coal

8.2 Coke

8.3 Oil

8.4 Gas

8.5 Electricity

9. SHELL MOLDING4 hrs.

9.1 Definition

9.2 Pattern

9.3 Molding material

9.4 Parting and dressing material

9.5 Procedure for construction

10. INVESTMENT CASTING (LOST WAX). 4 hrs.

10.1 Definition

10.2 Preparation of pattern

10.3 Construction of mould

10.4 Pouring

10.5 Advantages & Disadvantage

11. SPECIAL CASTING PROCESSES. 4 hrs.

11.1 Centrifugal casting.

11.2 True Centrifugal Casting.

11.3 Semi-Centrifugal Casting

11.4 Centrifuging

12. MOULDING TECHNIQUES TO SOLVE MOULDING PROBLEMS 4 hrs.

12.1 False Cope
12.2 Cope Down
12.3 Green sand match
12.4 Drawback
12.5 Using Loose Piece
12.6 Using dry sand core
12.7 Using a cover core

13. MATERIAL HANDLING EQUIPMENT IN FOUNDRY.6 hrs.

13.1 Handling of sand.

13.2 Handling of molds

13.3 Handling of molten metals

13.4 Handling of Castings

13.5 Conveyor Systems ,Cranes, Skip Cars ,Lifters.

14. Modernization of Foundry 6 hrs.

14.1 Plant Lay-out.

14.2 Planning of Foundry

14.3 Determination of Process for Manufacturing products.

14.4 Determination of Work station.

14.5 Considering personnel facilities and services.

14.6 ISO in Foundries.

15. QUALITY CONTROL TEST FOR GREY IRON FOUDRIES 6 hrs.

15.1 Importance and classification of tests

15.2 Visual test

15.3 Dimensional inspection

15.4 Chill wedge test

16. Quality Control in Foundry. **6 hrs.**

16.1 What needs to be controlled.

16.2 How to control.

16.3 Limits of Quality required.

16.4 Specifications imposed by the Consumer.

RECOMMENDED BOOKS:

1. Principles of Metal Casting by RICHARD W.HEIRE PHILIP C. ROSENTHAL
2. Foundry Practice by WILLIAN H. SALMON AND ERIC N.SIMON**.**
3. Basic Principles of Risering by American Foundrymen's Society.
4. Casting Defects Hand Book by American Foundrymen's Society.
5. Introduction to Cast Metals Industry, Cast Metals Technology Series by AFS.
6. ASM HAND BOOK Volume 15 Casting

INSTRUCTIONAL OBJECTIVES:

1. UNDERSTAND RECLAMATION OF SANDS AND THEIR APPLICATIONS.

1.1 State Dry reclamation.

1.2 State Wet reclamation

1.3 State Thermal reclamation.

1.4 State Combined wet and thermal.

1.5 State Equipment for fume and dust extraction.

2. UNDERSTAND CASTING DEFECTS.

2.1 Definition of casting defects (shift, Misrun, swell, fin, hot tear and cracks, blow hole gas hole, porosity, shrinkage cavity, cold shut, cuts and washer, dirt inclusion)

2.2 Describe Causes of casting defects

2.3 Describe Remedies of casting defects

3. UNDERSTAND FLUXES.

3.1 Definition and purposes

3.2 Describe Different fluxes (cover flux, degasser, grain refiner) used for Al. Cu, Zn, Brass, Grey iron and steel during melting & pouring

4. UNDERSTAND MELTING ATMOSPHERE.

4.1 Definition of furnace atmosphere, Types of atmospheres (oxidizing neutral, reducing)

4.2 Describe Atmosphere needed during melting of cu, brass, Aluminium.

4.3 Describe Functions of oxidizer and De-oxidizers.

4.4 Describe Deoxidizers of common metals.

4.5 Describe Inoculation and its effects.

3.6 Describe Functions of scavengers

3.7 Describe Scavengers used for different metals

5. UNDERSTAND MELTING CONDITIONS

5.1 State Different factors to be observed during melting g to remove the absorbed gases in Al, cu, brass, steal during melting.

6. UNDERSTAND CAST IRONS.

6.1 State Various grades of Pig Iron according to Carbon content with Physical Properties.

6.2 Types of cast iron (grey, white, Chilled, malleable, Ductile Iron (Nodular/SG, Acicular.)

6.3 Describe Description and properties of each type

6.4 State Effects of alloying elements on the properties of cast iron.

5.1 Describe Melting and casting of gray and SG irons

5.2 State Risering and gating system for cast irons.

7. UNDERSTAND STEEL CASTING.

7.1 Describe Moulding method for steel casting (dry sand mold, green sand mold, core sand, skin dry, cement bonded graphite, ceramics

7.2 State Physical properties of molding sand for steel casting (Hardness and permeability)

7.3 State Moulding Mixtures for steel castings and their standards

7.4 State Steel facing materials

7.5 State Mould coating materials

7.6 State Core sand mixtures for steel castings

7.7 State Gating and risering of steel castings.

7.8 State Steel Casting alloys and their applications.

7.9 State Slush Casting.

7.10 State Continuous Casting(C-C Plant).

8. UNDERSTAND FUELS (characteristics and applications for various Furnaces.)

8.1 Coal

8.2 Coke

8.3 Oil

8.4 Gas

8.5 Electricity

9. UNDERSTAND SHELL MOLDING

9.1 Definition

9.2 Pattern

9.3 State Molding material

9.4 Describe Parting and dressing material

9.5 State Procedure for construction

10. UNDERSTAND INVESTMENT CASTING (LOST WAX).

10.1 Definition

10.2 Describe Preparation of pattern

10.3 Describe Construction of mould

10.4 State Pouring

10.5 State Advantages & Disadvantage

11. UNDERSTAND SPECIAL CASTING PROCESSES.

11.1 Describe Centrifugal casting.

11.2 Describe True Centrifugal Casting.

11.3 Describe Semi-Centrifugal Casting

11.4 Describe Centrifuging

12. UNDERSTAND MOULDING TECHNIQUES TO SOLVE MOULDING PROBLEMS

12.1 False Cope
12.2 Cope Down
12.3 Green sand match
12.4 Drawback
12.5 Using Loose Piece
12.6 Using dry sand core
12.7 Using a cover core

13. UNDERSTAND MATERIAL HANDLING EQUIPMENT IN FOUNDRY.

13.1 State Handling of sand.

13.2 State Handling of molds

13.3 State Handling of molten metals

13.4 State Handling of Castings

13.5 State Conveyor Systems ,Cranes, Skip Cars ,Lifters.

14. UNDERSTAND MODERNIZATION OF FOUNDRY

14.1 Describe Plant Lay-out.

14.2 Describe Planning of Foundry

14.3 Describe Determination of Process for Manufacturing products.

14.4 Describe Determination of Work station.

14.5 Describe Considering personnel facilities and services.

14.6 What is ISO in Foundries.

15. UNDERSTAND QUALITY CONTROL TEST FOR GREY IRON FOUDRIES

151 Describe Importance and classification of tests

15.2 State Visual test

15.3 state Dimensional inspection

15.4 State Chill wedge test

16. UNDERSTAND QUALITY CONTROL IN FOUNDRY.

16.1 What needs to be controlled.

16.2 How to control.

16.3 Describe Limits of Quality required.

16.4 State Specifications imposed by the Consumer.

FP- 314 **PRACTICALS** **192 Hrs.**

MOULDING PRACTICE

1. Mould making using sprit base surface dressing
2. Mould making using water base surface dressing
3. Mould making using chaplets and chills
4. Sweep moulding
5. Shell moulding

MELTING PRACTICE

6. Introduction and working operation of induction furnace.
7. Steel melting/making in induction furnace and study fluxing, alloying, taping and pouring.
8. S.G. Iron and alloy making in induction furnace.

CUPOLA MELTING.

19. Cupola preparation (lining, sand bed, coke bed etc.)
20. Cupola charge preparation.
21. Cupola firing and charging practice.
22. Cupola melting (tapping of slag and metal)
23. Poring practice of molten metal.
24. Closing of cupola.

CRUCIBLE MELTING PRACTICE

29. Melting practice of Al , Cu and alloys using flux, grain refiner and degasser
30. Melting in crucible furnace
31. Use of covering flux, de-gasification, and pouring in moulds

CASTING PRACTICE

9. Mould making using chills to study directional solidification.
10. Study of directional solidification in big casting with the help of risers.
11. Investment casting.
12. Gravity die casting.
13. Centrifugal casting.
14. Semi-centrifugal casting.
15. Permanent mould Casting.
16. Plaster of Paris molding and Casting Practice.

POST CASTING PROCESSES

17. Sawing/trimming

18. Chipping
19. Grinding.
20. Tumbling.
21. Cleaning
22. Shots /sand Blast cleaning

23. Brazing and Welding

TESTING & QUALITY CONTROL

24. Visual test of casting and moulding
25. Temperature measurement by pyrometer
26. Percentage of C, Si and Mn in cast iron/steel by wet analysis method
27. Composition of alloy by spectrometer
28. Carbon-Equivalent determination

FP-324 WOOD WORKING MACHINES

Total contact hours:	T	P	C
Theory: 64 hours	2	6	4
Practical: 192 hours			

AIM: To give awareness and understanding to students about operation and function of different pattern making machines. Students will be able to use these machines and aware about their maintenance and safety precautions.

COURSE CONTENTS

1. CIRCULAR SAW MACHINE. 6 HRS

1.1 Construction of machine

1.2 Cutting operation (Along grains and across the grain, Miter cutting, Grooving, Rabbeting, Tannin)

1.3 Sharpening of circular saw blade

1.4 Care and maintenance

1.5 Safety precautions

2. BAND SAW MACHINE. 8 HRS

2.1 Construction (main parts)

2.2 Cutting operations (Ripping, Cross cutting, Tannin cutting, Bevel and Chamfer)

2.3 Cutting speed

2.4 Coiling of band saw blade

2.5 Common faults and their prevention

2.6 Sharpening of band saw blade

2.7 Brazing of band saw blade

2.8 Care and maintenance of machine

3. JOINTER MACHINE 8 HRS

3.1 Principal parts

3.2 Operations (Surfacing, Edging, Straight edges, Bevel and chambers)

3.3 Sharpening

4.4 Honing

4.5 Adjustment of rear table

4.6 care and maintenance

4. THICKNESS MACHINE. 8 HRS

4.1 Function of main parts

4.2 Uses of machine

4.3 Sharpening of blade

4.4 care and Maintenance

5. SPINDLE MOULDER 6 HRS

5.1 Function of principal parts

5.2 Operations (Shaping, Grooving,Molding, Rabbeting, Core Molding)

5.3 Safety precautions

5.4 care and Maintenance

6. UNIVERSAL MACHINE 6 HRS

6.1 Construction

6.2 Types of operations

6.2.1 Sawing

6.2.2 Planning

6.2.3 Boring

6.2.4 Molding

6.3 Care and maintenance

6.4 Advantages and limitations

7. SANDING MACHINES 6 HRS

7.1 Disc sander

7.1.1 Main Parts

7.1.2 Sanding operations

7.2 Belt sander

7.2.1 Constructions

7.2.2 Sanding operation

7.3 Spindle sander

7.3.1 Construction

7.3.2 Operations

7.4 Care and maintenance

8. TOOL GRINDING MACHINES 6 HRS

8.1 Definition

8.2 Types of grinding machines (Tool grinders, Circular saw blade Grinder)

8.3 Main parts

8.4 Uses of grinders

8.4 Dressing of grinding wheel

9. ELECTRIC PORTABLE DRILL. 2 HRS

9.1 Main parts

9.2 Uses

9.3 Care and maintenance

10. PORTABLE ROUTER. 2 HRS

10.1 Main parts

10.2 Uses

10.3 Care and safety

11. JIG SAW. 2 HRS

11.1 Construction/Main parts

11.2 Cutting operation

11.3 Uses of machine

12. MODERN PATTERN MAKING MACHINES 4HRS

12.1 CNC lathe machine
12.2 CNC Router Machine
12.3 CNC Prototype machine

RECOMMENDED BOOKS:-

1. Principles of wood working by Herman H. Jorth
2. Exploring pattern Making and foundry by Harvey D. Muier
3. Wood working by Willis H. Wagner
4. Wood work made Simple Tompettit, FRSA, and MRST
5. The wood working Bible by Percy W. Blandford
6. General Wood working by Chrishgroneman
7. The Wood Work book by John Makepeace

FP-324 WOOD WORKING MACHINES

INSTRUCTIONAL OBJECTIVES

1. UNDERSTAND CIRCULAR SAW MACHINE.

1.1 Explain construction of machine

1.2 Describe cutting operation (Along grains and across the grain, Miter cutting, Grooving, Rabbeting, Tannin)

1.3 State method of sharpening of circular saw blade

1.4 Enlist care and maintenance

1.5 State safety precautions

2. UNDERSTAND ABOUT BAND SAW MACHINE.

2.1 Explain construction (main parts)

2.2 Describe cutting operations (Ripping, Cross cutting, Tannin cutting,

Bevel and Chamfer)

2.3 State cutting speed

2.4 State method of Coiling of band saw blade

2.5 Describe Common faults and their prevention

2.6 Describe Sharpening of band saw blade

2.7 State method of Brazing of band saw blade

2.8 State Care and maintenance of machine

3. UNDERSTAND ABOUT JOINTER MACHINE

3.1 Explain Principal parts

3.2 explain different Operations (Surfacing, Edging, Straight edges,Bevel and chambers)

3.3 Describe method of Sharpening of blade

4.4 Describe Honing

4.5 state adjustment of rear table

4.6 State care and maintenance

4. UNDERSTAND THICKNESS MACHINE.

4.1 explain function of main parts

4.2 Enlist uses of machine

4.3 Describe sharpening of blade

4.4 State care and Maintenance

5. KNOW ABOUT SPINDLE MOULDER

5.1 Describe function of principal parts

5.2 Describe operations (Shaping, Grooving,Molding, Rabbeting, Core Molding)

5.3 Enlist safety precautions

5.4 State care and Maintenance

6. UNDERSTAND UNIVERSAL MACHINE

6.1 Explain construction

6.2 Describe types of operations

6.2.1 Circular saw

6.2.2 Jointer and thicknesser

6.2.3 Boring

6.2.4 Molding

6.3 State care and maintenance

6.4 Enlist advantages and limitations

7. UNDERSTAND SANDING MACHINES

7.1 Describe Disc sander

7.1.1 Explain main Parts

7.1.2 State sanding operations

7.2 Describe Belt sander

7.2.1 Explain constructions

7.2.2 State sanding operation

7.3 Describe Spindle sander

7.3.1 Explain construction

7.3.2 Describe different operations

7.4 State care and maintenance of each machine

8. KNOW ABOUT TOOL GRINDING MACHINES

8.1 Define toll grinding

8.2 describe types of grinding machines (Tool grinders, Circular saw blade Grinder)

8.3 Describe main parts of each machine

8.4 Enlist uses of grinders

8.4 State method of dressing of grinding wheel

9. UNDERSTAND ELECTRIC PORTABLE DRILL.

9.1 Explain main parts

9.2 Enlist uses

9.3 State care and maintenance

10. KNOW ABOUT PORTABLE ROUTER.

10.1 Describe main parts

10.2 Enlist uses of router

10.3 state care and safety

11. KNOW ABOUT JIG SAW.

11.1 Explain Construction/Main parts

11.2 Describe cutting operation

11.3 Enlist uses of machine

12. UNDERSTAND MODERN PATTERN MAKING MACHINES

12.1 Describe CNC lathe Machine

12.2 Describe CNC Router Machine

12.3 Describe CNC Prototype machine

FP-324 WOOD WORKING MACHINES

LIST OF PRACTICALS

Construction of following patterns along with core boxes

1. **Elbow**
   - i. Preparation of Lay out
   - ii. Cutting of different pieces
   - iii. Paper gluing
   - iv. Template making
   - v. Sizing and shaping by filing
   - vi. Construction of core box

2. **WHEEL HANDLE**
   - i. Segment cutting and gluing
   - ii. Template making
   - iii. Sizing and shaping by cutting and filing
   - iv. Finishing and painting

3. **BOW ARM**
   - i. Wood cutting and planning
   - ii. Template making
   - iii. Sizing and finishing

4. **OUTLET FOR PUMP HOUSE**
   - i. Cutting and planning
   - ii. Gluing different pieces
   - iii. Finishing and painting

5. **LAG PATTERN**
   - i. Cutting and shaping of pieces
   - ii. Assembly of different pieces
   - iii. Painting and finishing
   - iv. Construction of core box

6. **MASTER PATTERN OF PIPE REDUCER**
   - i. Allowances added
   - ii. Cutting and paper gluing
   - iii. Turning
   - iv. Construction of core box
   - v. Painting

7. **Construction of metal pattern from Master pattern**
   - i. Casting from master pattern
   - ii. Machining
   - iii. Finishing

FP-302 **PRODUCT LAYOUT AND CAD**

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

AIM: Develop the skill to read different types of drawing and prepare lay out patterns. Study of various symbols of pattern lay out prepare patterns drawings.

COURSE CONTENTS

PART – A MANUAL LAYOUT

1. INTRODUCTION TO LAYOUT **4HRS**

1.1 Lay out of patterns

1.2 Allowance

1.3 Core Boxes

1.4 Core print

1.5 Colors

2. LAYOUT TOOLS **3HRS**

2.1 Layout tools for drawing sheets

2.2 Layout tools for wood patterns

2.3 Layout tools for metal patterns

3. MASTER PATTERN **1HRS**

3.1 Define master pattern

3.2 Allowances for master patterns

3.3 Core print

3.4 Colors

4. BUSH. **1HRS**

4.1 Self core pattern

4.2 Machine allowance

4.3 Draft

4.4 Segment

5. ELBOW. **1HRS**

5.1 Templates

5.2 Sizes of core print

5.3 Flange

6. SKELTON PATTERN **2HRS**

6.1 Allowances

6.2 Size of ribs

6.3 Flange sizes

6.4 Accessories

7. PISTON. **2HRS**

7.1 Cover/Hanging core

7.2 Joint lines

7.3 Loose piece in core

7.4 Core box for piston core

7.5 Core print

7.6 Joint limits at the core box

7.7 Loose pieces

8. LAG PATTERN. **2HRS**

8.1 Pattern sizes (with allowances)

8.2 Construction

8.3 Core

8.4 Size of core print

8.5 Core box for lag pattern

9. WHEEL HANDLE 2HRS

9.1 Size of segment determination

9.2 Core print with ring core

9.3 Shape and size for template

10. PUMP HOUSE. 2HRS

10.1 Draft

10.2 Template for turning pattern

10.3 Size of core print

10.4 Color for core

10.5 Material thickness of pattern Template

11. INLET FOR PUMP HOUSE 1HRS

11.1 Allowances

11.2 Size of core print

11.3 Template

11.4 Core box

12. OUTLET FOR PUMP HOUSE 1HRS

12.1 Allowances added

12.2 Size of core print

12.3 Template

12.4 Core box

PART – B AUTO CAD

13. INTRODUCTION TO TOOL BARS AND COMMANDS 2 HRS

13.1 Draw tool bar

13.2 Modify tool bar

13.3 Layers tools bar

13.4 Selection of objects

13.5 Change Command

13.6 O-snap

13.7 Rotate command

13.8 Extend command

13.9 Trimming

14. BASIC EDITING SKILLS 2HRS

14.1 Adding Text to a Drawing

14.2 Filling Areas with Hatching

14.3 Deleting and Restoring Objects

14.4 Moving, Copying, and Offsetting Objects

14.5 Rotating, Mirroring, Scaling, and Stretching Objects

14.6 Editing Edges and Corners of Objects

14.7 Producing Arrays of Objects (ARRAY)

15. DIMENSIONING 2 HRS

15.1 Dimensioning Basics and Dimensioning with Precision

15.2 Linear and Radial Dimensioning

15.3 Angular Dimensioning

15.4 Editing Dimensions

16. 3D MODELING 4 HRS

16.1 Define 2D and 3D models

16.2 Use of UCS

16.3 Editing and changing in 3D objects

16.4 Subtraction and rendering

16.5 View ports

RECOMMENDED BOOKS:

1. Exploring pattern Making and Foundry by Hervey D. Miner
2. Advance pattern Making by L.L.Cox
3. Wood working by Willis H. Wagner
4. Wood work made Simple Tompettit, FRSA, and MRST
5. The wood working Bible by Percy W. Blandford
6. General Wood working by Chrishgroneman
7. The Wood Work book by John Makepeace
8. Principles of wood working By Herman H .Jorth
9. Engineering Drawing and CAD-II by (Muhammad HafeezAshrafi)
10. AutoCAD 2010 Tutorial First Level: 2D Fundamentals by Randy H. Shih
11. AutoCAD 2010 Tutorial Second Level: 3D Modeling by Randy H. Shih

FP-302 **PRODUCT LAYOUT AND CAD**

INSTRUCTIONAL OBJECTIVES

PART – A MANUAL LAYOUT

1. KNOW ABOUT LAYOUT

1.1 Describe Lay out of patterns

1.2 State Allowances

1.3 Describe Core Boxes

1.4 State Core print

1.5 Describe Colors

2. UNDERSTAND LAYOUT TOOLS

2.1 State Layout tools for drawing sheets

2.2 Describe Layout tools for wood patterns

2.3 Describe Layout tools for metal patterns

3. UNDERSTAND MASTER PATTERN

3.1 Define master pattern

3.2 state Allowances for master patterns

3.3 State Core print

3.4 Describe Colors

4. UNDERSTAND BUSH.

4.1 Define Self core pattern

4.2 State Machine allowance

4.3 state Draft

4.4 Describe Segment

5. UNDERSTAND ELBOW.

5.1 state Templates

5.2 Describe Sizes of core print

5.3 Describe Flange

6. UNDERSTAND SKELTON PATTERN

6.1 Describe Allowances

6.2 State Size of ribs

6.3 Describe Flange sizes

6.4 describe accessories

7. UNDERSTAND PISTON.

7.1 state Cover/Hanging core

7.2 describe Joint lines

7.3 State loose piece in core

7.4 Describe Core box for piston core

7.5 State Core print

7.6 State Joint limits at the core box

7.7 State Loose pieces

8. UNDERSTAND LAG PATTERN.

8.1 Describe Pattern sizes (with allowances)

8.2 Describe Construction

8.3 State Core

8.4 State Size of core print

8.5 Describe Core box for lag pattern

9. UNDERSTAND WHEEL HANDLE

9.1 Describe Size of segment determination

9.2 State Core print with ring core

9.3 Describe Shape and size for template

10. KNOW ABOUT PUMP HOUSE.

10.1 State Draft

10.2 Describe Template for turning pattern

10.3 Describe Size of core print

10.4 State Color for core

10.5 State Material thickness of pattern Template

11. KNOW ABOUT INLET FOR PUMP HOUSE

11.1 State Allowances

11.2 Describe Size of core print

11.3 State Template

11.4 Describe Core box

12. KNOW ABOUT OUTLET FOR PUMP HOUSE

12.1 State Allowances

12.2 Describe Size of core print

12.3 State Template

12.4 Describe Core box

PART – B AUTO CAD

13. UNDERSTAND TOOL BARS AND COMMANDS FOR 2D AND 3D MODELING

13.1 State Draw tool bar

13.2 Describe Modify tool bar

13.3 State Layers tools bar

13.4 State Selection of objects

13.5 State Change Command

13.6 State O-snap

13.7 State Rotate command

13.8 State Extend command

13.9 Describe Trimming

14. UNDERSTAND BASIC EDITING SKILLS

14.1 Describe Adding Text to a Drawing

14.2 State Filling Areas with Hatching

14.3 State Deleting and Restoring Objects

14.4 Describe Moving, Copying, and Offsetting Objects

14.5 State Rotating, Mirroring, Scaling, and Stretching Objects

14.6 Describe Editing Edges and Corners of Objects

14.7 Describe Producing Arrays of Objects (ARRAY)

15. UNDERSTAND DIMENSIONING

15.1 Describe Dimensioning Basics and Dimensioning with Precision

15.2 State Linear and Radial Dimensioning

15.3 State Angular Dimensioning

15.4 State Editing Dimensions

16. UNDERSTAND 3D MODELING

16.1 Define 2D and 3D models

16.2 Describe Use of UCS

16.3 Describe Editing and changing in 3D objects

16.4 State Subtraction and rendering

16.5 Describe View ports

FP-302 **PRODUCT LAYOUT AND CAD**

LIST OF PRACTICAL

PART – A MANUAL LAYOU **48 Hrs.**

1. Draw layout of master pattern of Pipe Reducer
2. Draw layout of Bush pattern
3. Draw layout of Elbow pattern
4. Draw layout of Skelton pattern
5. Draw layout of Piston pattern
6. Draw layout of Lag pattern
7. Draw layout of Wheel Handle pattern
8. Draw layout of Pump House pattern
9. Draw layout of Inlet for Pump House pattern
10. Draw layout of Bow Arm pattern

PART – B AUTO CAD **48 Hrs.**

1. Draw 2D objects
2. Draw lines and make them vertical and horizontal with change command
3. Practice for rotate command by moving object with in drawing
4. Practice for breaking command for pre drawn circle and trim it
5. Draw a cylinder
6. Draw a Bush pattern
7. Draw a Pipe Reducer
8. Draw Skelton pattern
9. Draw step Pulley
10. Draw Wheel Handle Pattern

FP-372 **METALLURGICAL CALCULATIONS**

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

COURSE CONTACTS:

AIM. Designing of different capacities of cupola Estimating the weight of casting Designing of gating system Floating effect of core and Lifting forces in the mould

1. ARITHMETIC. 8 HOURS

1.1 Area of geometric figures

1.2 volume calculation of solid, hollow etc.

1.3 Density of different metals

1.4 Weight calculation of castings of different metals

2. FLUID METAL PRESSURE IN THE MOULD. 9 HOURS

2.1 Floatation effect of metal on the core

2.2 Lifting forces on the core

2.3 Effect of momentum due to fluid metal and height of the pouring lip

2.4 Estimation of weight of core of different sizes and shapes

2.5 Calculating the weight of the core body including reinforcement rods to adjust the floatation effect

2.6 Design the cores used for different metals as cast iron, aluminum, brass

2.7 Floating forces of molten metals exerted in the mould

2.8 Governing laws (P=WxA)

2.9 Practice on examples of Foundry Practice by Salmon & Simon page 59 to 64

3. Design of Gating System. 3 Hrs

3.1 Metal flow rate and velocity calculations.

3.2 Calculation of pouring time for

(i) Brass or Bronze Castings.

(ii) Steel Castings.

(iii) Gray Iron Castings.

(iv) light metal alloys.

4. Design of runner and gates considering Gating ratio for 2Hrs

(i)Aluminium, Brass,

(ii)Ductile Iron.

(iii)Gray Cast Iron and Steel.

5- Feeder Head(or Riser system) Design. 3 Hrs

5.1.How is Riser shape decided.

5.2How is Riser size decided.

5.3How is Riser positioning or location decided.

6- Solve words Problems. 2Hrs

7- Cost Calculations for different metal Castings with the help of different Patterns. 3Hrs

8. FURNACE CHARGE CALCULATION. 20 HOURS

8.1 Find the percentage of each element of an alloy when weight of individual element is given

8.2 Find the weight of each element of an alloy when their percentage and weight of alloy is given

8.3 Calculation of the weight of inoculants of given specifications added to a ladle charge of known composition to get the required analysis of the metal to adjust the composition

8.4 To calculate the composition of a charge on the spout of a cupola or in a ladle when two or more than two irons with different composition are added together

8.5 To calculate the above charge in a cupola when there is a loss or gain of any element during melting in the furnace

8.6 Adjustment of the different irons of known composition in a furnace, to get the required analysis of the final metal for pouring, the irons of different compositions may be two or more than two

8.7 To calculate the weight of above irons when there is a loss or gain of any element during melting in the furnace

9. MAKING ALLOY

9.1 Prepare a 500 Kg heat of 1045 by using alloying elements through Induction Furnace.

9.2 Prepare a 500 Kg heat of low alloying steel of following composition by using alloying elements through Induction Furnace.

C 0.4 ~ 0.55 %

Mn 0.7 ~ 1.0 %

Si 0.4 ~ 0.6 %

Cr 0.4 ~ 0.7 %

Ni 0.3 ~ 0.6 %

S & P 0.035 % max

Ferro Alloy composition:

1. Fe – Mn H/C Recovery-75 % Mn
2. Fe – Cr H/C Recovery- 65 % Cr
3. Ni Recovery- Pure Nickel 99 %
4. Fe – Si Recovery-75 % Si

9.3 Prepare a heat of SG Iron by using Inoculant and Nodulant after getting molten metal from Induction Furnace.

C 3.2 ~ 3.5 %

Mn 0.3 max

Si 2.2 ~ 2.5 %

S 0.03 % max

P 0.045 % max

Mg 0.04 % max

Note: Use high purity Pig Iron and by using carburizing of M.S scrap.

9.4 . Charge Calculation of Cupola Furnace.

9.5 Treatment of alloying addition to get alloying cast iron after getting molten metal from cupola.

C 3.3 ~ 3.8 %

Mn 0.3 ~ 0.8 %

Si 1.8 ~ 2.2 %

S 0.03 % max

P 0.045 % max

10. CUPOLA DESIGNING FOR DIFFERENT CAPACITIES. 14 HOURS

10.1 To Estimate the size of a cupola when a specific amount of metal is require to be melted per hour

10.2 Internal diameter of the cupola

10.3 Thickness of the lining of the furnace

10.4 Shape of the lining bricks/blocks

10.5 Outer diameter of the shell of the furnace

10.6 Approximate thickness of the shell and material

10.7 Height of the cupola tubers

10.8 Number of tyres, shape of the tuyres, and size of each tuyre

10.9 Height of the cupola well

10.10 Height of the cupola slag hole

10.11 Size and shape of the slag hole

10.12 Height of the tap hole

10.13 Size and shape of the tap hole

10.14 Height of the cupola shell (upto the charging door)

10.15 Capacity of the blower

10.16 Air pipe size estimation

10.17 Wind box size estimation

10.18 Height of the cupola legs

10.19 Estimation of the furnace charge (Melting ratio iron-coke is given)

10.20 Weight of each coke charge layer

10.21 Size of the coke lumps

10.22 Weight of each iron charge

10.23 Size of the iron charge lumps

10.24 Weight of the lime stone for each charge.

BOOK RECOMMENDED:

1. "Foundry Practice "By William H.Salmon Eric N.Simons Sir Isaac pitman & sons Ltd, London.

2. "Casting & Forming processes in Manufacturing " By James campbelljr McGRAW-HILL Book CO.

FP-382 METALLURGICAL CALCULATION

INSTRUCTIONAL OBJECTIVES:

1. UNDERSTAND THE FORMULA FOR WEIGHT ESTIMATING.

1.1 Calculate areas of geometric figures

1.2 Calculate volumes of solid & hollow castings

1.3 Estimate weights of different shaped castings of different metals

2. UNDERSTAND THE FLOATING FORCES ON THE MOULD.

2.1 Define fluid metal pressure in the mould

2.2 Describe floating effect of molten on the core

2.3 Discuss lifting forces on sand cores

2.4 Explain effect of momentum due to fluid metal and height of the pouring lip

2.5 Calculate the weight of core body including reinforcement rods to adjust the floatation effect

2.6 Design the cores used for cast iron, aluminum and brass

2.7 Explain floating forces of molten metals exerted in the mould

2.8 Apply governing laws (P=WxA) Furnace charge calculation

3. Understand Design of Gating System.

3.1 Metal flow rate and velocity calculations.

3.2 Calculation of pouring time for

(i) Brass or Bronze Castings.

(ii) Steel Castings.

(iii) Gray Iron Castings.

(iv) light metal alloys.

4. Under stand Design of runner and gates considering Gating ratio for

(i)Aluminium,

(ii)Brass,

(iii)Ductile Iron.

(iv)Gray Cast Iron and Steel.

5- Under stand Feeder Head(or Riser system) Design.

5.1.How is Riser shape decided.

5.2How is Riser size decided.

5.3How is Riser positioning or location decided.

6- Solve words Problems.

7- Cost Calculations for different metal Castings with the help of different Patterns.

8. UNDERSTAND THE FURNACE CHARGE CALCULATIONS.

8.1 Determine percentage of each element of an alloy when weight of individual element is given

8.2 Calculate weight of each element of an alloy, when their percentage and total weight of alloy is given

8.3 Calculate weight of inoculates of given specifications, added to a ladle charge of known composition to get required analysis of the metal to adjust the composition

8.4 Describe composition of a charge on the spout of a cupola or in a ladle when two or more irons of different composition are added together.

8.5 Calculate the composition of a charge in a cupola when there is a loss or gain of any during element diring melting in the furnace

8.6 Adjust the quantity of different irons of known composition in a furnace to get the required analysis of final metal product

8.7 Calculate the weight of different irons to adjust the loss and gain type elements

9. Prepare a 500 Kg heat of 1045 by using alloying elements through Induction Furnace.

10. Prepare a 500 Kg heat of low alloying steel of following composition by using alloying elements through Induction Furnace.

C	0.4 ~ 0.55 %
Mn	0.7 ~ 1.0 %
Si	0.4 ~ 0.6 %
Cr	0.4 ~ 0.7 %
Ni	0.3 ~ 0.6 %
S & P	0.035 % max

Ferro- Alloy composition:

1. Fe – Mn H/C 75 % Mn

2. Fe – Cr H/C 65 % Cr

3. Ni Pure Nickel 99 %

4. Fe – Si 75 % Si

11. Prepare a heat of SG Iron by using Inoculant and Nodulant after getting molten metal from Induction Furnace.

C 3.2 ~ 3.5 %

Mn 0.3 max

Si 2.2 ~ 2.5 %

S 0.03 % max

P 0.045 % max

Mg 0.04 % max

Note: Use high purity Pig Iron and by using carburizing of M.S scrap.

12. Charge Calculation of Cupola Furnace.

13. Treatment of alloying addition to get alloy cast iron after getting molten metal from cupola.

C 3.3 ~ 3.8 %

Mn 0.3 ~ 0.8 %

Si 1.8 ~ 2.2 %

S 0.03 % max

P 0.045 % max

14. UNDERSTAND THE ASPECTS OF CUPOLA DESIGN.

14.1 Design the cupola for different capacities

14.2 Calculate the internal dia, outer dia of shell, thickness of lining, size of bricks, thickness of outer shell

14.3 Calculate the height of the cupola shell, height of cupola well, height of tap hole, height of tuyres, hole, size and shape of tuyres hole

14.4 Calculate the capacity of blower, estimate air pipe, and wind box sizes

14.5 Calculate the weight of coke charge layer, weight of iron charge, coke and flux

14.6 State the proper size of coke, and iron charge lumps

FP-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 METALS. 2HRS

1.1 Metallography

1.2 Microstructure and Macrostructure

1.3 Study of microstructure

1.4 Define grain and grain boundary

1.5 Applications 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. 10HRS

7.1 Construction and labeling of iron carbon diagram.
7.2 Study of diagram.
7.3 Definition of structures.
7.4 Transformation of hypo, hyper eutectoid and eutectoid steel

8. STEEL. 2HRS

8.1 Define steel, Carbon steel and alloy steel

8.2 Classification of steel.

8.3 Commercial grades of steel

8.3 properties and uses of carbon steel and alloy steel

8.4 Effects of alloying elements on properties of steel

9. HEAT TREATMENT FURNACES. 4HRS

9.1 furnace requirements

9.2 Types of heat treatment furnaces

9.2.1 Hardening furnaces.

9.2.2 Annealing furnaces.

9.2.3 Bath furnaces.

10. TEMPERATURE MEASURING EQUIPMENT. 2HRS

10.1 Temperature measuring instruments.

10.2 Thermo meter and Pyrometer

10.3 Types of pyrometer

10.3.1 Optical pyrometers.

10.3.2 Thermo electric pyrometer.

11. HEAT TREATING OF STEEL. 4HRS

11.1 Definition of heat treatment.

11.2 Types of heat treatment

11.3 Annealing

11.4 Normalizing.

11.5 Hardening.

11.6 Tempering.

12. CASE HARDENING/SURFACE HEAT TREATMENT OF STEEL. 6HRS

12.1 Define case hardening.

12.2 Methods of case hardening

12.2.1 Carburizing

12.2.2 Nitriding.

12.2.3 Cyaniding/Carbo-Nitriding.

12.2.4 Flame hardening

12.2.5 Induction hardening

13. HEAT-TREATMENT OF ALLOY STEELS. 2 HRS

13.1 Heat treatment of stainless steel.

13.2 Heat treatment of tool steels.

13.3 Heat treatment of high speed steel.

13.4 Heat treatment of spring steel.

14. HEAT TREATMENT OF NONFERROUS METALS. 2HRS

14.1 Methods of hardening

14.2 Cold working

14.3 Age hardening

14.3.1 Solution Treatment

14.3.2 Aging

15. HEAT TREATMENT OF CAST IRON. 2HRS

15.1 Heat treatment of Grey cast iron.

15.2 Heat treatment of White Cast iron

15.3 Heat treatment of malleable cast iron

15.4 Heat treatment of SG iron

FP-343 METALLOGRAPHY AND HEAT TREATMENT

INSTRUCTIONAL OBJECTIVES:

1. INTRODUCTION TO MICRO EXAMINATION OF 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 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, Cu, Al)

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)
  4.3.2 Describe Close packed hexagonal (CPH)
4.4 Define Solid solution
4.4.1 Types of solid solution

5. UNDERSTAND 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 **KNOW ABOUT ALLOTROPY OF IRON.**

6.1 Define allotropy
6.2 Define Polymorphism
6.3 Explain allotropy of iron/cooling curve of pure iron

6 **UNDERSTAND 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

8. KNOW ABOUT STEEL.

8.1 Define steel, Carbon steel and alloy steel
8.2 Classification of steel.
8.3 properties and uses of carbon steel and alloy steel
8.3 State effects of alloying elements on properties of steel (C, Si, Mn, Ni, Cr, W, Mo, V, and Cu)

9. KNOW ABOUT HEAT TREATMENT FURNACES.

9.1 Describe furnace requirements
9.2 Enlist types of heat treatment furnaces
9.2.1 Describe Hardening furnaces.
9.2.2 Describe Annealing furnaces.
9.2.3 Describe Bath furnaces.

10. KNOW ABOUTTEMPERATURE MEASURING EQUIPMENT.

10.1 Describe temperature measuring instruments.
10.2 Explain thermo meter and Pyrometer
10.3 Enlist Types of pyrometer
10.3.1 Describe Optical pyrometers.
10.3.2 Describe Thermo electric pyrometer.

11. UNDERSTAND HEAT TREATING OF STEEL.

11.1 Define heat treatment.
11.2 State types of heat treatment
11.3 Explain Annealing.
11.4 Describe Normalizing.
11.5 Explain Hardening.
11.6 Describe Tempering.

12. UNDERSTAND CASE HARDENING/SURFACE HEAT TREATMENT OF STEEL.

12.1 Define case hardening.
12.2 Enlist methods of case hardening
12.2.1 Describe carburizing
12.2.2 Describe Nitriding.
12.2.3 Describe cyaniding/carbo-nitriding.
12.2.4 Describe flame hardening
12.2.5 Describe induction hardening

13. KNOW ABOUT HEAT-TREATMENT OF ALLOY STEELS.

13.1 Describe Heat treatment of stainless steel.
13.2 Describe Heat treatment of tool steels.
13.3 Describe Heat treatment of high seeped steel.
13.4 Describe Heat treatment of spring steel.

14. KNOW ABOUT HEAT TREATMENT OF NONFERROUS.

14.1 Describe Methods of hardening
14.2 Describe Cold working
14.3 Describe Age hardening
14.3.1 Describe Solution Treatment
14.3.2 Describe Aging

15. UNDERSTAND HEAT TREATMENT OF CAST IRON.

15.1 Describe heat treatment of grey cast iron.
15.2 Explain heat treatment of White Cast iron
15.3 Heat treatment of malleable cast iron
15.4 Heat treatment of SG iron

FP-343 **METALLOGRAPHY AND HEAT TREATMENT**

LIST OF PRACTICALS **96 Hrs.**

1. Practice of preparation of specimen for Metallographic examination.
2. Practice for working on Metallurgical Microscope.
3. Study microstructure of Mild steel specimen.
4. Study microstructure of low carbon steel.
5. Study microstructure of medium carbon steel.
6. Study microstructure of high carbon steel specimen.
7. Study microstructure of grey cast iron specimen.
8. Study microstructure of white cast iron specimen.
9. Practice for annealing of carbon steel and study its effect on microstructure and hardness.
10. Practice for normalizing of carbon steel and study its effect on microstructure and hardness.
11. Practice for hardening of carbon steel by quenching and study its effect on microstructure and hardness.

12 Practice for Tempering of steel and study its effect on hardness.

FP-382 **MATERIALS TESTING**

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

COURSE CONTENTS:

1. INTRODUCTION TO THE SUBJECT. 3 HRS

1.1. Physical properties of metals.

1.2 Mechanical properties of metals

1.3 Importance of material testing in industry.

DESTRUCTIVE TESTS

2. BRINELL HARDNESS TEST. 2 HRS

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 2 HRS

3.1 Hardness testing principles and procedure.

3.2 Types of Rock well hardness testing machines.

3.3 Rockwell scales

3.4 Advantages and limitation of test

3.5 Accuracy check of machine

4. VICKER HARDNESS TEST. 2 HRS

4.1 Working principle and procedure.

4.2 Measurement of indentation.

4.3 Comparison between Brinell and Rockwell hardness tests.

5. UNIVERSAL TESTING MACHINE. 2 HRS

5.1 Definition of 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 2 HRS

6.1 Specimens for tensile test

6.2 Procedure of tensile test

6.3 Construction and explanation 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. 2 HRS

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. IMPACT TEST. 2 HRS

8.1 Procedure and working principle of machine.

8.2 Specimens for test.

8.3 precautions for impact test

9. TORSION TEST. 2 HRS

9.1 Procedure and working principle of machine.

9.2 Specimens for Torsion test.

NON- DESTRUCTIVE TESTS (NDT)

10. NON-DESTRUCTIVE TESTING. 2 HRS

10.1 Definition of non-destructive test

10.2 Visual examination.

10.3 Dye-Penetrant test

0.4 sound test

11. RADIOGRAPHIC EXAMINATION. 3 HRS

11.1 Radiographic examination techniques.

11.2 Production of X-rays and gamma rays.

11.3 Working principle and procedure of radiographic examination.

11.4 Comparison between x-ray and gamma ray test.

12. MAGNETIC PARTICLE INSPECTION 4 HRS

12.1 Requirements of magnetic test

12.2 Magnetic testing methods.

12.3 Magnetizing and demagnetizing methods.

13. ULTRA-SONIC TESTING. 2 HRS

13.1 Introduction of Ultrasonic testing.

13.2 Methods of Ultrasonic inspection.

14. EDDY CURRENT INSPECTION 2 HRS

14.1 Introduction of Eddy current test.

14.2 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.

FP-382 **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.

DESTRUCTIVE TESTS

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 limitation of test

3. KNOW ABOUT THE ROCKWELL HARDNESS TEST

3.1 Explain Hardness testing principles and procedure.
3.2 Describe types of Rock well hardness testing machine.
3.3 State Rockwell scale
3.4 Enlist Advantages and limitation 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 Discuss Construction and explanation 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 IMPACT TEST.

8.1 Describe Procedure and working principle of machine.
8.2 State Specimens for test.
8.3 Enlist precautions for impact test

9. KNOW ABOUT THE TORSION TEST.

9.1 Discuss working principle of machine.

9.2 Describe specimen for torsion test.

NON- DESTRUCTIVE TESTS (NDT)

10. KNOW ABOUT THE NON-DESTRUCTIVE TESTING.

10.1 Define non-destructive testing.
10.2 State Visual examination.
10.3 Explain Dye-Penetrant test
10.4 Describe sound test

11. KNOW ABOUT THE RADIOGRAPHIC EXAMINATION.

11.1 Describe Radiographic examination techniques.
11.2 Explain Production of X-rays and gamma rays.
11.3 Explain Working principle and procedure of radiographic examination.
11.4 Enlist Comparison between x-rays and gamma rays test.

12. KNOW ABOUT THE MAGNETIC PARTILE INSPECTION

12.1 State Requirements of magnetic test.
12.2 Explain Magnetic testing methods.
12.3 Describe Magnetizing and demagnetizing methods.

13. KNOW ABOUT THE ULTRA-SONIC TESTING.

13.1 Introduction of Ultrasonic testing.
13.2 Explain Methods of Ultrasonic inspection.

14. KNOW ABOUT THE EDDY CURRENT INSPECTION

14.1 Introduction of Eddy current test.
14.2 Explain Working procedure for eddy current inspection.

FP-382 **MATERIALS TESTING**

LIST OF PRACTICALS

1. Determination of Hardness of Mild steel by using Brinell hardness Tester.
2. Determination of Hardness of grey Cast iron by using Brinell hardness Tester.
3. Determination of Hardness of Mild steel by using Rockwell hardness Tester.
4. Determination of Hardness of high speed steel by using Rockwell hardness Tester.
5. Determination of tensile properties of mild steel specimen with the help of Universal Testing Machine.
6. To perform Shear test on mild steel specimen with the help of Universal Testing Machine.
7. To perform Bend test on mild steel specimen with the help of Universal Testing Machine.
8. To perform Compression test with the help of Universal Testing Machine.
9. To perform Impact test for determination of material Toughness.
10. To perform Torsion test for determination of material Toughness.
11. To perform following Non Destructive tests on Castings.

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

FP-392 MATERIAL SCIENCE

TOTAL CONTACT HOURS **T P C**

Theory 32 hours **1 3 2**

Practical 96 hours

COURSE CONTENTS:

1-**Definition of Material Science.**

2-Engineering Materials. 3 hours

2.1 Definition of Material.

2.2 Material Classification.

2.3 Engineering requirements of Materials.

2.4 Selection of Material for engineering design.

2.5 Identify the Factors involved in the selection of Materials.

3-Properties of Engineering Materials 3 hours

3.1 Introduction.

3.2 Mechanical Properties.

3.3 Thermal Properties.

3.4 Electrical Properties.

3.4 Magnetic Properties.

3.5 Chemical Properties.

3.6 Optical Properties.

3.7 Physical Properties.

4-Ferrous and Non-Ferrous Metals and Alloys 3 hours

4.1 Introduction.

4.2 Difference between Ferrous and Non-Ferrous.

5-Ceramic Materials **3 hours**

5.1 Introduction.

5.2 Silicate structures (Introduction and types of Silicate structures).

5.3 Properties of Ceramic Materials.

(Mechanical, Electrical, Chemical, Thermal, Optical and Nuclear Properties).

5.4 Glass

(Definition, Composition, Manufacture, Properties, Types, Uses)

5.5 Abrasives

(Definition, Types and Uses)

5.6 Insulators

(Introduction, Characteristics and examples)

5.7 Rocks

(Introductions and types of Rocks)

5.8 Building stones

(Definition, Properties, Types)

6-Plastics **2 hours**

6.1 Introduction

6.2 Properties

6.3 Thermosetting resins, Various Thermoplastic resins

6.4 Forming and Fabricating and deformation of Plastics.

7-Corian Materials **2 hours**

7.1- Corian Materials and their Properties.

7.2- Corian Materials in Pakistan.

8-Rubbers (Elastomers) **3 hours**

8.1 Definition

8.2 Types and Uses

8.3 Properties

8.4 Forming and Fabricating Techniques and Finishing Methods

9-Cements **2 hours**

9.1 Introduction and Types

9.2 Reinforce cement concrete

10- Composite Materials **3 hours**

10.1 Glass Fiber reinforce composites

11- Protective coatings **2 hours**

11.1 Introduction

11.2 Types (Metallic, Inorganic and Organic Coatings).

12-Conductors. **2 hours**

Introduction and Definition.

13- Semi-Conductors **2 hours**

(Introduction, Types, Intrinsic and extrinsic Semi-Conductors, Applications of Semi-Conductors)

FP-392 MATERIAL SCIENCE

INSTRUCTIONAL OBJECTIVES

1. Definition and Introduction of Material Science.

1.1 Describe different Materials used to form different end Product.

2- ENGINEERING MATERIALS.

2.1 Definition of Material.

2.2 Describe the Classification of Materials.

2.3 Describe the Engineering requirements of Materials.

2.4 Describe the selection of Materials for Engineering design.

2.5 Identify the Factors involved in the selection of Materials.

3- PROPERTIES OF ENGINEERING MATERIALS.

3.1 Introduction.

3.2 Describe Mechanical Properties.

3.2.1 Strength (in Tension, Compression, Shear and Bending), Elasticity, Plasticity, Stiffness, Ductility, Hardness, Toughness, Fatigue, Creep, Malleability.

3.3 Explain the Thermal Properties such as Specific heat, Thermal expansion, Melting Point and Thermal conductivity.

3.4 Briefly describe the electrical Properties such as resistivity, Conductivity, Thermal co-efficient of resistance, Di electric strength.

3.5 Briefly describe Magnetic Properties such as Permeability, Coercive force, Hysteresis.

3.6 Describe Chemical Properties such as Corrosion resistance, Chemical Composition, Acidity or Alkalinity.

3.7 Describe Optical Properties such as Refractive Index, Absorptivity, Absorption Co-efficient, Reflectivity.

3.8 Describe Physical Properties such as Dimensions, Density, Porosity , Structure.

4- FERROUS METALS AND ALLOYS.

4.1 Briefly explain the following terms used in Iron and Steel making (Pig Iron, Cast Iron, Acid Iron, Basic Iron, Wrought Iron).

4.2 Briefly explain Steel and its Classification.

4.3 Briefly explain Alloy Steel and its Types (High speed steel, Stainless steel, Mar aging Steel).

5- NON-FERROUS METALS AND ALLOYS.

5.1 Briefly explain the Principal characteristics of Aluminum, Copper, Magnesium, Tin, Zink, Lead, Nickel, and their Alloys.

6- CERAMIC MATERIALS.

6.1 Introduction and definition.

6.2 Explain Silicate structures and their Types.

6.3 Explain Properties of Ceramic Materials as (Mechanical, Electrical, Chemical, Thermal, Optical and Nuclear)

6.4 Briefly explain Ceramic Materials as (Glass, Abrasives, Insulators, Rocks, Building stones, Refractories)

7-PLASTICS.

7.1 Introduction and definition.

7.2 Explain the Properties of Plastic Materials.

7.3 Describe the Types of Plastic Materials with their applications.

7.4 Explain Forming and Fabricating Techniques of Plastic Materials.

7.4.1 Forming Techniques of Thermosetting Plastics as (Compression Molding, Casting).

7.4.2 Forming Techniques of Thermoplastic Plastics as (Injection Molding, Blow Molding, Extrusion, Calendaring, Casting).

7.4.3 Fabricating Techniques of Thermosetting Plastics as (Mechanical Fasteners, Adhesive bonding).

7.4.4 Fabricating Techniques of Thermoplastic Plastics as (Solvents Cements, Welding, Mechanical fasteners, Adhesive bonding)

7.5 Explain deformation of Plastics.

8-Corian Materials

8.1- Describe Corian Materials and their Properties.

8.2-Explain Corian Materials in Pakistan.

9-RUBBERS (ELASTOMERS)

9.1 Introduction and definition.

9.2 Describe Properties, Types, Uses of elastomers.

9.3 Describe Forming, Fabricating Techniques and Finishing Methods of elastomers.

10-COMPOSITE MATERIALS

10.1 Introduction and definition.

10.2 Describe Types and Applications of Composite Materials as (Glass Fiber reinforced Plastics, Cermet's)

10.3 Explain Forming and Fabricating Techniques of Composites.

11-PROTECTIVE COATINGS

11.1 Introduction and definition.

11.2 Describe classification of coatings as (Metallic, Organic and In-Organic Coatings).

12-Conductors:

12.1 Introduction and definition.

13-SEMI-CONDUCTORS

13.1 Introduction and definition.

13.2 Describe Types/Classification and Application of Semi-Conductors.

FP-392 MATERIAL SCIENCE

LIST OF PRATICALS

1- Prepare different Fiber-Glass Products by Wet Layup Technique (Industrial Components, Consumer Goods)

2- Draw a neat and clean sketch of Power operated Plastic Injection Molding Machine and labels it.

3-Practice a process cycle for injection Molding.

4-Study of different channels for the molten Plastic to flow into the mold cavity.

5-Study of Mould design.

6-Prepare different Injection Molding Products (household appliances, small automotive small dash boards) by hand molding Plastic Injection Molding Machine)

7-Study of different Plastic materials that are used in the Injection moulding Process.

8-Making of a shoe mould by Silicon Rubber.

9-Making of different Rubber stamps.

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.