CURRICULUM FOR
DIPLOMA OF ASSOCIATE
ENGINEER
IN
CAST METAL & FOUNDRY
TECHNOLOGY (MECHANICAL)
(3 - Years Course)
## CAST METAL & FOUNDRY TECHNOLOGY

### SCHEME OF STUDIES

#### 1st YEAR:

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CAST METAL AND FOUNDRY TECHNOLOGY
1st YEAR

SCHEME OF STUDIES

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**TOTAL** 18   24   26
قرآن مجيد

البيئة

1.1 نزلت الجزء بين 2 نزلت القرآن 3 - كل مئتي سورة في خمسيات 4 - و 5 - و 6 - نصف كل سورة

1.2 واعتصموا بحبل الله جميعًا ولا انفرقو

1.3 ولا يجرمنكم شنآن قوم على إن تصدوا

1.4 إن لله يا مankind نودولانات إلى أهلها

1.5 إن لله يأمر بالعدل والحسان

1.6 إن الصلاة تنهى عن الفحشاء و المنكر

1.7 لقد كان لكم في رسل الله سوة حسنات

1.8 إن كثر مكرون عند الله لتقام

1.9 وما أن تناكم الرسول فخر زوامهنه عنئونتهوا

1.10 وافقو بالعدل

1.11 وماشوهن بالمعروف

1.12 يمحق لله الربوبية الصمدقات

1.13 واصبر على ماصباتك

1.14 وقولوا ولا سدى

1.15 إن الذين عند الله السلام

سنت

-1

-2

GEN III
انملا اعمال بالانیات

2. ایانون لاتی مکا کر اخلاق

3. لا یہو یس خدشس حس ور حس یس، جس کی لہبت اپنے

4. عور من سیمس مسلموں من سیم مسلموں لسیم ویس
5. فق ایسی بالعہ سالم مسقیم

6. حیب کم خیر کم لاء

7. سسب مسلم فسوق وفاتہ کفر

8. امومن اخو الامومن

9. کی مسلم سیم مسلم حس لبیس، وہ وفارہ

10. ایہ صفاتی خلیات ادنتی حیب ور فق اور فنغل

دیا اسلام

1. ایہم کے بانی ایرس حس و مسکم لور ایسی کی ایسی اور فق اور زیری یا ان کے مکا

2.1. تودید

2. رسالت

3. آخبہ

4. لا کم

5. آسان کب

6. ملاحظہ

6.2. مشروط 2.2.1.2.2.2.2.
قرآن مجيد

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ق
دوین اسلام

غوری مقاصد: دویں اسلام کے مقاصد مقامی معلومات کے پابندیوں میں پیمانہ تک اوہ اصل کے

خصوصی مقاصد

افٹار دویں اسلام کے الفاظ اور اصطلاحات میں پیمانہ تک اوہ اسلام کے مقاصد کی آئینی تھانے کے

افطار دویں اسلام کے مقاصد سے انسان کی آخری اور اجتماعی زندگی پر عمل و اثرات پیمانہ تک

علما کے افاقی اور اصطلاحی پیمانہ تک اوہ اسلام کے مقاصد کی آئینی تھانے کے

حقیقی سے اوہ عمل کا فرق پیمانہ تک

عمل کے افاقی و اجتماعی زندگی پر اثرات پیمانہ تک اوہ اسلام کے

عمل کے افاقی و اجتماعی زندگی پر اثرات پیمانہ تک اوہ عمل کا فرق کے

عمل کے افقی و اجتماعی زندگی پر اثرات پیمانہ تک اوہ عمل کا فرق کے
تدریسی مقاصد

عمده شماری: اصل اخلاقی که بی‌خاک چند ترکیبی که

فصوصی مقاصد جلوگیری از خانم، از خوک، و کک
موصولات که حلال نیست، و

کل زندگی سالم و صقری کن

یافتن و ثبت اورقی، از معاشرت، پر موفقیت کرکن

قیمت داری که اینیت بیان کرکن

وام و وافری که اینیت بیان کرکن

کل موضوعاتی که بنیاد بیان کرکن

صدق بیان که شرورت بیان کرکن

دوام صورتی که تشکیل بیان کرکن

یافتن میلکی که نیاز بیان کرکن

متعلقات و فردی اخلاقی تفسیر سه منظم کرکن که
منہاج پاکستان

موضوعات

1. ترقی فن تعمیر: سہولتیں اور دیکھ کر تعمیر کا متبادل ستاف کی اہمیت تصور کرتے ہیں۔
2. میک اور وکٹوئر: ایک ہی اسی اور کسی اپنے کام کا مقصد تحریک پاکستان کی وضاحت کی گئی اور پاکستان اور مسیحیوں کی ارتباطات کے لئے کُنی ہویں۔
3. نظریہ پاکستان کا آرٹیکل یا میز
4. کشمیر میں 35 ایم کی بہت سی مہم اور چند الیکٹرین کی کہانی کے متعلق میدانی لوگوں کی رہائش ہے۔
5. گیرب پر میوزیک شپکرز کا گنگا ریکارڈ
6. علامت اور اعماد کے لئے یونیورسیٹی ہرات اور افغانستان میں شدید اسماء کے ذبح کے لئے
سیالکوہ پاکستان (اہمیت درمیں)

دورکی مقامات

حیرت نور

مزید متعلق

طالب عالم جہان سے کہ اسلام میں اور مسلمین قوم کے آزادی قدرتی کیا گیا ہے

خصوصی مقامات

حیرت نور سے متعلق بنی آزادی کے

آزادی قدرتی کیا گیا

خصوصی مقامات

حیرت نور سے متعلق بنی آزادی کے

خلیقی اسلام میں تعلق ارہان رہتا ہے کہ آزادی بنی آزادی کے

زیادہ تر غیر کے قوی طور پر تعلق حاصل کے کئے

سالی علامتی قدرتی کے حاصل کے

خلیقی پرکاش

خصوصی مقامات

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نظریہ بیان بنی آزادی اسلام میں ہر دی<User:0-101559124>یرے واقعت بھی

خصوصی مقامات

نظریہ بیان بنی آزادی اسلام میں ہر دی

 branding کے متعلق کی روند میں تعلق حاصل کے

نظریہ بیان کا کاملیت کیا گیا

خصوصی مقامات

نظریہ بیان کے مرکزی بیان سے واقعت حاصل کے

خصوصی مقامات

ہر دی علامتی قدرتی کے بارے میں بنی آزادی کے
علمي تحریکین

عوامل مشترک

برزشی که سرکاری سے آگی مالا بھی کی

تحصیلی مذکور

ملک کے نیڑے بازت آزادی دوسرے کے

شریعہ ملتی آیا بھی بھارت کے

آزادی پر ہوئے صرف کہ تجربہ آپ کی خبرتیں بھی کرتے
ENG-112: English

Total Contact Hours:  

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AIMS: At the end of the course, the students will be equipped with cognitive skill have the capability of presenting facts in a systematic and logical manner to meet the demands of English language in the dynamic fields commerce and industry. The course is designed to inculcate skills of reading, writing and comprehending the facts from the written material. This will also help the students in developing speaking skill.

1.1 Course Contents

1. **PROSE/TEXT**  

1.1 First eight essays of Intermediate English Book-II.  

2. **CLOZE TEST.**  

2.1 A passage comprising 50-100 words will be selected from the text. Every 11th word 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”.

1. **GRAMMAR**  

1.1 Sentence structure  
1.2 Tenses (correct use of verb/tense)  
1.3 Parts of speech  
1.4 Punctuation  
1.5 Change of Narration  
1.6 Words often confused.  
1.7 One word of several

2. **COMPOSITION.**  

2.1 Letters / Messages  
2.2 Job Applications letter  
2.3 For character certificate / for grant of scholarship  
2.4 Telegram, Cablegrams and Radiograms, Telexes, Facsimiles  
2.5 Essay writing  
2.6 Technical Education, Science and our life, Computers, Environmental pollution, Duties of students

5. **TRANSLATION.**  

5.1 Translation from Urdu into English for Foreign Students: A paragraph or a dialogue.
RECOMMENDED BOOKS:

1. Intermediate English Book-II
2. An English Grammar and Composition of Intermediate Level
3. A Handbook of English Students by Gatherer
ENG-112: ENGLISH

Instructional Objectives:

1. DEMONSTRATE BETTER READING, COMPREHENSION AND VOCABULARY.
   1.1 Describe and narrate in simple English.
   1.2 Identify the author and the essay.
   1.3 Write summaries of the textual essays.
   1.4 Identify facts and ideas.

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 sentence 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 word 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 PRACTICAL SITUATIONS.
   4.1 Use concept to construct applications for employment, for character certificate, for grant of scholarship
   4.2 Define and write telegram, cablegram and radiograms, telexes, facsimiles
   4.3 Describe steps of a good composition
   4.4 Describe features of a good composition writing
   4.5 Describe method 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 of translation from Urdu to English in simple paragraph and sentences
MATH-113:  APPLIED MATHEMATICS-I

Total Contact Hours:  
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Aims & Objectives:

After completing the course the students will be able to:

(i) Solve problems of Algebra, Trigonometry, Vectors, Phasors and Mensuration etc.

(ii) Develop skill, mathematical attitudes and logical perception.

COURSE CONTENTS:

1. QUADRATIC EQUATIONS.  6 Hrs.
   1.1 Standard form.
   1.2 Solution
   1.3 Nature of rules
   1.4 Sum & Product of roots
   1.5 Formation
   1.6 Problems

2. ARITHMETIC PROGRESSIVE AND SERIES.  3 Hrs
   2.1 Sequence
   2.2 Series
   2.3 nth terms
   2.4 Sum of the first n terms
   2.5 Means
   2.6 Problems

3. GEOMETRIC AND PROGRESSION AND SERIES.  3 Hrs
   3.1 nth terms
   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 FRACTION.**  
   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.**  
   6.1 Angles  
   6.2 Quadrants  
   6.3 Measurement of angles  
   6.4 Relation between Hexadecimal & 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.**  
   7.1 Trigonometric functions of any angle  
   7.2 Signs of trigonometric function  
   7.3 Trigonometric ratios of particular angles  
   7.4 Fundamental Identities  
   7.5 Problems  

8. **GENERAL IDENTITIES.**  
   8.1 The Fundamental law  
   8.2 Deductions  
   8.3 Sum & Difference formula  
   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.**  
   9.1 The law of sines  
   9.2 The law of cosines  
   9.3 Measurement of Heights & Distances  
   9.4 Problems  

10. **MENSURATON (Calculation) OF SOLIDS.**  
   10.1 Review of regular plane figures and Simpson rule  
   10.2 Prisms  
   10.3 Cylinders  
   10.4 Pyramids  
   10.5 Cones  
   10.6 Frusta  
   10.7 Spheres
### VECTORS.  
11.1 Scalars & Vectors  
11.2 Addition & Subtraction  
11.3 The unit Vectors i, j, k.  
11.4 Direction Cosines  
11.5 Scalar or Dot product  
11.6 Deductions  
11.7 Dot product in terms of orthogonal components  
11.8 Vector or cross product  
11.9 Deductions  
11.10 Analytic Expression for a x b  
11.11 Problems  

### MATRICES AND DETERMINANTS  
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:  
2. Prof. Riaz Ali Khan – Polytechnic Mathematic series Vol-I & II, Majeed Sons, Faisalabad  
MATH-113       APPLIED MATHEMATICS-I

INSTRUCTIONAL OBJECTIVES:

1. **USE DIFFERENT METHODS FOR THE SOLUTION OF QUADRATIC EQUATION.**
   1.1 Define a standard quadratic equation
   1.2 Use method of factorization and method of completing the square for solving the
      equation
   1.3 Derive quadratic formula
   1.4 Write expression for the discriminate
   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 equation

2. **UNDERSTAND AND 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 number
   2.4 Insert n Arithmetic means between two number
   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 number
   3.4 Insert n geometric means between two number
   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 three formulas

4. **EXPAND AND EXTRACT ROOTS OF A BINOMIAL.**
   4.1 State binomial theorem for positive integral index
   4.2 Explain binomial coefficients
   4.3 Derive expression for the general term
   4.4 Calculate the specific term
   4.5 Expand a binomial of a given index
   4.6 Extract the specific roots
   4.7 Compute the approximate value to a given decimal place
   4.8 Solve problems involving binomials

5. **RESOLVE A SINGLE FRACTION INTO PARTIAL FRACTIONS USING DIFFERENT 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 constant involved
   5.5 Resolve a single fraction into partial fractions
   5.6 Solve problems involving all the four types
6. **UNDERSTAND SYSTEM OF MEASUREMENT OF ANGLES.**
   6.1 Define angles and the related terms
   6.2 Illustrate the generation of an angle
   6.3 Explain sexagesimal and circular system for the measurement of angles
   6.4 Derive the relationship between radian and degree
   6.5 Convert radian to degree 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 TRIGONOMETRIC FUNCTIONS.**
   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 TECHNOLOGICAL PROBLEMS.**
   8.1 List fundamental identities
   8.2 Prove the fundamental law
   8.3 Deduce important results
   8.4 Derive sum and different formulas
   8.5 Establish half angle, double angle and triple 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 sines and the law of cosines
   9.3 Explain elements of a triangles
   9.4 Solve triangle and the problems involving heights and distances

10. **USE PRINCIPLES OF MENSTRUATION IN FINDING SURFACES, AREAS, VOLUMES AND WEIGHTS OF SOLIDS.**
    10.1 Define menstruation of plane and solid figures
    10.2 List formulas for perimeters & areas of plan 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 SOLVING TECHNOLOGICAL PROBLEMS.**
   11.1 Define vector quantity
   11.2 Explain addition and subtraction of vector
   11.3 Illustrate unit vector \( i, j, k \)
   11.4 Express a vector in the component form
   11.5 Explain magnitude, unit vector, direction, cosines of a vector
   11.6 Derive analytic expression for dot product and cross product of two vector
   11.7 Deduce conditions of perpendicularity and parallelism of two vectors
   11.8 Solve problems

12. **USE THE CONCEPT OF MATRICES & DETERMINANTS IN SOLVING TECHNOLOGICAL PROBLEMS.**
   12.1 Define a matrix and a determinate
   12.2 List types of matrices
   12.3 Define transpose, adjoin and inverse of a matrix
   12.4 State properties of determinates
   12.5 Explain basic concepts
   12.6 Explain algebra of matrix
   12.7 Solve linear equation by matrix
   12.8 Explain the solution of a determinate
   12.9 Use Cramers rule for solving linear equation
PHY-113 APPLIED PHYSICS

Total Credit Hours:

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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.
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.
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
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.
4.1 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.
5.1 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.**
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.**
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.**
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.**
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.**
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.
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<td>13.3</td>
<td>Moving fields</td>
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<td>13.4</td>
<td>Types of electromagnetic waves</td>
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<td>13.5</td>
<td>Generation of radio waves</td>
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<td>13.6</td>
<td>Spectrum of electromagnetic waves</td>
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<td>14</td>
<td>ATOMIC NUCLEUS.</td>
<td>5 Hours</td>
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<tr>
<td>14.1</td>
<td>Structure of the nucleus</td>
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<td>14.2</td>
<td>Radioactivity</td>
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<td>14.3</td>
<td>Radioactive series</td>
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<td>14.4</td>
<td>Transmutation of elements</td>
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<td>14.5</td>
<td>The fission reaction</td>
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<td>14.6</td>
<td>The fusion reaction</td>
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<td>14.7</td>
<td>The nuclear reactor</td>
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<td>15</td>
<td>NUCLEAR RADIATIONS.</td>
<td>5 Hours</td>
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<td>15.1</td>
<td>Properties and integration with matter</td>
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<td>15.2</td>
<td>Radiations detector</td>
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<td>15.3</td>
<td>Radiation damage and its effects</td>
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<td>15.4</td>
<td>Radiation therapy</td>
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<td>15.5</td>
<td>Radioactive tracers</td>
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<td>15.6</td>
<td>Application of radiation techniques in archeology, agriculture, chemical industry, polymerization, sterilization, food preservation, gauging and control, radiography</td>
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<td>16</td>
<td>ARTIFICIAL SATELLITES.</td>
<td>2 Hours</td>
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<tr>
<td>16.1</td>
<td>Review law of gravitation</td>
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<td>16.2</td>
<td>Escape velocity</td>
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<td>16.3</td>
<td>Orbital velocity</td>
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<td>16.4</td>
<td>Geosynchronous and geostationary satellites</td>
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<tr>
<td>16.5</td>
<td>Use of satellites in data communication</td>
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### MAGNETIC MATERIALS.

17.1 Magnetism  
17.2 Domains theory  
17.3 Para and ferromagnetism and magnetic materials  
17.4 B.H. curve and hysteresis loop.

### SEMI CONDUCTOR MATERIALS.

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. Farid Khawaja, Fundamentals of Physics Vol-I and II  
3. Wells and Slusher, Schaum's Series Physics  
4. Nelkon and Oyborn, Advanced Level Practical Physics  
5. Mehboob Ilahi Malik and Inam-ul-Haq, Practical Physics  
6. Wilson, Lasers - Principles and Applications  
7. M. Aslam Khan and M. Akram Sandhu, 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 ELECTROMAGNETIC 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 hysteresis 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) $Y = X^2$
   c) $Y = \frac{1}{x}$

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


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.


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
CH-112 APPLIED CHEMISTRY

Total Contact Hours
Theory 32 Hours
Practical 96 Hours

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.
4. Gain skill for the efficient conduct of practical in a Chemistry lab.

COURSE CONTENTS

1. INTRODUCTION AND FUNDAMENTAL CONCEPTS. 2 Hours
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 Hours
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 Hours
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 Hours
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, Degrees French, PPM, mg / liter).
4.5 Boiler feed water, scales and treatment.
4.6 Sea-water desalination, sewage treatment.
5. **ACIDS, BASES AND SALTS.**
   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.**
   6.1 The process, definition & examples.
   6.2 Oxidizing and reducing agents.
   6.3 Oxides and their classifications.

7. **NUCLEAR CHEMISTRY.**
   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.**
   8.1 Introduction
   8.2 Composition and manufacture.
   8.3 Chemistry of setting and hardening.
   8.4 Special purpose cements.

9. **GLASS.**
   9.1 Composition and raw material.
   9.2 Manufacture
   9.3 Varieties and uses.

10. **PLASTICS AND POLYMERS.**
    10.1 Introduction and importance.
    10.2 Classification.
    10.3 Manufacture.
    10.4 Properties and uses.

11. **PAINTS, VARNISHES AND DISTEMPER.**
    11.1 Introduction
    11.2 Constituents.
    11.3 Preparation and uses.

12. **CORROSION.**
    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.**
   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.**
   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.**
   15.1 Introduction of fuels.
   15.2 Classification of fuels.
   15.3 Combustion.
   15.4 Numerical Problems of Combustion.

16. **LUBRICANTS.**
   16.1 Introduction.
   16.2 Classification.
   16.3 Properties of lubricants.
   16.4 Selection of lubricants.

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

**BOOKS RECOMMENDED**
1. Text Book of Intermediate Chemistry (I & II)
4. Chemistry for Engineers by P.C. Jain (New Delhi, India).
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 no. 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 BOUND.
   3.1 Define chemical bond.
   3.2 Describe the nature of chemical bond.
   3.3 Differentiate between electrovalent and 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/liter., 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 at least six examples of each.
   6.6 Define oxides.
   6.7 Classify the oxides and give examples.

7. UNDERSTAND THE FUNDAMENTALS OF NUCLEAR CHEMISTRY.
   7.1 Define nuclear chemistry and radio activity.
   7.2 Differentiate between Alpha, Beta and Gamma particles.
   7.3 Explain half life process.
   7.4 Explain at least six nuclear reactions resulting in the transformation of some elements.
   7.5 State important uses of isotopes.

8. UNDERSTAND THE MANUFACTURE, SETTING AND HARDENING OF CEMENT.
   8.1 Define Portland 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 AND 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 DISTEMPEPS.
     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.
    12.5 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.

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 for particular purpose/job.

17. UNDERSTAND THE NATURE 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.
LIST OF PRACTICALS: 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 the scheme of IV group radicals.
20. To detect and confirm An^{++} and Mn^{++} radicals of IV group.
21. To detect and confirm 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 percentage composition of a mixture solution of KNO_{3} and KOH volumetrically.
30. To find the amount of chloride ions (Cl') in water volumetrically.
AIMS: This subject will enable the student to be familiar with the operation of a Micro-computer. He will also learn BASIC language and word processing to elementary level.

COURSE CONTENTS:

1. **ELECTRONIC DATA PROCESSING (EDP).** 12 Hours
   1.1 Basics of computers
   1.2 Classification of computers
   1.3 Block diagram of a computer system
   1.4 Binary number system
   1.5 BIT, BYTE, RAM, ROM, EROM, EPROM
   1.6 Input and output devices
   1.7 Secondary storage media details
   1.8 Processors and types
   1.9 Using computer for system software
   1.10 Using computers for application software.
   1.11 Common types of software and their application.

2. **WINDOWS 2000** 8 Hours
   2.1 Introduction
   2.2 Files & Folders
   2.3 Creation of new files & folders
   2.4 Manipulation of files & folders

3. **BASIC LANGUAGE.** 20 Hours
   3.1 Introduction to high level languages
   3.2 Introduction to BASIC
   3.3 REM Statement
   3.4 Assignment statement
   3.5 Input statement
   3.6 Read-Data statement
   3.7 IF-THEN statement
   3.8 IF-THEN Else statement
   3.9 FOR-NEXT statement
   3.10 DIM statement
   3.11 L PRINT statement
3.12 STOP statement
3.13 END statement
3.14 Logic of a BASIC Program
3.15 Running a BASIC Program
3.16 Saving and Retrieving a Program
3.17 Advance features

4. WORD PROCESSING. 16 Hours
4.1 Starting word processor session
4.2 Opening a document
4.3 Saving a document
4.4 Ending word processor session (Temporarily)
4.5 Retrieving a document
4.6 Spell check
4.7 Margins and tab setting
4.8 Aligning Paragraph
4.9 Printing a document
4.10 Advance features

5. COMPUTER GRAPHIC IN BASIC. 8 Hours
5.1 Graphic fundamentals
5.2 Points and lines
5.3 Dots in space
5.4 A lightening blot
5.5 Shapes
5.6 Expanding circles and rectangles

RECOMMENDED BOOKS:
1. Ron S. Gottfrid, Programming with BASIC,
2. Any Word Processor Latest Release (e.g., Word, Word-Perfect etc).
3. ABC'S of DOS (latest release).
4. Judd Robbins, Mastering DOS 6.0 and 6.2
COMP-133  COMPUTER APPLICATIONS

INSTRUCTIONAL OBJECTIVES

1. UNDERSTAND ELECTRONIC DATA PROCESSING (EDP).
   1.1 Know basics of computers.
   1.2 Know classification of computers.
   1.3 Know block diagram of a computer system.
   1.4 Know binary number system.
   1.5 Know some general terms used in computers.
   1.6 Know input and output devices.
   1.7 Know secondary storage media.
   1.8 Explain processor and its types.
   1.9 Know the use of computer for system software.
   1.10 Know use of computers for application software.
   1.11 Explain commonly used application of software

2. WINDOWS 2000
   2.1 Know about Windows 2000 environment (Desk Top area and different icons over it)
   2.2 Know about files & folders.
   2.3 Know about the creation of new files & folders.
   2.4 Ability to perform Manipulation of files & folders.

3. UNDERSTAND BASIC LANGUAGE.
   3.1 Explain high level languages.
   3.2 Explain Basic language.
   3.3 Describe Ram statement
   3.4 Describe assignment statement
   3.5 Explain Input statement
   3.6 Explain Read-Data statement
   3.7 Explain If-Then Statement
   3.8 Explain If-then-Else Statement
   3.9 Explain For-Next Statement
   3.10 Explain DIM Statement
   3.11 Explain LPRINT statement
   3.12 Explain stop statement
   3.13 Explain end Statement
   3.14 Describe Logic of Basic program
   3.15 Describe running a Basic Program
   3.16 Describe saving & retrieving Basic Program
   3.17 Describe some Advance features of Basic program

4. UNDERSTAND WORD PROCESSING SESSION.
   4.1 Describe word-processing
   4.2 Name command to be entered on Dos-prompt to load word processor
   4.3 Identify initial screen
   4.4 Describe the command to open a document
   4.5 Describe the procedure for naming the document
   4.6 Explain importance of giving extension to a document
4.7 Describe saving and retrieving a document
4.8 Explain importance of saving the work at regular intervals
4.9 State temporarily ending word-processing session & document retrieval
4.10 State procedure to re-enter word processor
4.11 State procedure to re-open the document and editing
4.12 Describe spell-check facility
4.13 Describe Margins & Tab Setting
4.14 Describe to align paragraph
4.15 Describe Re-editing techniques
4.16 Describe procedure to set-up printer
4.17 Describe command for printouts
4.18 Explain multiple copy printout procedure
4.19 Explain some advance features
4.20 Describe procedure of condensed printing
4.21 Describe procedure for change of fonts

5. UNDERSTAND PROGRAMMING INSTRUCTIONS FOR COMPUTER GRAPHIC IN BASIC LANGUAGE.
5.1 Identify graphic fundamentals in basic language
5.2 Draw points and lines
5.3 Draw dot in space
5.4 Draw lighting blot
5.5 Draw shapes
5.6 Draw expanding circles and rectangles
COMP-133 COMPUTER APPLICATIONS
LIST OF PRACTICAL  96 hours

Windows 2000
1. Creating a folder at hard disk
2. Creating a folder at Floppy Disk
3. Copying the files in folder at hard disk
4. Moving the files from one folder to an other folder
5. Creating a shortcut at desktop
6. Changing the icon of shortcut.
7. Deleting a file and restoring from Recycle bin.
8. Deleting a folder and restoring from Recycle bin.

BASIC
1. Practice for loading & unloading BASIC software and identify role of function keys in Basic
2. Identify role of various keys in continuation with ALT key in BASIC programming
3. Practice for CLS, LOAD, SAVE, FILE, RENUM command by loading any existing BASIC Program
4. Practice for editing any existing BASIC Program
5. Prepare BASIC Program to display sum of two numbers using INPUTS
6. Prepare BASIC Program to display sum of two numbers using READ-DATA
7. Prepare BASIC Program to multiply two numbers
8. Prepare BASIC Program to calculate Area of Rectangle, when length and width are given
9. Prepare BASIC Program to calculate area of a circle when radius/diameter is given
10. Prepare very simple BASIC Programs using IF-THEN-ELSE and FOR-NEXT statement
11. Identify DIM statement
12. Practice for LPRINT statement for various Programs hard-copy output

WORD PROCESSING
1  Practice for loading & unloading a word processor
2  Practice for creating document & saving it
3  Practice for spell-check facility of the word-processor
4  Practice for editing an existing document
5  Practice for various word-processing Menu Options
6  Practice for printing a document
7  Practice for margin and TAB setting and document alignment
8  Practice for some advance features
MT-112     ENGINEERING DRAWING-I

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

COURSE CONTENTS:

1. USES AND APPLICATIONS OF TECHNICAL DRAWING.  1 Hour
   1.1  Technical drawing and the technician
   1.2  Use of technical drawing
   1.3  Common drawing forms
   1.4  Applications of drawing forms
   1.5  Practices and conventions

2. DRAWING TOOLS AND ACCESSORIES.  1 Hour
   2.1  Drawing pencils
   2.2  Drawing papers specifications
   2.3  Drawing instruments
   2.4  Use and care of drawing instruments and materials

3. ALPHABET OF LINES.  1 Hour
   3.1  Importance of the alphabet of lines
   3.2  Common alphabet of lines
   3.3  Uses and correct line weight of the lines
   3.4  Applications of lines

4. LETTERING.  1 Hour
   4.1  Importance of good lettering
   4.2  Single stroke gothic
   4.3  Letter strokes
   4.4  Letter guide lines
   4.5  Vertical single stroke gothic
   4.6  Unclaimed single stroke gothic
   4.7  Composition of lettering

5. DRAWING LINES TERMINOLOGY.  1 Hour
   5.1  Introduction to sketching techniques
   5.2  Sketching lines
   5.3  Sketching circle and arcs
   5.4  Sketching ellipse
   5.5  Sketching view of object
6. **GEOMETRICAL CONSTRUCTIONS.** 4 Hours
   - 6.1 Introduction of geometry
   - 6.2 Definition of terms
   - 6.3 Definition geometrical shapes, surface objects
   - 6.4 Basic geometrical constructions
   - 6.5 Construction, ellipse, parabola, and cycloids

7. **INTRODUCTION TO MULTI-VIEW PROJECTIONS.** 3 Hours
   - 7.1 Definition and concept of multi-view drawings
   - 7.2 Principle view of plane of projections
   - 7.3 Orthographic projections
   - 7.4 1st angle and 3rd angle projections
   - 7.5 Six principal view
   - 7.6 Arrangement of view
   - 7.7 Multi view drawings

8. **INTRODUCTION TO PICTORIAL DRAWING.** 2 Hours
   - 8.1 Uses of pictorial
   - 8.2 Three types of pictorials
   - 8.3 Oblique sketching of a rectangular block
   - 8.4 One-part perspective sketching of a rectangular block
   - 8.5 Preparation of pictorial drawing of simple objects

9. **BASIC DIMENSIONING.** 2 Hours
   - 9.1 Definition of dimensioning
   - 9.2 Types of dimension
   - 9.3 Elements of dimensioning
   - 9.4 System of measurements
   - 9.5 Dimensioning pictorial views
   - 9.6 Dimensioning rules and practice
   - 9.7 Dimensioning multi views
   - 9.8 Note & specifications

10. **SECTIONING AND SECTIONAL VIEWS.** 7 Hours
    - 10.1 Definition and purpose
    - 10.2 Cutting plane position and cutting plane lines
    - 10.3 Types of sectional view
    - 10.4 Conventional section lines of different material
    - 10.5 Practice sectional views

11. **MULTIVIEW DRAWINGS OF MACHINE ELEMENTS.** 9 Hours
    - 11.1 Terminology and drawing of rivets of rivets and riveted joints
    - 11.2 Terminology and drawing of screw
    - 11.3 Terminology and drawing of keys and cotters
    - 11.4 Description and drawing of simple bearings
    - 11.5 Description and drawing of simple coupling

**TEXT BOOKS:**
1. (Engineering Drawing by French work)
2. Engineering Drawing by A.C. Parkinson
INSTRUCTIONAL OBJECTIVES:

1. TECHNICAL DRAWING.
   1.1 Know the use of Technical drawing
   1.2 Recognize the different applications
   1.3 Describe the importance of technical drawing from the point of view of a technician
   1.4 Explain the main uses of technical drawing from the point of view of a technical
   1.5 Industry commonly used drawing forms
   1.6 Illustrate the different drawing forms
   1.7 Differentiate different drawing forms
   1.8 Develop Technical vocabularies

2. DRAWING TOOLS AND ACCESSORIES.
   2.1 Know the common drawing tools and accessories
   2.2 Describe the uses of different pencils for Technical Drawing and different types of erasers and their uses.
   2.3 Maintain a well sharpened pencil for drawing.
   2.4 Describe the drawing instruments.
   2.5 State the use of drawing instruments.

3. ALPHABET OF LINES USED IN DRAWING.
   3.1 Understand the Importance, Alphabet, correct Wight age and application of line uses in Technical drawing.
   3.2 Describe the importance of lines.
   3.3 Describe the Alphabet of lines.
   3.4 Identify the lines characteristics of each alphabet of line.
   3.5 Explain method of horizontal, vertical and inclined lines
   3.6 Explain method of lines with correct weight ages

4. LETTERING.
   4.1 Applies the good lettering an a drawing
   4.2 Describe the importance of lettering in a Technical Engineering Drawing.
   4.3 Identify the letter style used in Technical Drawing
   4.4 Describe letter strokes and guide lines,
   4.5 Perform better stroke in single stroke gothic.
   4.6 Print Vertical single stroke letters and numbers
   4.7 Print inclined single stroke letters and numbers
   4.8 Stability and pleasing appearance of letters in printing

5. DRAWING LINES TECHNOLOGY.
   5.1 Understand drawing of circles, arcs, and views of objects.
   5.2 Draw circular and arc using circular line method.
   5.3 Draw a circular are using square method.
   5.4 Draw an ellipse using rectangular method
   5.5 Draw views of simple objects.
6. GEOMETRICAL CONSTRUCTIONS.
   6.1 Apply drawing skill with the aid of drawing Instruments in geometrical construction
   6.2 Define common terms used in geometrical construction.
   6.3 Explain different geometrical shapes, surfaces of objects.
   6.4 Draw basic geometrical construction.
   6.5 Draw ellipse with different methods.
   6.6 Draw parabola by different methods.
   6.7 Draw involutes conic.
   6.8 Draw cycloid conic.

7. INTRODUCTION TO MULTI-VIEW PROJECTIONS.
   7.1 Understand the multi view of projections specific objective
   7.2 Define the concept of multi-view drawings.
   7.3 Knows principal planes of projections.
   7.4 Knows the orthographic method of projection.
   7.5 Explain the 1st and 3rd angle projections.
   7.6 State six principle views.
   7.7 Practice multi-view projections.

8. INTRODUCTION TO PICTORIAL DRAWINGS.
   8.1 Explain types and methods of pictorial views
   8.2 Knows the use of pictorial views.
   8.3 Knows the pre-requisites of pictorial drawing.
   8.4 State three types of pictorial drawings.
   8.5 Draw isometric view of rectangular Blocks, Arcs, and circles.
   8.6 Draw oblique sketching of rectangular blocks.
   8.7 Draw one-point perspective view of a Rectangular block.
   8.8 Draw two punt perspective e view of a rectangular block.
   8.9 Prepare/ draw pictorial drawings of simple regular objects.

9. BASIC DIMENSIONING.
   9.1 Apply good dimensioning on Maldives and pictorials.
   9.2 Define dimension.
   9.3 Identify the types of dimensioning
   9.4 Enlist the elements of dimensioning
   9.5 Identify the system of measurements
   9.6 Indicate complete dimension on multi-view drawings
   9.7 Indicate complete dimension
   9.8 Follow the general rules for dimensioning
   9.9 Indicate notes and specifications or multisided drawings

10. SECTIONING AND SECTIONAL VIEWS
    10.1 Apply the sectioning methods of material and draw sectional views
    10.2 Define sectioning and its purpose.
    10.3 Describe cutting planes and lines
    10.4 State type of sectional views
    10.5 Explain conventional section lines of different materials.
    10.6 Practice sectioned views
11. MULTIVIEW DRAWING OF MACHINE ELEMENTS
   11.1 Apply drawing methods to draw Maldives of machine elements
   11.2 Draw reverse and related joints
   11.3 Sketch Screw
   11.4 Draw keys and Cotters
   11.5 Draw multi views of simple having
   11.6 Draw multi views of a Rigid coupling (Flange Coupling)
AIM: To produce the castings of simple regular machine parts and select the most suitable process.

COURSE CONTENTS:

1. **INTRODUCTION TO FOUNDRY TECHNOLOGY.** 4 Hrs
   1.1 Brief history
   1.2 Role of Foundry in industrial development
   1.3 Basic casting operations
   1.3.1 Pattern Making
   1.3.2 Moulding
   1.3.3 Melting
   1.3.4 Pouring and freezing
   1.4 Classifications of foundries
   1.5 Major foundries in Pakistan

2. **HAND TOOLS USED IN THE SAND MOULDING.** 4 Hrs
   2.1 Shovel
   2.2 Riddle
   2.3 Sprinkler
   2.4 Moulding box (flask)
   2.5 Top and bottom board
   2.6 Bench rammer
   2.7 Floor rammer
   2.8 Strike-off bar
   2.9 Dust bag
   2.10 Sprue pin
   2.11 Sprue cutter
   2.12 Vent wire /vent rod
   2.13 Swab
   2.14 Draw spike/screw/rod
   2.15 Bellows
   2.16 Slick and spoon
   2.17 Lifter
   2.18 Trowel

3. **MOULDING SANDS.** 4 Hrs
   3.1 Types of Moulding Sands
   3.2 Chemical composition of Silica sands.
   3.3 General ingredients of moulding sand mixtures (sand, clay, water)

4. **GENERAL PROPERTIES OF MOULDING SANDS.** 4 Hrs
   4.1 Refractoriness.
   4.2 Permeability.
4.3 Cohesiveness
4.4 Adhesiveness
4.5 Green strength
4.6 Dry strength
4.7 Collapsibility

5. BINDERS FOR MOULDING SANDS. 4 Hrs
5.1 Function of Binders
5.2 Types of binders (organic and inorganic)
5.2.1 Organic Binders (cereals, protein drying oil, gums, pitch, molasses)
5.2.2 Inorganic Binders (clay, silicate, cement, plastic, resins)
5.3 Properties of binders used in foundry

6. SAND ADDITIVES. 4 Hrs
6.1 Definitions
6.2 Types of additives used i.e. coal dust (sea coal), silica flour, wood flour, black lead, Starch/ Dextrin

7. PARTING POWDERS. 4 Hrs
7.1 Parting powders
7.2 Dried silica flour
7.3 Burnt sand
7.4 Limestone dust
7.5 Dolomite dust
7.6 Fire clay
7.7 Ashes
7.8 Lycopodium

8. SURFACE DRESSING. 2 Hrs
8.1 Dressing (definition)
8.2 Black lead
8.3 Fire clay
8.4 Zircon coatings

9. INTRODUCTION TO MOULDS. 2 Hr
9.1 Parts of simple moulds (cope, drag, and cheek)
9.2 Parts of castings /moulds (sprue, pouring basin, runner, in gate, mould cavity, core print, riser or feeder)

10. MOULDING FLASKS. 4 Hrs
10.1 Parts of common flasks
10.2 Accessories of flasks (pin, socket, clamp)
10.3 Types of flasks (permanent flask, removable flask, snap flask, jacket flask, flask with bar)

11. SAND CONDITIONING EQUIPMENTS. 4 Hrs
11.1 Lump crushing
11.2 Sand riddle
11.3 Sand Muller / Mixer
11.4 Magnetic separator
11.5 Sand dryers

12. SAND MOULDING PROCESSES. 8 Hrs
12.1 Green sand moulding
12.2 Dry Sand moulding
12.3 Skin dried moulding
12.4 Molasses sand moulding
12.5 Cement bonded moulding
12.6 Pit moulding.

13. CORE MAKING. 8 Hrs
13.1 Core & its function
13.2 Types of cores
13.3 Properties of core sands
13.4 Composition of molasses sands
13.5 Composition of oil sands
13.6 Core making
13.6.1 Baking of core
13.6.2 Daubing and positioning of core
13.6.3 Reinforcement of sand cores

14. INTRODUCTION TO METAL MELTING FURNACES. 8 Hrs
14.1 Coke fired crucible furnace
14.2 Oil fired crucible furnace
14.3 Gas fired crucible furnace
14.4 Cupola Furnace.
14.5 Electric Arc Furnace
14.6 Induction Furnace

15. CRUCIBLE 2 Hrs
15.1 Shapes and materials
15.2 Capacity and number of size of crucibles
15.3 Care and maintenance of crucible

BOOKS RECOMMENDED:
2. Richard W Rosenthal – “Principles of Metal Casting”.
4. American Foundry society “Fundamental Moulding Sand Technology”
5. “Chemically Bonded Cores and Moulds” by American Foundry men’s Society.
INSTRUCTIONAL OBJECTIVES:

1. KNOW ABOUT FOUNDRY WORK.
   1.1. State brief history of foundry
   1.2. State role of foundry in industrial development.
   1.3. Enlist basic casting operations
   1.4. Define moulding
   1.5. Define melting
   1.6. Define pouring and freezing
   1.7 Define foundry
   1.8 Describe classes of foundry in respect of the nature of work
   1.9 State classes of foundries in respect of metals they melt
   1.10 Name major foundries in Pakistan

2. UNDERSTAND HAND TOOLS FOR SAND MOULDING.
   2.1 Describe the uses of each hand tool used in sand moulding
   2.2 Sketch each hand tool used in sand moulding
   2.3 Explain tools required for finishing and repair of sand mould.

3. UNDERSTAND MOULDING SANDS.  4 Hrs
   3.1 Describe types of Moulding Sands
   3.2 State chemical composition of Silica sands.
   3.3 General ingredients of moulding sand mixture (sand, clay, water)

4. UNDERSTAND MOULDING PROCESSES.
   4.1 Define the moulding process
   4.2 Enlist the parts of simple mould
   4.3 State the parts of casting
   4.4 Define the pattern
   4.5 Describe the mould cavity

5. UNDERSTAND GENERAL PROPERTIES OF MOULDING SAND.
   5.1 Explain refractoriness, permeability, cohesiveness, and adhesiveness
   5.2 Describe the green strength.
   5.3 Explain dry strength.
   5.4 Distinguish between cohesiveness and adhesiveness

6. UNDERSTAND BINDERS USED IN MOULDING SAND.
   6.1 Define the binder
   6.2 Describe properties of binders
   6.3 Enlist types of binders.
   6.4 Explain each type of binder.

7. UNDERSTAND SAND ADDITIVES.
   7.1 Define additives
   7.2 State the types of special additives
7.3 Enlist types of special additive
7.4 Enlist cereal additive
7.5 Describe silica flour
7.6 Explain wood flour as an additive
7.7 Explain black lead as an additive
7.8 Explain grog.
7.9 Explain sea coal additive

8. UNDERSTAND PARTING POWDER.
  8.1 Define parting powder
  8.2 Explain dried silica flour as parting material
  8.3 Explain burnt sand
  8.4 Describe limestone dust
  8.5 Explain dolomite
  8.6 Explain fire clay
  8.7 Explain paraffin oil as parting material
  8.8 Explain ashes
  8.9 Explain Lycopodium

9. UNDERSTAND SURFACE DRESSING.
  9.1 Define surface dressing
  9.2 Explain black lead as surface dressing
  9.3 Explain fire clay as surface dressing

10. UNDERSTAND MOULDING SAND.
  10.1 Name the parts of flasks
  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
  11.2 Describe sand riddling
  11.3 Explain magnetic separator
  11.4 State the composition of green sand for gray iron.

12. UNDERSTAND METAL MELTING FURNACES.
  12.1 Enlist types of crucible furnaces
  12.2 Describe coke fired crucible furnace
  12.3 Describe oil fired crucible furnace
  12.4 Describe the gas fired crucible furnaces
  12.5 Explain the construction and operation of oil fired crucible furnace.
  12.6 Sketch the oil fired crucible furnace
  12.7 Sketch the cupola furnace
  12.8 Describe the construction of a cupola furnace
  12.9 Enlist the parts and their function
  12.10 Describe operation of cupola furnace.
13  **UNDERSTAND CORE MAKING.**
   13.1 Define core
   13.2 Describe the functions of core
   13.3 Describe various types of sand core
   13.4 Explain the properties of core sand
   13.5 State the composition of oil sand
   13.6 State procedure of making simple sand core
   13.7 Describe baking of sand core, daubing and pasting of sand core, baking of core.
   13.8 Describe reinforcement of sand core

14.  **UNDERSTAND SAND MOULDING.**
   14.1 Describe the green sand mould
   14.2 Compare green, dry, and skin dry mould.

15.  **KNOW ABOUT CRUCIBLE.**
   15.1 Define crucible
   15.2 Describe the shape and material of crucible
   15.3 Describe the properties of material used in their making
   15.4 Describe the capacity and number of crucible
   15.5 State maintenance of crucible
AIM: Select and use the different tools and equipment of making measurement and layout of jobs and make wood work jobs and patterns. Student will be required to maintain the tools/equipments in proper and safe working conditions.

COURSE CONTENTS:

1. MEASURING AND LAY-OUT TOOLS. 3 Hrs
   1.1 Steel rule
   1.2 Caliper rule
   1.3 Shrinkage rule
   1.4 Flexible rule
   1.5 Marking gauge
   1.6 Panel gauge
   1.7 Mortise gauge
   1.8 Steel square
   1.9 T-bevel
   1.10 Combination set
   1.11 Divider
   1.12 Trammel
   1.13 Caliper
   1.14 Surface plate
   1.15 Angle plate
   1.16 V-block
   1.17 Surface gauge
   1.18 Try square

2. SAWING TOOLS. 3 Hrs
   2.1 Rip saw
   2.2 Cross cut saw
   2.3 Copping saw
   2.4 Compass saw
   2.5 Panel saw
   2.6 Back saw
   2.7 Dove tail saw
   2.8 Pattern maker saw
   2.9 Key hole saw
   2.10 Turning saw

3. PLANING TOOLS. 3 Hrs
   3.1 Black plane
   3.2 Smooth plane
   3.3 Jack plane
   3.4 Fore plane
   3.5 Jointer plane
3.6  Rabbet plane
3.7  Router plane
3.8  Circular plane
3.9  Core–box Plane
3.10  Spoke shave
3.11  Sharpening plane

4.  BORING TOOLS.  3 Hrs
4.1  Ratchet brace
4.2  Hand drill
4.3  Auger Bit
4.4  Twist drill
4.5  Counter sink
4.6  Multi-spur machine bit
4.7  Bit gauge
4.8  Doweling Jig

5.  CLAMPING TOOLS.  3 Hrs
5.1  Hand screw
5.2  Bench Vice
5.3  C-Clamp
5.4  Bar clamp
5.5  Prick punch/punch dog.

6.  FILES.  3 Hrs
6.1  Definition
6.2  Parts of file, classification
6.3  Common shapes (flat, round, half round, tri-angular).
6.4  Cuts (Blistered, rough, smooth, dead smooth,) single cut, double cut
6.5  Operations (Flat, smooth, dead smooth)
6.6  File card
6.7  Precautions

7.  HACK SAW.  3 Hrs
7.1  Main parts
7.2  Types of frames
7.3  Types of blades (all hard, flexible)
7.4  Selection of blades (for soft and hard metals and thin sections, tubes, angle iron)
7.5  Sawing rules
7.6  Care and maintenance

8.  HAMMERS.  2 Hrs
8.1  Functions
8.2  Main parts
8.3  Types (ball peen, cross peen, straight peen)

9.  MISCELLANEOUS TOOLS.  3 Hrs
9.1  Claw hammer
9.2  Mallet
9.3  Wood chisels (socket, tang, mortise, firmer)
9.4 Gouges
9.5 Nail set
9.6 Screw drivers
9.7 Fillet iron
9.8 Cornering tools

10. MICRO METER. 3 Hrs
10.1 Working principle
10.2 Main parts
10.3 Types (Inside, out side, depth)
10.4 Least count (inch, mm)
10.5 Reading
10.6 Use and care of micrometer

11. VERNIER CALIPER (IN SIDE, OUT SIDE, DEPTH). 3 Hrs
11.1 Principles
11.2 Main Parts
11.3 Least count
11.4 Reading
11.5 Use and care of micrometer

RECOMMENDED BOOKS:
1. “Exploring Pattern Making and Foundry” by Mier and Miller
2. “Principles of Wood Working” by Herman H Jorth
3. “Metal Work Technology and Practice” by Victor E Repp Ed .D
INDRUCTONAL OBJECTIVES

1. **UNDERSTAND TOOLS USED FOR MEASURING, LAYOUT AND, MARKING.**
   1.1 Enlist the measuring and lay out tools
   1.2 Sketch of each tool
   1.3 Describe the function of each tool
   1.4 Select tools for drawing parallel lines, circles, and arcs

2. **UNDERSTAND SAWING TOOLS.**
   2.1 Clarify saws
   2.2 Describe types of saws
   2.3 Distinguish rip saw and cross cut saw
   2.4 State uses of each tool
   2.5 Select proper tools for specific operation
   2.6 Sketches different saw.

3. **UNDERSTAND BORING TOOLS.**
   3.1 Clarify planes
   3.2 State the uses of each plane
   3.3 Describe in the main parts
   3.4 Distinguish each plane.

4. **UNDERSTAND BORING TOOLS.**
   4.1 Clarify boring tools
   4.2 State the uses of each tool
   4.3 Describe the function of each tool
   4.4 Draw sketch of each.

5. **UNDERSTAND CLAMPING TOOLS.**
   5.1 State different types of clamping tools.
   5.2 Describe function of each tool
   5.3 State cares for using each tool.

6. **UNDERSTAND FILES.**
   6.1 Define files
   6.2 Enlist main parts on their sketch
   6.3 State types according to their cross-sectional and cuts
   6.4 Explain filling operations
   6.5 Describe use of file card for cleaning.

7. **UNDERSTAND HACK SAW.**
   7.1 Enlist main parts
   7.2 State types of frames and blades
   7.3 Select proper for specific work
   7.4 Observe precautions during use.
8. **HAMMERS.**
   8.1 Describe hammers
   8.2 Classify hammers
   8.3 Describe their uses.

9. **UNDERSTAND MISCELLANEOUS TOOLS USED IN PAKISTAN WORKING.**
   9.1 Enlist miscellaneous tools
   9.2 Draw sketch of each tool
   9.3 State the function of each tool
   9.4 Differentiate chisel and gouge
   9.5 Compare socket chisel and tang chisel
   9.6 Distinguish mortise and firmer chisel

10. **UNDERSTAND MICROMETER**
    10.1 State working principle
    10.2 Label, main parts on its sketch
    10.3 List its types
    10.4 Take readings
    10.5 State cases during use of micrometer

11. **UNDERSTAND VERNIER CALIPER**
    11.1 Label main parts on its sketch
    11.2 Find least count
    11.3 Take reading
FP-132  METALLURGY-I

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

AIMS The students will be able to:
1. Acquire knowledge of iron ores and the methods of dressing them.
2. Have knowledge of different operations carried out in the recovery of iron from its ores.
3. Have knowledge of different steel making processes.
4. Acquaint with various methods employed for shaping iron and steel for industrial applications.

COURSE CONTENTS

1. INTRODUCTION TO METALLURGY.  2 Hrs
   1.1 Define Metallurgy and its classifications.
   1.2 Scope of Metallurgy.

2. OCCURRENCE OF ORES.  2 Hrs
   2.1 Definition.
   2.2 Iron, its occurrence in nature.
   2.3 Iron ores in Pakistan.

3. TREATMENT OF IRON ORES (DRESSING).  4 Hrs
   3.1 Hand picking.
   3.2 Magnetic Separation.
   3.3 Gravity Separation.
   3.4 Roasting and Calcinations.
   3.5 Froth Floatation.

4. PRODUCTION PROCESSES.  3 Hrs
   4.1 Reduction and oxidation.
   4.2 Acidic and basic in Metallurgical terminology.

5. REFRACTORY MATERIALS.  3 Hrs
   5.1 Acidic Refractory Materials.
   5.2 Basic Refractory Materials.
   5.3 Neutral Refractory Materials.

6. BLAST FURNACE.  4 Hrs
   6.1 Construction of blast furnace.
   6.2 Charge of blast furnace.
   6.3 Operation of blast furnace.
   6.4 Main reactions
   6.5 Products of blast furnace and its uses.

7. CUPOLA FURNACE.  4 Hrs
   7.1 Construction of Cupola Furnace
   7.2 Cupola charge.
   7.3 Operation of cupola furnace.
8. **MANUFACTURE OF WROUGHT IRON.** 4 Hrs
   8.1 Construction of peddling furnace.
   8.2 Charge
   8.3 Operation of furnace.
   8.4 Uses of wrought iron.

9. **STEELS AND ITS CLASSIFICATIONS.** 4 Hrs
   9.1 Carbon steels.
   9.2 Alloy Steels.
   9.3 Common applications of carbon and alloy steels.

10. **STEEL MANUFACTURING PROCESSES.** 4 Hrs
    10.1 Chemistry of steel refining.
    10.2 Construction of open hearth furnace
    10.3 Charge and operation of open hearth furnace (Acidic / Basic)
    10.4 LD Converter

11. **BESSEMER CONVERTOR.** 3 Hrs
    11.1 Construction of the Converter.
    11.2 Charge of the Converter.
    11.3 Operation of Bessemer converter.
    11.4 Advantages of the process.

12. **ELECTRIC ARC FURNACE.** 4 Hrs
    12.1 Construction of direct and indirect electric furnace
    12.2 Operation of an electric arc furnace
    12.3 Charging
    12.4 Addition of alloying elements
    12.5 Tapping
    12.6 Duplex operation

13. **INDUCTION FURNACE.** 4 Hrs
    13.1 Construction of induction furnace
    13.2 Working Principle
    13.3 Operation of furnace

14. **EFFECTS OF IMPURITIES ON PROPERTIES OF STEELS.** 3 Hrs
    14.1 Sulphur and Phosphorous
    14.2 Manganese and Silicon
    14.3 Carbon

15. **CAST STEEL INGOTS.** 4 Hrs
    15.1 Killed steel ingots
    15.2 Semi killed steel ingots
    15.2 Rimmed steeon ingots
16. **HOT WORKING OF METALS AND ALLOYS** 6 Hrs
   16.1 Hot Rolling.
   16.2 Hot Forging
   16.2.1 Drop Forging
   16.2.2 Drop Forging Machines – Dew Block Dies, heat and furnaces.
   16.3 Hot Pressing
   16.4 Extrusion
   16.4.1 Direct Extrusion
   16.4.2 Indirect Extrusion
   16.5 Production of Seamless tubes

17. **COLD WORKING OF METALS AND ALLOYS** 6 Hrs
   17.1 Cold rolling of Sheets and Strips
   17.2 Cold Drawing of steels.
   17.3 Wire Drawing
   17.4 Work Hardening and Annealing in drawing.
   17.5 Pressing.
   17.6 Spinning.
   17.7 Blanking and piercing.

**BOOKS RECOMMENDED.**
4. Elementary Metallurgy and Metallography by M. Saracen.
7. Cupola Operation Guide by Cupola committee.(RH. Hafner)
INSTRUCTIONAL OBJECTIVES:

1. KNOW ABOUT METALLURGY.
   1.1 Define metallurgy.
   1.2 State list scopes of metallurgy.
   1.3 Classify types of metallurgy.

2. KNOW ABOUT IRON ORES.
   2.1 Define ore.
   2.2 State nature of ores.
   2.3 State classification of iron ores.
   2.4 State nature and extent of iron ores in Pakistan.

3. KNOW ABOUT THE DRESSING OF ORES.
   3.1 State hand picking method.
   3.2 State magnetic separation method.
   3.3 State roasting and calcinations.
   3.4 State froth flotation process

4. KNOW THE TERMINOLGY USED IN METALLURCICAL TREATMENTS.
   4.1 State reduction and oxidation.
   4.2 State meaning of acidic and basic metallurgical processes.

5. KNOW THE REFRACTORY MATERIALS.
   5.1 Define Refractory materials
   5.2 State acid refractories
   5.3 State basic refractories
   5.4 State neutral refractories

6. UNDERSTAND BLAST FURNACE.
   6.1 Sketch and label the diagram of blast furnace.
   6.2 Describe functions of different parts of blast furnace.
   6.3 Enlist charge of blast furnace.
   6.4 State function of charge elements.
   6.5 State chemistry of ore smelting.
   6.6 Explain operation of blast furnace.
   6.7 Enlist products of blast furnace
   6.8 State uses of blast furnace products.

7. UNDERSTAND CUPOLA FURNACE.
   7.1 Sketch and label the diagram of cupola
   7.2 Enlist charge of cupola
   7.3 Describe the operation of cupola furnace.

8. UNDERSTAND MANUFACTURE OF WROUGHT IRON.
   8.1 Sketch and describe the construction of puddling furnace.
   8.2 Enlist charge material.
8.3 Explain operation of pudding furnace.
8.4 Enlist use of wrought iron.

9. **KNOW ABOUT STEEL.**
9.1 Define carbon steel.
9.2 Define alloy steel
9.3 State common applications of carbon and alloy steel

10. **UNDERSTAND STEEL MANUFACTURING BY OPEN HEARTH FURNACE.**
10.1 Sketch and label an open hearth furnace.
10.2 Explain the operation of open hearth furnace, both acidic and basic.

11. **UNDERSTAND THE BESSEMER PROCESS.**
11.1 Describe construction of the Bessemer converter.
11.2 State charge of the converter.
11.3 Explain operation of Bessemer converter.
11.4 Enlist main features of the process.

12. **UNDERSTAND THE MANUFACTURING PROCESS OF ALLOY STEELS BY ELECTRIC ARC FURNACE.**
12.1 Draw the sketch of electric arc furnace and label parts.
12.2 Differentiate between direct and indirect electric furnace.
12.3 Describe the operation of furnace.
12.4 Enlist the charge material.
12.5 Describe the oxidation of alloying elements and tapping.
12.6 Describe the oxidation period
12.6 State the addition of alloying elements and tapping.
12.7 Explain duplex operation of furnace.

13. **UNDERSTAND THE MANUFACTURE OF ALLOY STEEL IN INDUCTION FURNACE.**
13.1 Sketch its parts.
13.2 Describe the working principle
13.3 Explain briefly the operation of induction furnace.
13.4 State chemical reaction in induction purview

14. **KNOW THE EFFECT OF IMPURITIES ON THE PHYSICAL PROPERTIES OF STEEL**
14.1 Describe the effect of sulphur and phosphorous
14.2 Describe the effect of manganese and silicon.
14.3 Describe the effect of carbon.

15. **UNDERSTAND STEEL INGOTS.**
15.1 Describe the killed ingot.
15.2 Describe the semi killed ingot.
15.3 Describe the Rimmed ingot.
16. UNDERSTAND THE HOT WORKING PROCESSES APPLIED TO METALS AND ALLOYS.

16.1 State cold and hot rolling process.
16.2 State forging process.
16.3 State drop forging process.
16.4 Describe construction and working of drop forging machines.
16.5 State block dies.
16.6 Describe heating furnace
16.7 Describe hot pressing.
16.8 Explain direct extrusion process, indirect extrusion process, method of production of welded tube, and method of production of seamless tube.

17. UNDERSTAND THE COLD WORKING PROCESS APPLIED TO METALS AND ALLOYS.

17.1 Describe the cold rolling method of sheet.
17.2 Describe the cold rolling of strip
17.3 Describe the wire drawing (Wet Process)
17.4 Describe the wire drawing (Dry Process)
17.5 State the work hardening and annealing in drawing.
17.6 Explain the pressing process.
17.7 Explain the spinning process
17.8 Explain blanking & piercing
FP-141  PATTERN MAKING-1

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

AIMS: Study of pattern making materials and manufacturing of various types of patterns, pattern allowances and color codes etc.

PATTERN MATERIALS:

1. WOOD.  2 Hrs
   1.1 Common woods used for pattern making
   1.2 Advantages
   1.3 Limitations

2. METALS.  2 Hrs
   2.1 Metals and alloys used for metal patterns
   2.2 Advantages and Limitations of each metal used

3. PLASTICS.  1 Hr
   3.1 Types of plastics used
   3.2 Advantages
   3.3 Limitations

4. TREES  2 Hrs
   4.1 Classification of Trees
   4.2 Growth
   4.3 Structure
   4.4 Cross-Section of Tree Trunk

5. DEFECTS OF TIMBER.  2 Hrs
   5.1 Cup shake
   5.2 Heart shake
   5.3 Star shake
   5.4 Up-Sets
   5.5 Twisted grains
   5.6 Wood Worms
   5.7 White Aunts
   5.7 Types of knots

6. SAWING OF LOGS.  2 Hrs
   6.1 Tangential sawing
   6.2 Slab sawing
   6.3 Rift sawing
   6.4 Quarter sawing
   6.5 Quarter sawing
   6.6 Modified quarter sawing
7. **SEASONING OF WOOD.**  
7.1 Purposes of seasoning  
7.2 Types of wood seasoning  
7.3 Water seasoning method  
7.4 Air Seasoning method  
7.5 Artificial seasoning method  
7.6 Calculation of moisture contents

8. **DEFECTS CAUSED BY INCORRECT SEASONING.**  
8.1 Wrapping  
8.2 Twisting  
8.3 Case hardening  
8.4 Surface cracking  
8.5 Honey combing  
8.6 Splitting

9. **WOOD PRESERVATION METHODS AND THEIR APPLICATIONS.**  
9.1 Methods of wood preservation  
9.2 Application of preservers  
9.2.1 By Brush  
9.2.2 By Spray  
9.2.3 By Pressure

10. **TIMBER CALCULATIONS.**  
10.1 Cubic foot  
10.2 Board feet  
10.3 Log

11. **TIMBER SHRINKAGE AND ITS EFFECTS.**  
11.1 Longitudinal shrinkage  
11.2 Radial shrinkage  
11.3 Tangential shrinkage

12. **TIMBER USED IN PATTERN MAKING**  
12.1 Deodar wood (Description, characteristic, source of supply)  
12.2 Kail wood (Description, characteristic, source of supply)  
12.3 Red wood (Description, characteristic, source of supply)  
12.4 Mahogany (Description, characteristic, source of supply)

13. **TYPES OF PATTERNS (DEFINITION, ADVANTAGES, DISADVANTAGES)**  
13.1 Single Piece Patterns  
13.2 Split Patterns  
13.3 Cope and Drag Patterns  
13.4 Match plate patterns  
13.5 Follow board patterns  
13.6 Skeleton patterns  
13.7 Sweep patterns  
13.8 Master patterns
13.9 Gated patterns

14. PATTERN ALLOWANCES. 2 Hrs
14.1 Shrinkage allowance for Steels, Cast Irons, Brasses, Aluminum, Bronzes
14.2 Draft allowance for pattern and core box
14.3 Machining allowance
14.4 Distortion allowance

15. CORES. 2 Hrs
15.1 Types of cores (green sand core, dry sand core, metal cores)
15.2 Core prints (vertical, bottom and top print, horizontal, balanced, hanging, cover core print, wing print)
15.3 Core boxes (half core box, Dump, Split, Trickle left and right hand box, loose piece core boxes)

16. PATTERN COLORS. 2 Hrs
16.1 American color code/scheme
16.2 British color code/scheme
16.3 Swedish system color code/scheme
16.4 Preparation of pattern surface for color (Putty Filler sanding, Under coat, final Coat)
16.5 Preparation and application of varnish
16.6 Preparation and application of enamels

17. PATTERN ACCESSORIES. 2 Hrs
17.1 Brass dowel with socket
17.2 Wooden dowel
17.3 Raping and Lifting Plates
17.4 Pattern Letters
17.5 Pattern fillets and rounds
17.6 Pattern numbering and storing pattern shop planning

REFERENCE BOOKS:
1. Pattern Making by S.P.I.T Gujarat
2. Advance Pattern Making by L.L.Cox
3. Exploring Pattern Making & Foundry by Harvey D.Miners and John G.Miller
INSTRUCTIONAL OBJECTIVES:

1. UNDERSTAND ABOUT PATTERN MATERIALS.
   1.1 Describe different types of wood used in pattern making
   1.2 Describe the characteristic and botanical names of deodar wood
   1.3 Distinguish between deodar and Kail

2. UNDERSTAND THE METAL PATTERN.
   2.1 List metal and alloys used for metal pattern
   2.2 Explain advantages of each (cast iron, alloys, and brasses)
   2.3 Write advantages and disadvantages of each

3. KNOW PLASTIC MATERIAL USED FOR PATTERN.
   3.1 Describe advantages and disadvantages of plastic material
   3.2 State composition of phenolic plastic

4. UNDERSTAND ABOUT DEFECTS OF TIMBER.
   4.1 Describe classifications of tree
   4.2 Describe growth of tree
   4.3 Explain the structure of timber
   4.4 Draw a cross section of tree trunk

5. UNDERSTAND ABOUT DEFECTS OF TIMBER.
   5.1 State defects of timber
   5.2 Describe cup-shake and heart-shake
   5.3 Describe star shake
   5.4 Distinguish between up-sets and twisted grains
   5.5 Write wood worms
   5.6 State white ants
   5.7 Explain different types of knots

6. UNDERSTAND ABOUT SAWING OF LOGS.
   6.1 Describe various method of sawing log
   6.2 Distinguish between modified quarter sawing and rift sawing

7. UNDERSTAND SEASONING OF TIMBER.
   7.1 Define seasoning of timber
   7.2 Describe different types of seasoning
   7.3 Describe water seasoning and air seasoning method
   7.4 Explain artificial seasoning
   7.5 Define moisture control
   7.6 Explain effects of moisture contents on quality of wood
8. **UNDERSTAND DEFECTS CAUSED BY IMPROPER SEASONING.**
   8.1 Define Warping
   8.2 State twisting the boards during incorrect seasoning
   8.3 Describe case hardening
   8.4 Explain surface cracking
   8.5 Distinguish between case hardening and honey combing
   8.6 Explain splitting of wood and its causes

9. **UNDERSTAND THE WOOD PRESERVATION METHODS AND THEIR APPLICATION.**
   9.1 Define wood preservation
   9.2 Describe the different method of wood preservation
   9.3 Explain the preservation method of wood
   9.4 Describe pressure method of wood preservation

10. **UNDERSTAND TIMBER CALCULATIONS.**
    10.1 Apply the formula of timber calculation
    10.2 Compute board feet calculation
    10.3 Apply the log calculation formula

11. **UNDERSTAND ABOUT TIMBER SHRINKAGE AND ITS EFFECTS.**
    11.1 Describe longitudinal shrinkage and radial shrinkage
    11.2 Describe tangential shrinkage

12. **UNDERSTAND ABOUT TIMBER USED IN PATTERN MAKING.**
    12.1 Describe deodar wood
    12.2 State kail wood and Mohegan source of supply
    12.3 Describe red wood

13. **UNDERSTAND THE TYPES OF PATTERN.**
    13.1 Define solid or one piece pattern
        - Split pattern
        - Multi piece pattern
        - Loose piece pattern
        - Skeleton pattern
        - Sweep pattern
    13.2 Explain the construction of master pattern
    13.3 Distinguish between gated and match plate pattern

14. **UNDERSTAND THE PATTERN ALLOWANCES.**
    14.1 State shrinkage allowance for cast iron, steel, brass etc
    14.2 Define draft allowance
    14.3 State machining allowance
    14.4 Determine the final size and shape of pattern by adding pattern allowance
15. UNDERSTAND CORE MAKING
15.1 Describe different types of core
15.2 State the various types of core prints (vertical, bottom, and top print, horizontal, Balanced and covered core print).
15.3 Explain various types of core boxes (half, dump, split, etc)

16. UNDERSTAND PATTERN COLOURS
16.1 State American system of pattern color code
16.2 State British system of pattern color code
16.3 Describe the Swedish system of color code
16.4 State preparation of pattern surfaces for paint (color)
16.5 Explain application of varnish for color code
16.6 Explain the process of enameling.

17. UNDERSTAND THE PATTERN ACCESSORIES
17.1 State the use of brass dowel with sockets
17.2 State wooden dowels
17.3 Describe the rapping and lifting plates
17.4 State the pattern fillets and rounds
17.5 Describe pattern number and storing
17.6 Explain the pattern making shop planning.
INSTRUCTIONAL OBJECTIVES:

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   2.2 Explain advantages of each (cast iron, alloys, and brasses)
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    12.1 Describe deodar wood
    12.2 State kail wood and Mohegan source of supply
    12.3 Describe red wood

13. UNDERSTAND THE TYPES OF PATTERN.
    13.1 Define solid or one piece pattern
        ▪ Split pattern
        ▪ Multi piece pattern
        ▪ Loose piece pattern
        ▪ Skelton pattern
        ▪ Sweep pattern
    13.4 Explain the construction of master pattern
    13.5 Distinguish between gated and match plate pattern

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17.4 State the pattern fillets and rounds
17.5 Describe pattern number and storing
17.6 Explain the pattern making shop planning.
FP-154 WORKSHOP PRACTICE-I

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Practical: 384 Hours

1. **BENCH WORK.**
   1.1 Introduction to Hand tools
   1.2 Prepare square block for hammer
   1.3 Prepare rectangular piece of try square
   1.4 Practice of scrubbing and drilling.
   1.5 Filling, marking, centre punching.
   1.6 Construction of cross peen hammers, filling, drilling and tapping.

2. **MOULDING AND CORE MAKING**
   1. Introduction to moulding sands and tools
   2. Cutting, riddling, and tempering of moulding sand
   3. Making a mould of solid pattern
   4. Making a mould of self core pattern
   5. Preparing a mould of parting off pattern, irregular pattern in cope.
   6. Making a mould of parting off pattern, irregular parting in drag.
   7. Making a mould of split pattern.
   8. Making a mould of loose piece pattern
   9. Making a mould having core
   10. Introduction to core and preparation of core sand
   11. Simple core making

3. **PATTERN MAKING PLANNING PRACTICE.**
   1. Planning a wooden stock to size with hand plane
   2. Face planning
   3. Edge planning with jack plane
   4. Planning stock with smooth plane
   5. Grooving practice
   6. Use of try square, rabbet plane, block plane, marking plane.

4. **SAWING PRACTICE**
   Cutting stock with saw, ripping, and cross cutting with hand saw, curve sawing with Copping saw, bow saw, key hole saw, out side, inside curve cutting.

5. **WOODEN JOINTS**
   Dado joint, cross lap joint, dove tail joint, mortise and tenon joint, bridle joint.

6. **TOTAL GRINDING**
   Sharpening of plane iron hand saw and chisels.

7. **MELTING PRACTICE**
   7.1 Melting of Aluminum alloys
   7.2 Melting of Copper Alloys (Brass, Bronze and other alloys)
   7.3 Melting of Steels
PRACTICAL EXERCISE

(Prepare patterns, moulds, and cast following jobs)

PE 1  Plate (use of necessary allowance)
PE 2  Frame
PE 3  Block
PE 4  Holder
PE 5  Locking plate
PE 6  Sidle
PE 7  Iron Blank
PE 8  Clamp
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موضوعات

1. سورة اسحاق، آية 21: أي أنَّهُ لا يُقْتَرِبُوا REPORT.
2. شن كراهية مع زعم وشرب
3. خيبركم من تعليم القرآن وعلمه
4. لا يهمون لحنهم للاضطهاد، هم دون لحن لا عهم
5. وياكم! وظفوا أن تنظروا كأكبر الحدث
6. من أحدث في أمرنا فاعل، ليس من فلور
7. من حمل عليه السلام، وليس من
8. لا تستدعي أو ضرروا في لسلام
9. كلكم راع وكلكم راع وكلكم مسؤول عن رعيته
10. محمد
11. في زندان، وال rhs b لبأ لبأ.}
12. على نزول، وأجل حتى ضياء (الجلاب، وجلاب)
13. ضياء، وشامل للإجابة.
14. فعلنا ورش حردان
15. اطلق في العراق
16. قَضِرُوا وَلَدُوا، وَتَوَفَّى عِبَادَنَا، كَأَيْنَ عِبَادُنَا}
17. فَقَلَٰلُوا بِمُكَذِّبِيهِنَّ}
18. إِنَّ ذَٰلِكَ لَلْمُكَذِّبِينَ
19. وَأَلا يَسْتَمِرَّ الْمُكَذِّبُ مُنتَظِمًا
اصلاحات

تدريس مقاصد

عمى معاصر في بطاطسندس بجان بكر، يذكر القرآن الكريم بردته من موسكي، كتبت قرآني،

خصوصی مقاصد:

- قرآني یک مرجع ازبین کره
- قرآني یک مرجع پرمرکز کره
- قرآني یک مرجع پرمرکز یکی
- قرآني یک مرجع پرمرکز

اطلاعات نامبر:

- عمودی مقصد اطلاعات کی روشنی سس اسلامی اخلاقی اقدار (العراوی و العناوین) سے آزاد گئے

خصوصی مقاصد:

- اطلاعات کی روشنی کے
- اطلاعات کی روشنی کے

اطلاعات سے روشنی میں اسلامی اخلاقی اقدار کی روشنی کے

اطلاعات سے روشنی یہی قیمتی کے معاونت ایک اصغری اقدار کے

عوامی مقصد: ضرورت مقصد کی پرستی غیب کے بارے میں جان کے

خصوصی مقاصد:

- ضرورت مقصد کی پرستی غیب کے دوبارے جان کے
- ضرورت مقصد کی پرستی غیب کے دوبارے جان کے
- ضرورت مقصد کی پرستی غیب کے دوبارے جان کے
اسلامی ریاست

عمومی مقامات اسلامی ریاست کی خصوصیت، بینان کرنا کے

خصوصی مقامات:

ریاست کی تحفظ بینان کرنا

اسلامی ریاست میں طرز تحفظ سے افقت خاص کرنا

اسلامی ریاست کی تحریکیات بینان کرنا

اسلامی ریاست کے انرفت و مقامات بینان کرنا

اسلامی ریاست کے قوم کی لینے دوران کرنا
نصاب سطح میان پاکستان

مل ہور
حد صورت

موضوعات
یہ تاریک نظر
توی بانگنی
مریون کی گھڑیوں
سیرتی
مپر گل
مکن کودن
تکرکن خاتم
سندنہ تکرکن
تھیزی روپی
سہور یوز
کوہلی کی پتھر کے چارے اور
خلق آل کیا
افلاک 1938 کو پہلی انتخاب
کوہور پاکستان
تصویب مقاصد

قدم پہلی

 травیک پاکستان

خصوصی مقاصد:

 تقومی کے خصوصی کا بانک کرنے
رومی تحقیقی تقریب دی تحریک کرے
رومی تعلمی اہمیت بانک کرنے

جامعہ عظمیت کوہستان کی محسوسی کوہستان کرے

قومی تحقیق کو مجعل رکھنے کے لیے سلامتی بندری مسائی بانک کرے

ازوری شہری قومی ویک پاکستان ملاد اٹارنی دو قومی ایکم کی سلامتی بانک کرے

قومی پاکستان سے مطابق اصلی قائم کے لیے سلامتی کوہستان کوہستان کرے

سلمان کے قومی پاکستان کے لیے بہت ضروری کرے
(نگر سنتر ظباء کے لئے)

لی ہے یک
1 10
کل رفت: 20 کگر

موضوعات
سائنسی قرار دادنے سے ہم، قوی ہے، شریک جو، متحرک اور دوری کی جانب ضرورت دوسرے
ہوٹی، وریئوئی
قوت یونیورس
قوت ایکلا
کیا دوچار
ہم کنی
ہم ہر
میں دو ریس
ہم نہیں
ہم میں
ہم کیا
ہم ہو
ہم کیا
ہم ہو

83
تدریس مقاومت

شو مقدمات:

طلاب علم: اقلیت کی ایجاد و ضرورت سے جوہر سے تحقیق کے

خصوصی مقدمات: طالب علم اپنے کال اور کے

موہومات کے محتویات بیان کرے

تمل زندگی کے خلاص کی تنازعات کرے

پہلی فصیحی اور خاصیہ، موہومات کے محتویات کے مطابق تحقیق کی روزگار کے

افضل تحقیق کا مرکز

کل اثنائی کی لسانی تنازعات بیان کرے

افضوالات سے ضریف کر کے

کر کے
MGM-211  BUSINESS COMMUNICATION

Total contact hours
Theory : 32 Hours.

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 communiqué
   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.  
   6.1 Goals of report writing  
   6.2 Report format.  
   6.3 Types of reports.  
   6.4 Report writing strategy.

7. READING COMPREHENSION.  
   7.1 Reading problems.  
   7.2 Four Reading skills.

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

RECOMMENDED BOOKS
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 COMMUNICATION.**
   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 feedback.

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

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

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

4. **FACTORS OF PRODUCTION.**
   4.1 Land
   4.2 Labor
   4.3 Capital
   4.4 Organization.

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

6. **ENTERPRENEURIAL SKILLS**
   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

- **Meaning and its determination.**
- **Large scale production.**
- **Small scale production.**

# 8. ECONOMIC SYSTEM

- **Free economic system.**
- **Centrally planned economy.**
- **Mixed economic system.**

# 9. MONEY

- **Barter system and its inconveniences.**
- **Definition of money and its functions.**

# 10. BANK

- **Definition**
- **Functions of a commercial bank.**
- **Central bank and its functions.**

# 11. CHEQUE

- **Definition**
- **Characteristics and kinds of cheque.**
- **Dishonor of cheque.**

# 12. FINANCIAL INSTITUTIONS

- **IMF**
- **IDBP**
- **PIDC**

# 13. TRADE UNION

- **Introduction and brief history.**
- **Objectives, merits and demerits.**
- **Problems of industrial Labor.**

# 14. INTERNATIONAL TRADE

- **Introduction**
- **Advantages and disadvantages.**

# 15. MANAGEMENT

- **Meaning**
- **Functions**
16. **ADVERTISEMENT**  
16.1 The concept, benefits and draw-backs.  
16.2 Principal media used in business world.  

17. **ECONOMY OF PAKISTAN**  
17.1 Introduction  
17.2 Economic problems and remedies.  

**BOOKS RECOMMENDED**  
1. Nisar-ud-Din, Business Organization, Aziz Publisher, Lahore  
INSTRUCTIONAL OBJECTIVES

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

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

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

4. **UNDERSTAND THE FACTORS OF PRODUCTION**
   4.1 Define the four factors of production.
   4.2 Explain labor 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 its merits.
   7.3 Explain small scale of production and its advantages and disadvantages.

8. **UNDERSTAND DIFFERENT ECONOMIC SYSTEMS.**
   8.1 Describe free economic system and its characteristics.
   8.2 Explain centrally planned economic system, its merits and demerits.
   8.3 State mixed economic system and its features.
9. UNDERSTAND WHAT IS MONEY
   9.1 Define money
   9.2 Explain barter system and its inconveniences.
   9.3 Explain functions of money.

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

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

12. UNDERSTAND FINANCIAL INSTITUTIONS.
   12.1 Explain IMF and its objectives.
   12.2 Explain 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 labor.

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.
### MATH-212  Applied Mathematics-II

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

2. **DIFFERENTIATION.** 6 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.** 6 Hours
   - 3.1 Explicit function
   - 3.2 Implicit function
   - 3.3 Parametric forms
   - 3.4 Problems

4. **DIFFERENTIATION OF TRIGNOMETRIC FUNCTION.** 8 Hours
   - 4.1 Differential coefficient of sin x, cos x ,tang x from first principle.
   - 4.2 Differential coefficient of Cosec x, Sec x, Cot x.
   - 4.3 Differentiation of inverse trigonometric function.
   - 4.4 Problems.
5. DIFFERENTIATION OF LOGARITHMIC & EXPONENTIAL FUNCTION. 6 Hours
   5.1 Differentiation of $\ln x$
   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. 4 Hours
   7.1 Concept
   7.2 Fundamental Formulas
   7.3 Important Rules
   7.4 Problems.

8. METHOD FOR INTEGRATION. 4 Hours
   8.1 Integration by substitution
   8.2 Integration by parts
   8.3 Problems.

9. DEFINITE INTEGRALS. 4 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.**

   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

**REFERENCE BOOKS**

1. Thomas finny –Calculus and analytic geometry
4. Prof. Sana Ullah Bhatti –Calculus and analytic geometry , Punjab Text Book Board Lahore.
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 ionic 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 ,cos x,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 VARIABLE 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 TECHNOLOGICAL PROBLEMS.**
   - 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 DEFINITE INTEGRALS.**
   - 9.1 Define definite integral
   - 9.2 List properties of definite integrals using definite integrals.
   - 9.3 Find areas under curves
   - 9.4 Solve problems of definite integrals.

10. **UNDERSTAND THE CONCEPT OF PLANE ANALYTIC GEOMETRY.**
    - 10.1 Explain the rectangular coordinate system
    - 10.2 Locate points in different quadrants
    - 10.3 Derive distance formula
    - 10.4 Prove section formula
    - 10.5 Derive slope formula
    - 10.6 Solve problems using the above formulas.

11. **USE EQUATIONS OF STRAIGHT LINE IN SOLVING PROBLEMS.**
    - 11.1 Define a straight line
    - 11.2 State general form of equation of a straight line
    - 11.3 Derive slope intercept and intercept forms of equations.
    - 11.4 Derive expression for angle between two straight lines
    - 11.5 Derives conditions of perpendicularity and parallelism lines
    - 11.6 Solve problems involving these equations/formulas.

12. **SOLVE TECHNOLOGICAL PROBLEMS USING EQUATION OF CIRCLE.**
    - 12.1 Define a circle
    - 12.2 Describe standards, central and general forms of the equation of a circle.
    - 12.3 Convert general forms to the central forms of equation of a circle.
    - 12.4 Deduce formulas for the radius and the coordinates of the centre of a circle from the general form.
    - 12.5 Derive equation of the circle passing through three given points.
    - 12.6 Solve problems involving these equations.
Total Contact Hour:

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COURSES CONTENTS

1. **DRAWING SYMBOLS.**
   1.1 Welding Symbols
   1.2 Conventional breaks
   1.3 Thread symbols
   2 Hrs

2. **SECTIONING.**
   2.1 Half sectioning
   2.2 Full sectioning
   2.3 Revolved sectioning
   2.4 Broken out sectioning
   2.5 Oblique sectioning
   2.6 Phantom sectioning
   2.7 Conventional sectioning
   2.8 Practice sectional views.
   3 Hrs

3. **GEOMETRICAL SURFACES AND SOLIDS.**
   3.1 Plane surfaces
   3.2 Cube, cylinder, prism, cone, pyramid.
   2 Hrs

4. **CONIC SECTIONS.**
   4.1 Description of conic sections
   4.2 Definition of Circles, Ellipse, Parabola, Hyperbola.
   4.3 Drawing of ellipse parabola hyperbola.
   2 Hrs

5. **DEVELOPMENTS OF GEOMETRICAL SOLIDS.**
   5.1 Cylinder
   5.2 Cone
   5.3 Prism Right and truncated
   5.4 Cone frustum and truncated
   4 Hrs

6. **FASTENERS DESCRIPTION AND DRAWING.**
   6.1 Screw threads
   6.2 Studs nuts and bolts
   6.3 Cap screws
   6.4 Machine screws
   6.5 Set screws
   6.6 Locks nuts and locking devices
   4 Hrs

7. **KEYS AND COTTERS.**
   7.1 Key nomenclature
   7.2 Square & rectangular
   7.3 Gib head
   4 Hrs
7.4 Wood ruff
7.5 Cotters

8. **RIVETS & RIVETED JOINTS.** 4 Hrs
8.1 Button head
8.2 High button
8.3 Cone head
8.4 Flat top counter sunk
8.5 Round top counter sunk
8.6 Single riveted single cover butt joint
8.7 Single riveted single cover butt joint
8.8 Double riveted lap joint
8.9 Single riveted double cover butt joint

9. **SET OF DRAWING** 4 Hrs
9.1 Working drawing
9.2 Gear shifter bracket
9.3 Conveyor hanger
9.4 Brake plate
9.5 Relief valve body
9.6 Torque tube support
9.7 Automotive connecting rod

9.2 **ASSEMBLY DRAWING**
9.2.1 Cone hook
9.2.2 Jig table
9.2.3 V-belt
9.2.4 Pivot hanger
9.2.5 Ant vibration mount
9.2.6 Boring bar holder
9.2.7 Hydraulic check valve
9.2.8 Stay rod pivot
9.2.9 Arbor press
9.2.10 Two flanged vice

10. **AUTO - CAD.** 1 Hr
10.1 CAD Fundamentals
10.2 CAD and Its Importance
10.3 Purpose
10.4 Advantages

11. **CAD SOFTWARE.** 1/2 Hr
11.1 CAD abbreviation
11.2 CAD help
11.3 Co-ordinate system
12. **BORDER TEMPLATE.**  
12.1 Drawing Area  
12.2 SNAP & GRID  
12.3 P-edit & Q-Save

13. **TITLE BLOCKS.**  
13.1 Change command  
13.2 Layout Creation  
13.3 Zooming  
13.4 Type faces of CAD  
13.5 Plotting

14. **LINE & CIRCLE.**  
14.1 Draw a line  
14.2 Draw a Circle  
14.3 Undo & Redo

**RECOMMENDED BOOKS:**
1. Engineering drawing by French & Verk  
2. ABC Of Auto Cad released 12 or latest by Alen R Miller
INSTRUCTIONAL OBJECTIVES

1. KNOW BASIC CONCEPT OF DRAWING SYMBOLS IN ENGINEERING DRAWING
   1.1 Describe graphical symbol of engineering drawing.
   1.2 State the usage of graphical symbol in engineering drawing
   1.3 Draw graphic symbol for welding
   1.4 Draw the conventional breaks lines for solid and hollow round bars, square rods
   1.5 Draw sectioning symbols for different materials
   1.6 Represent external and internal threads conventionally

2. UNDERSTAND SECTIONING AND SECTIONAL VIEWS
   2.1 Describe sectional views
   2.2 Explain full section, half section, broken section, revolved section and phantom section
   2.3 Describe conventional section method
   2.4 Understands multi view projection in section
   2.5 Draw half and full sectional view of simple machine parts

3. UNDERSTAND GEOMETRIC SURFACES AND SOLIDS
   3.1 Define geometric surfaces
   3.2 Explain types of geometric solids
   3.3 Explain types of geometric solids
   3.4 Draw plane geometric shapes
   3.5 Draw orthographic views of geometric solids
   3.6 Define geometric solids

4. UNDERSTAND CONIC SECTIONS
   4.1 Define sections
   4.2 State principle of obtaining circle, ellipse, parabola, and hyperbola by Intersection plan.
   4.3 Explain method of drawing ellipse, parabola, and hyperbola, by different method.

5. KNOW THE DEVELOPMENT OF LATERAL SURFACES OF GEOMETRIC SOLIDS.
   5.1 State the principle and step by step procedure of difference in procedure for development of right and oblique geometric solids.
   5.2 Describe frustum and truncated geometrical objects.
   5.3 Understand procedure of development of solids bounded by plane surfaces and single Curved surfaces.
   5.3.1 Explain development of truncated right prism and cylinder.
   5.3.2 Explain development of frustum and truncated of right cone and pyramid.
6. **KNOW FASTENERS AND THEIR PRINCIPAL USAGE**
   6.1 Define fasteners
   6.2 Describe difference between temporary and permanent fastening.
   6.3 Define nomenclature of screw thread.
   6.4 Describe types of threads
   6.5 State different types of screws thread fastener.
   6.6 Understand common threaded fastener.
       6.6.1 Draw detailed representation of vee and square threads.
       6.6.2 Draw hexagonal nut, nut and both.

7. **UNDERSTAND THE PURPOSE AND USAGE OF KEYS AND COTTERS**
   7.1 Define key and cotters.
   7.2 Compare keys and cotters.
   7.3 Explain the types and use of keys and cotters
   7.4 Explain method of drawing keys in shafts and hubs
   7.5 Draw gib and cotter joints

8. **UNDERSTAND RIVETS, RIVETING AND RIVETED JOINTS**
   8.1 Describe rivets and riveting
   8.2 Define terminology of riveting
   8.3 Explain types of riveted joints
   8.4 Draw rivets heads and riveted joints
       8.4.1 Draw rivet heads
       8.4.1 Draw single and double riveted lap and butt joint

9. **DESCRIBE WORKING DRAWING**
   9.1 Describe set of working drawing
   9.2 Explain detail of assembly drawing
   9.3 Explain title blode sand record strips
   9.4 Explain types of assembly drawing
   9.5 Prepare set of working drawings
       9.5.1 Draw working drawing, detail, and assembly drawing selecting from the list of exercise.
LIST OF PRACTICALS

1. Construction of cycloid
2. Construction of helix
3. Draw welding symbols
4. Construction and involutes of a circle
5. Draw sectioning symbols for different materials
6. Representation of breaks in line, tubes, square rods
7. Conventional representation of internal and external threads
8. Draw hexagonal nut
9. Draw hexagonal, square bolt and nut.
10. Practice in drawing sectional views of the object enlisted below
    - Gland for stuffing box
    - Fork for hooks coupling
    - Centre for hooks coupling
    - Vee block
    - Shackle bolts
    - Flange coupling
    - Bushed bearings
    - Open bearing
    - Arm pulley
    - Cone and step pulley
    - Wall blacket
    - Engine cross head
    - Bracket for fan
11. Construction of conic section, ellipse, parabola and hyperbola
12. Development of truncated square, hexagonal prism
13. Development of truncated cylinder
15. Development of truncated and frustum of square, hexagonal pyramid.
16. Development of funnel
17. Drawing of rivet head
18. Drawing of single /double rivety lap and butt joint in chain/ zig zag riveting.
19. Draw detail and answering drawing /working drawing relecting from the following
    1. Gib and cotter joints.
    2. Gear shifter
    3. Conveyor hanger
    4. Brace plate
    5. Relief vlave body
    6. Torque tube support
    7. Automotive connecting rod
    8. Cone hook
    9. Zig table
    10. Vee belt drive
    11. Flanged vice
LIST OF PRACTICALS (AUTO - CAD)

1. Installation of Soft Ware in to Computer
2. Practice Function Keys
3. Practice to Draw Straight line using Polar coordinate system
4. Setup drawing area using CAD soft ware
5. Draw a line with line command
6. Create layer and Border
7. Create a layer for title block
8. Create a title block
9. Practice for Plating a drawing on Platter or Printer
10. Begin a New Drawing
11. Draw a angle line
12. Practice with Undo and Redo command
13. Draw a circle
14. Draw a Pentagon
AIM: To develop the knowledge of modern foundry, selection of different materials, core making and casting.

COURSE CONTENT

1. **FOUNDROY SANDS.**
   1.1 Chemical composition of common sands
   1.2 Classifications of sands with respect to grain shape (round, sub-angular, angular and compound)
   1.3 Effects of grain shapes on the properties of moulding sands
   1.4 Classifications of sands with respect to grain size (very coarse, medium, fine, very fine /slit.
   1.5 Effects of grains size on the properties of sands.

2. **CLAY.**
   2.1 Definition of clay
   2.2 Common clay (montmorillonite / western bentonite)
   2.3 Composition, refractoriness, swelling due to water, shrinkage due to loss of water
   2.4 Composition of kaolinite (fire clay) refractoriness, swelling, due to water shrinkage due to loss of water.
   2.5 Effects of clay grain size.
   2.6 Effects of clay contents on the properties of moulding sands.

3. **WATER.**
   3.1 Effects of water percentage on the properties of moulding sands.

4. **SAND MIXTURES.**
   4.1 Sand mixtures for cast irons (thin, medium and heavy casting)
   4.2 Sand mixtures for steels (thin, medium and heavy casting)
   4.3 Sand mixtures for copper base alloys (thin, medium and heavy casting)
   4.4 Composition of sand mixtures for aluminum alloys (thin, medium and heavy casting)

5. **SURFACE DRESSING.**
   5.1 Need for dressing of moulds/cores
   5.2 Water base coatings (for cast iron, steel, Al, brass)
   5.3 Spirit base coatings (for cast iron, steel, Al, brass)

6. **SKELETON MOULDING.**
   6.1 Definition
   6.2 Pattern and accessories
   6.3 Construction of mould.
7. SWEEP MOULDING.  2 Hrs
   7.2 Definition
   7.3 Pattern and accessories
   7.4 Construction of mould

8. SHELL MOULDING.  3 Hrs
   8.1 Definition
   8.2 Pattern
   8.3 Moulding materials
   8.4 Parting and dressing materials
   8.5 Procedure for construction
   8.6 Advantages and disadvantages

9. INVESTMENT CASTING (LOST WAX).  3 Hrs
   9.1 Definition
   9.2 Preparation of wax pattern
   9.3 Construction of mould
   9.4 Preheating of mould
   9.5 Pouring
   9.6 Advantages and disadvantages

10. DIE CASTING.  6 Hrs
    10.1 Definition
    10.2 Gravity die casting
    10.3 Pressure die casting
       10.3.1 Cold Chamber pressure die casting
       10.3.2 Hot Chamber pressure die casting

11. CORE MAKING.  7 Hrs
    11.1 General properties of core sands
    11.2 Core sand ingredients (linseed oil, pitch, synthetic resins, dextrine, corn flour)
    11.3 Core sand mixtures and their baking temperatures (light and heavy castings of grey iron, steel, aluminum and other non-ferrous alloys)
    11.4 Hand core making
    11.5 Core reinforcement
    11.6 Core venting (vent wire, wax thread, piping)
    11.7 Core dressing mixtures
    11.8 Baking of cores
    11.9 Gluing the cores
    11.10 Matching and sizing of cores
    11.11 Placement of cores

12. SOLIDIFICATION.  6 Hrs
    12.1 Solidification of pure metals
    12.2 Solidification of alloys
    12.3 Shrinkage during solidification
13. GATING AND RISERING. 2 Hrs

13.1 Definition
13.2 Parts of gating system
13.3 Types of gating system
13.3.1 Top gates (pop gate, wedge gate, finger gate)
13.3.2 Parting lines gates (skin bob, relief sprue gate, whirl gate, branch gate)
13.3.3 Bottom gates (vertical bottom gate, horn gate, bottom gate with slag trap)
13.4 Risers /feeders
13.5 Chills
13.6 Ratio between sprue, runner, and its gates for ferrous and non ferrous metals

13. CUPOLA FURNACE 8 Hrs

14.1 Acidic lining materials
14.2 Basic Lining material
14.3 Shapes of the bricks and blocks
14.4 Knocking out slag
14.5 Patching mixture
14.6 Patching tool
14.7 Operation of cupola
14.8 Charges of Cupola
14.9 Sand bed
14.10 Coke bed
14.11 Shooting
14.12 Melting
14.13 Tapping
14.14 Staging
14.15 Precautions

15. QUALITY CONTROL. 10 Hrs

15.1 Chemical Analysis
15.2 Visual inspection
15.3 Dimensional inspection / gauging
15.4 Pressure test
15.5 Non-Destructive Testing
15.5.1 Magnetic particle inspection
15.5.2 Ultrasonic inspection
15.5.3 Radiographic inspection
15.6 Destructive Testing
15.6.1 Hardness Testing
15.6.2 Tensile Testing
15.6.3 Compression test
15.6.4 Impact testing

REFERENCE BOOK:
1. Foundry Practical by William H. Salmon & Eric N Simon
2. Foundry Technology by Dr. Fazal Karim
6. Pressure Die Casting by DF Allsop and D Kennedy.
7. Pressure Die Casting by B Upton.
8. Principle of the Shell Process Cast Metals Technology Series AFS.
FP-212        FOUNDRY MATTER-II

INSTRUCTIONAL OBJECTIVE.

1. UNDERSTAND THE EFFECTS OF SIZES AND SHAPES OF FOUNDRY SANDS GRAIN ON THE MOULDING SAND PROPERTIES.
   1.1 State the chemical composition of moulding sand
   1.2 Classify the sand according to grain shape
   1.3 Describe the effects of sand grain shape and size
   1.4 Explain the effects of sand grain size on the properties of moulding sand

2. UNDERSTAND THE EFFECTS OF CLAY CONTENTS ON THE PROPERTIES OF MOULDING SAND.
   2.1 Define the clay
   2.2 List common clays added to moulding sand
   2.3 State the effects of clay on the properties of moulding sand
   2.4 State the effects of kaolinite (fire clay) on the properties of moulding sand
   2.5 Explain the effects of particle size

3. KNOW THE EFFECTS OF WATER ON THE PROPERTIES OF MOULDING SAND.
   3.1 State the effects of water on the properties of moulding sand
   3.2 State %age of water in moulding sand

4. KNOW THE SAND MIXTURES FOR DIFFERENT METALS
   4.1 State the compositions for thin, medium and heavy castings of cast iron
   4.2 State the compositions for thin, medium and heavy castings of steel
   4.3 State the compositions for thin, medium and heavy castings of copper base alloys
   4.4 State the compositions for thin, medium and heavy castings of Aluminium
   4.5 State the mixing cycle of sand mixture

5. UNDERSTAND THE SURFACE DRESSINGS.
   5.1 Describe the needs of surface dressing of mould and core
   5.2 List water base coatings for cast iron, steel, aluminium and brass alloys
   5.3 Explain the sprit base coatings for cast iron, steel, aluminium and brass alloys

6. UNDERSTAND MOULDING OF SKELETON PATTERN.
   6.1 Define skeleton pattern
   6.2 Explain the pattern & accessories required
   6.3 Describe the procedure for construction of mould

7. UNDERSTAND THE SWEEP MOULDING PROCESS.
   7.1 Define sweep moulding
   7.2 Explain sweep pattern and accessories
   7.3 Describe the procedure for mould construction

8. UNDERSTAND THE SHELL MOULDING PROCESS.
   8.1 Define shell moulding
   8.2 Explain pattern and material
   8.3 List the parting and dressing material
8.4 Describe the procedure for the construction of mould

9. **UNDERSTAND THE INVESTMENT CASTING PROCESS.**
   9.1 Define the investment casting
   9.2 Describe the procedure for construction of pattern
   9.3 Describe the procedure for the construction of mould
   9.4 Explain the facing of mould
   9.5 List the advantages and disadvantages

10. **UNDERSTAND THE DIE CASTING PROCESS.**
    10.1 Define die casting
    10.2 Explain gravity die casting procedure
    10.3 Define cold chamber die casting
    10.4 Explain working of the machine
    10.5 Enlist advantages & disadvantages

11. **UNDERSTAND THE CORE SAND AND CORE MAKING PROCESS.**
    11.1 Explain the properties of core sand
    11.2 List the ingredients of core sand
    11.3 List the core sand mixture, and their backing temperature for gray iron, light and heavy castings for steel light and heavy castings for aluminium and non-ferrous alloys
    11.4 Describe process of hand core making
    11.5 Explain the core reinforcement
    11.6 Explain core venting
    11.7 State the core dressing mixtures
    11.8 State the gluing of core parts together
    11.9 State and sizing of the core
    11.10 Describe placement of cores in the moulds with the help of chaplets

12. **UNDERSTAND THE SOLIDIFICATION PROCESS.**
    12.1 Define feeding
    12.2 State the progressive solidification of molten metal
    12.3 Distinguish liquid shrinkage, semi liquid shrinkage and solid shrinkage
    12.4 State the defects due to improper solidification (i.e., cavity, piping, porosity)
    12.5 Identify the method to control the improper solidification in moulds
    12.6 Define gates, risers, feeders, chills, and denser
    12.7 Determine ratio between sprue, runner, & in-gate

13. **UNDERSTAND THE TYPES OF GATING SYSTEM.**
    13.1 Differentiate between gate and riser
    13.2 List parts of gating system
    13.3 Distinguish among three classes of gating system
    13.4 Describe types of top gates i.e. pop gate, wedge gate, ring gate and sand finger gate
    13.5 Explain the following terminology, skim pop, relief sprue gate, hire gate, branch gate, strainer core, splash core
13.6 Classify bottom gates and distinguish among them i.e. vertical bottom gate horn Gate, bottom gate with slag trap

14. UNDERSTAND THE WORKING OF CUPOLA.
14.1 State the proper use of acidic & basic refractory lining
14.2 Explain the process of knocking out slag, patching mixtures and punching tools
14.3 Explain operation of cupola & charge of Cupola
14.4 Determine and state sand bed, coke bed, soaking, making, tapping, slagging and drop of cupola charge
14.6 Describe the precautions to be observed during charging of cupola

15. KNOW DESTRUCTIVE & NON-DESTRUCTIVE TEST.
15.1 State the following non-destructive tests, visual, dimensional, pressure test, magnetic particle inspection, ultra sonic inspection, and radio graphic inspection
15.2 Define destructive methods of testing i.e. tensile, compressive, Impact test
15.3 State chemical analysis
### FP-221 TOOLS AND EQUIPMENTS-II

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**AIM:** Understand working of different Furnaces Operations various machine tools for Furnaces of castings.

**COURSE CONTENTS:**

1. **MACHINE MOULDING.**
   - **6 Hrs**
     - 1.1 Operations involved in the construction of sand mould by hand
     - 1.2 Operation performed by machine in the construction of sand mould
     - 1.3 Comparison between hand and machine moulding
     - 1.4 Types of moulding machines
       - 1.4.1 Jolting machine
       - 1.4.2 Squeezing Machining
       - 1.4.3 Jolting and Squeezing machine
       - 1.4.4 Diaphragm moulding machine
     - 1.5 Jolt Squeeze stripper
     - 1.6 Jolt roll over pattern draw
     - 1.7 Jolt Squeeze roll over
     - 1.8 Sand stringer

2. **CORE MAKING MACHINES.**
   - **3 Hrs**
     - 2.1 Core blowing machine
     - 2.2 Core extracting machine
     - 2.3 Moulding machine employed for core making

3. **CORE BAKING OVENS.**
   - **3 Hrs**
     - 3.1 Heating media for core baking ovens (oil, gas, electricity)
     - 3.2 Types of ovens (Batch type, continuous drier type, dielectric core oven)

4. **SPECIAL TYPES OF CUPOLA.**
   - **5 Hrs**
     - 4.1 Hot Blast Cupola
       - 4.1.1 Construction
       - 4.1.2 Working
       - 4.1.3 Advantages
     - 4.2 Basic Cupola
       - 4.2.1 Construction
       - 4.2.2 Working
       - 4.2.3 Advantages
     - 4.3 Oxygen Enriched Cupola
       - 4.3.1 Construction
       - 4.3.2 Working
       - 4.3.3 Advantages
5. **LADLES AND CRUCIBLES.**  
5.1 Types of Ladles and their construction  
5.1.1 Lip Ladle  
5.1.2 Monorail Ladle  
5.1.3 Tea-pot Ladle  
5.1.4 Mixing Ladle  
5.1.5 Bottom pouring Ladle  
5.2 Number and holding capacity of crucible  
5.3 Care and maintenance of Crucibles

6. **FETTLING OPERATIONS.**  
6.1 Chipping  
6.1.1 Purpose of chipping operation  
6.1.2 Tools used for chipping operation  
6.2 Parting off  
6.2.1 Purpose of parting off operation, tools used for parting off operation (power saw, hand saw, gas touch cut-off wheels)  
6.3 Shake out of Castings

7. **SURFACE CLEANING.**  
7.1 Tools used for surface cleaning  
7.1.1 Tumbling barrel  
7.1.2 Sand blasting  
7.1.3 Short blasting  
7.1.4 Hydro blasting

8. **SAND TESTING EQUIPMENTS.**  
8.1 Sand sampling  
8.2 Green sand mould hardness tester  
8.3 Laboratory balance  
8.4 Moisture testing (by baking oven, infra red moisture teller, speedy moisture teller, electrical conductivity moisture tester)  
8.5 Specimen sand rammer  
8.6 Permeability meter  
8.7 Universal sand testing machine  
8.8 Rapid sand washer for clay content  
8.9 Laboratory sieves
INSTRUCTONAL OBJECTIVES.

1. UNDERSTAND THE MOULDING MACHINE.
   1.1 Recall the operations performed by hand moulding
   1.2 State operation performed by sand moulding machines
   1.3 Compare hand and machine moulding
   1.4 Enlist the types of moulding machines
   1.5 Describe moulding machines, i.e. jolt machine, squeezer machine, jolt squeeze machine, diaphragm, moulding machine, stripper – plate, jolt squeeze roll over machine and sand stringer
   Compare moulding principle of jolt, squeeze and sand stinger machines

2. UNDERSTAND CORE MAKING MACHINE.
   2.1 List core making machine
   2.2 Describe core blowing machine
   2.3 Explain core extracting machine
   2.4 Explain moulding machines employed for core making

3. KNOW CORE BAKING OVENS.
   3.1 State heating media for core baking ovens (i.e. oil, gas, electricity)
   3.2 Describe batch type, continuous type, drier type, dielectric core oven)

4. UNDERSTAND THE SPECIAL TYPES OF CUPOLA.
   4.1 Draw sketches of special types of cupola (basic, hot blast and oxygen enrich)
   4.2 Describe each main part of cupola
   4.3 Explain working principles of each
   4.4 Explain operational procedures of each cupola
   4.5 Compare advantages and limitations of each

5. UNDERSTAND LADLES AND CRUCIBLES.
   5.1 List the types of ladles
   5.2 Sketch lip pour ladle hand monorail, bull, tea pot, and mixing ladle and bottom pour ladle
   5.3 Describe the construction of lip pour and bottom pour ladles
   5.4 Describe the relationship between number and holding capacity of crucibles
   5.5 State care and maintenance of crucibles

6. UNDERSTAND FETTLING OPERATIONS.
   6.1 List methods of fatling
   6.2 Define technical terms
   6.3 Select tools and equipment required for fatling operations
   6.4 Explain the purpose of fatling operation
7. UNDERSTAND SURFACE CLEANING.
   7.1 State the uses of surface cleaning tools
   7.2 Describe tumbling barrel
   7.3 Compare Sand, shot and hydro blasting

8. UNDERSTAND THE OPERATION OF SAND TESTING EQUIPMENT.
   8.1 List equipment needed for testing foundry sand
   8.2 Explain the stages of preparation of sand samples for each test
   8.3 Demonstrate the procedure to perform each test
   8.4 State precautions to be observed during testing of sand specimens for quality Control

REFERENCE BOOKS:
   1. Casting and forming processes in manufacturing by James S. Campbell
   2. Foundry Practice by William H. Eric N. Simon
FP-232 METALLURGY-II

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Prerequisite: Basic knowledge of Metals and their Treatment.

AIMS: The Students 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 alloys

COURSE CONTENTS:

1. **METALLURGY OF COPPER.** 4 Hrs
   1.1 Copper ores
   1.2 Extraction of Copper from its ores
   1.3 Grades of copper
   1.4 Properties of Copper
   1.5 Uses of Copper
   1.6 Effects of impurities in Copper

2. **BRASSES.** 6 Hrs
   2.1 Composition of brasses
   2.2 Mechanical properties of brasses
   2.3 Preparation of Brasses
   2.4 Common use of Brasses

3. **BRONZES** 4 Hrs
   3.1 Composition of various bronzes
   3.2 Mechanical properties of brasses
   3.3 Common uses of bronzes

4. **COPPER NICKEL ALLOYS.** 4 Hrs
   4.1 Composition of copper nickel alloys
   4.2 Uses of copper nickel alloys
   4.3 Properties of copper nickel alloys

5. **METTALURGY OF ALUMINIUM.** 5 Hrs
   5.1 Aluminium Ores
   5.2 Extraction of aluminum (Electrolytic process)
   5.3 Properties of aluminium
   5.4 Uses of aluminium
6. ALUMINIUM BASE ALLOYS. 10 Hrs
   6.1 Wrought alloys of aluminium
   6.2 Classification of aluminum wrought alloys
   6.2.1 Heat treatable aluminum wrought alloys
   6.2.2 Non Heat treatable aluminum wrought alloys
   6.3 Cast alloys of aluminum
   6.3.1 Heat treatable cast aluminum alloys
   6.2.2 Non Heat treatable cast aluminum alloys

7. METALLURGY OF ZINC. 3 Hrs
   7.1 Properties and uses of zinc and its alloys
   7.2 Die casting alloys, their composition and uses
   7.3 Sand casting alloys, their composition and uses

8. METALLURGY OF LEAD. 3 Hrs
   8.1 Properties and uses of lead
   8.2 Lead alloys

9. METALLURGY OF NICKEL AND CHROMIUM. 5 Hrs
   9.1 Properties and uses of nickel alloys
   9.2 Properties and uses of chromium alloys

10. CAST IRONS 8 Hrs
    10.1 Types of cast irons (grey, white, malleable, nodular cast iron)
    10.2 Description and properties of each type
    10.4 Effects of Si, S, Mn, P and C on the properties of Cast Irons

11. ALLOY STEELS. 12 Hrs
    11.1 Purpose of alloying
    11.2 Specific effects of alloying elements (Chromium, Nickel, Manganese, Silicon, Molybdenum, Vanadium, Tungsten and Cobalt)
    11.3 Types of Steels
    11.4 Free cutting steels
    11.5 Heat resisting steels
    11.6 Corrosion resistant steels
    11.7 Tool steels
    11.8 Stellites
    11.9 Austenitic Stainless steels
    11.10 Ferretic stainless steels
    11.11 Martensitic stainless steels
OBJECTIVES:

1. **UNDERSTAND THE METALLURGY OF COPPER.**
   1.1 Write and explain the Copper ores
   1.2 Explain the extraction of Copper from its ores
   1.3 Enlist the Grades of copper
   1.4 Properties of Copper
   1.5 Uses of Copper
   1.6 Effects of impurities in Copper

2. **KNOW ABOUT BRASSES SPECIFIC OBJECTS.**
   2.1 Describe composition of brasses
   2.2 Enlist mechanical properties of brass
   2.3 State the method of preparation of brass
   2.4 State uses of brass

3. **KNOW ABOUT TIN BRONZES.**
   3.1 State composition of tin bronzes
   3.2 Enlist mechanical properties of bronzes
   3.3 State the uses of bronzes

4. **KNOW ABOUT THE COPPER NICKEL ALLOYS.**
   4.1 State composition of copper nickel alloys
   4.2 Enlist various uses of copper nickel alloys

5. **UNDERSTAND THE METALLURGY OF ALUMINIUM.**
   5.1 Enlist different aluminium ores
   5.2 Explain the electrolytic process of aluminium extraction
   5.3 Enlist mechanical properties
   5.4 State uses of aluminium

6. **UNDERSTAND THE ALUMINIUM BASE ALLOYS.**
   6.1 State wrought alloys of aluminium
   6.2 Explain annealing of aluminium alloys
   6.3 Explain non heat treated casting alloys
   6.4 Explain heat treated casting alloys

7. **METALLURGY OF ZINC.**
   7.1 State properties and uses of zinc and its alloys
   7.2 Explain die casting alloys, their composition and uses
   7.3 Explain sand casting alloys, their composition and uses

8. **METALLURGY OF LEAD.**
   8.1 State the properties and uses of lead
   8.2 Explain lead alloys

9. **METALLURGY OF NICKEL AND CHROMIUM.**
   9.1 Properties and uses of nickel alloys
10. **CAST IRONS**
   10.1 Identify of cast irons (grey, white, malleable, nodular cast iron)
   10.2 Description and properties of each type
   10.4 Effects of Si, S, Mn, P and C on the properties of Cast Irons

11. **IDENTIFY DIFFERENT ALLOYS STEEL.**
   11.1 Identify the purpose of alloying elements
   11.2 Describe the effects of alloying elements
   11.3 Outline corrosion resistant steel
   11.4 Describe free cutting steel
   11.5 Describe heat resistant steel
   11.6 Describe free cutting steel

**BOOKS RECOMMENDED:**
1. Introduction to Physical Metallurgy By Sidney H. Avner
2. Principles of Metal casting by HEINE and Rosenthal
3. Elementary Metallurgy and Metallography by Arthus M. Sharager
4. Process and Physical metallurgy by James E. Arside
6. Basic Metallurgy –II (Principles of production metallurgy for non ferrous castings) by Clyde B.Jenni. American Foundrymen’s Society
7. Basic Metallurgy –II (Principles of physical metallurgy for ferrous castings) by Clyde B.Jenni. American Foundrymen’s Society
FP-242 PATTERN MAKING-II

Total Contact hours: 

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AIM: Knowledge of pattern layout construction of pattern with different material develop the skill to use the different types of machinery for construction of pattern

COURSE CONTENTS:

1. **DISEASES OF TIMBER.** 6 Hrs
   - 1.1 Decay
   - 1.2 Wet Rot
   - 1.3 Dry Rot
   - 1.4 Piethora
   - 1.5 Drowsiness

2. **ABRASIVE.** 4 Hrs
   - 2.1 Sand paper
   - 2.2 Emery paper
   - 2.3 Glass paper
   - 2.4 Surface sanding

3. **GLUING TECHNIQUE.** 3 Hrs
   - 3.1 Lamination Gluing
   - 3.2 Paper Gluing
   - 3.3 Segment Gluing

4. **BOSSES AND WEBS.** 3 Hrs
   - 4.1 Description
   - 4.2 Preparation
   - 4.3 Uses

5. **WOOD FASTENERS.** 4 Hrs
   - 5.1 Nail
   - 5.2 Wood Screw
   - 5.3 Nuts and Bolts
   - 5.4 Hinges
   - 5.5 Butt Hinges
   - 5.6 Lift off Butt hinges
   - 5.7 Continuous hinges

6. **WOOD PRODUCTS.** 8 Hrs
   - 6.1 Vencers
   - 6.2 Ply wood
   - 6.3 Hard wood
6.4 Soft wood
6.5 Chip board
6.6 Laminated board

7. POLISH. 8 Hrs
7.1 Split polish
7.2 Wax polish
7.3 Lacquer polish
7.4 Varnish

8. USE OF METAL ON WOODEN PATTERNS. 4 Hrs
8.1 Pacing wood patterns and core boxes with metal piece
8.2 Metals loose piece
8.3 Metals section

9. METAL PATTERN MAKING. 4 Hrs
9.1 Metals used for pattern and core boxes
9.2 Tools used in Metallic Patterns
9.2.1 Hand tools
9.2.2 Twist drill
9.2.3 Tapped holes
9.2.4 Set screw / wood screw
9.2.5 Dowels
9.2.6 Machines for metal pattern making

10. SETTING UP METHODS AND PATTERN CHECKING. 4 Hrs
10.1 Setting up methods
10.2 Setting angles
10.3 Compound levels
10.4 Pattern checking

11. MASTER PATTERN. 4 Hrs
11.1 Allowances added
11.2 Layout
11.3 Uses

12. PLASTER PATTERN. 2 Hrs
12.1 Tools used
12.2 Preparation
12.3 Uses

13. PATTERN FOR LOAM MOULDING. 2 Hrs
13.1 Materials
13.2 Construction
13.3 Uses

14. POLYSTYRENE PATTERNS. 2 Hrs
14.1 Moulds for plastic pattern
14.2 Hardening and curing
14.3 Reinforcing with glass cloth lamination
14.4 Chill pattern
14.5 Polystyrene pattern

15. **CORE BOXES.** 6 Hrs
15.1 Construction of core boxes
15.2 Plastic core boxes
15.3 Repairs
15.4 Modifications

**BOOKS RECOMMENDED:**
1. Advanced Pattern making by L.L. Cox.
3. Expendable Pattern Casting by Raymond W. Monore by AFS.
INSTRUCTIONAL OBJECTIVES.

1. **UNDERSTAND DISEASES OF TIMBER.**
   1.1 Define diseases of timber (decay, wet, rot, dry rot)
   1.2 Describe decay
   1.3 State wet rot
   1.4 Distinguish between dry rot, wet rot, and plethora
   1.5 Describe precaution against timber diseases

2. **UNDERSTAND ABRASIVE.**
   2.1 Define abrasive
   2.2 List the name of the abrasive material
   2.3 Describe emery paper
   2.4 Explain the uses of glass and glass paper
   2.5 State the sanding procedure

3. **UNDERSTAND THE GLUING TECHNIQUE.**
   3.1 Describe lamination gluing
   3.2 State paper gluing
   3.3 Select direction
   3.4 Define segment
   3.5 Explain the gluing technique of segment
   3.6 State the uses of segment

4. **UNDERSTAND ABOUT BOSSES AND WEBS.**
   4.1 Describe the bosses and webs
   4.2 Determine sizes of boss and webs
   4.3 Explain the uses

5. **UNDERSTAND THE WOOD FASTENERS.**
   5.1 Define various type of wood fastener
   5.2 List kinds of nails
   5.3 State the various type of wood screen
   5.4 Distinguish between nail and screen
   5.5 Explain the sizes of wood screen
   5.6 Discuss nuts and bolts
   5.7 State examples of the use of nuts and bolts
   5.8 State the various types of hinges
   5.9 Draw a neck sketch of “Butt” hinges
   5.10 State uses for continuous hinges
6. **UNDERSTAND THE WOOD PRODUCTION.**
   6.1 Define wood veneers
   6.2 State the manufacturing methods of veneer
   6.3 State plywood and hard board
   6.4 Describe examples of the use of ply wood
   6.5 Explain the manufacturing process of soft board
   6.6 Describe the uses of chips board
   6.7 Describe the uses of laminated board

7. **UNDERSTAND USE OF METAL WOODEN PAT AND ABOUT POLISH.**
   7.1 Describe various types of polish
   7.2 State procedure of making sprit
   7.3 Explain lacquer polish
   7.4 Distinguish between lacquers polish and sprit polish
   7.5 State procedure of preparing varnish
   7.6 State procedure of preparing varnish
   7.7 Give example of the use of varnish

8. **USE OF METAL ON WOODEN PATTERN.**
   8.1 Write facing wooden pattern and core boxes with metal
   8.2 Describe the metal loose piece
   8.3 Explain metal sections
   8.4 Describe securing of metal section on pattern face

9. **METAL PATTERN MAKING.**
   9.1 Define metal pattern
   9.2 Enlist metal use in pattern
   9.3 Enlist various type of tool used in metal pattern
   9.4 State use of twist drill
   9.5 Describe tapped holes
   9.6 Describe about set screws / wood screws
   9.7 Describe write the use of dowels
   9.8 Describe machines used for metal pattern

10. **UNDERSTAND THE SETTING UP METHODS AND PATTERN CHECKING.**
    10.1 Define the master pattern and pattern
    10.2 Describe examples in use of setting angles
    10.3 State compound angles
    10.4 Express the procedure of pattern checking

11. **UNDERSTAND THE MASTER PATTERN.**
    11.1 Distinguish the master pattern and pattern
    11.2 Specify procedure for adding allowance
    11.3 Repair layout

12. **UNDERSTAND THE PLASTER PATTERN.**
    12.1 Name the tools used in plaster pattern making
    12.2 Describe examples of the use of plaster pattern
    12.3 Explain the procedure for making plaster pattern
13. UNDERSTAND PATTERN FOR LOAM MOULDING.
   13.1 Write the material used in pattern for loam moulding
   13.2 Explain the construction of pattern for loam moulding
   13.3 Describe the example of the use of loam moulding

14. UNDERSTAND THE POLYSTYRENE PATTERN.
   14.1 Describe moulds used for plastic pattern
   14.2 Explain handling and curing of plastic making
   14.3 Describe reinforcing with glass cloth lamination
   14.4 Explain chill pattern
   14.5 Describe polystyrene pattern

15. UNDERSTAND THE CONSTRUCTION OF CORE BOXES.
   15.1 Describe construction of the core box
   15.2 State method of making plastic core box
   15.3 Describe steps of repairs of core box
   15.4 Suggest modification of the core box
Total Contact Hours:  
Practical: 672  

COURSE CONTENTS:

Unit-1  Moulding (Hand)
Unit-2  Machine Moulding
Unit-3  Core Making
Unit-4  Cupola (Ferrous Melting)
Unit-5  Charge Making (Non-Ferrous Melting)
Unit-6  Laboratory
Unit-7  Pattern Making
Unit-8  Manufacturing Engineering & Technology

UNIT-1  MOULDING.
Green sand / Dry sand moulding
Blacking of Moulds

UNIT-2  MACHINE MOULDING.
Green sand / Dry sand moulding

UNIT-3  CORE MAKING.
Making cores of all Practical sizes, use of oil-sand
Daubing, Pasting and Blacking

UNIT-4  CUPOLA (FERROUS MELTING).
Cupola Repair
Ladle repair
Cupola melting and tapping of metal
To prepare charge for Cupola

UNIT-5  CHARGE CALCULATION (NON-FERROUS MELTING).
Melting of Aluminum and Copper alloys
Use of Fluxes
Use of degassers
Modification
Use of grain refiners

UNIT-6  LABORATORY
Electronic Balance
Rammer device for sand sample preparation.
Universal sand testing machine
Permeability Tester
Infrared Dryer
Hardness Tester
Laboratory Sifter
Swirler
Miscellaneous Lab. Apparatus
Methylene blue tester
Sand Muller capacity up to 10Kg
Sand mixer
Pyrometer

UNIT-7  PATTERN MAKING

PE-1  Cope
PE-2  Cylinder
PE-3  Scribe
PE-4  Scribing block
PE-5  Knob
PE-6  Depth gauge
PE-7  Face Plate
PE-8  Marking gauge
PE-9  Angle Plate
PE-10 Anvil

UNIT-8  MANUFACTURING ENGINEERING & TECHNOLOGY.

PE-1  What is manufacturing.
PE-2  The Design process and Concurrent Engineering.
PE-3  Design for Manufacturing and assembly.
PE-4  Selecting Materials.
PE-5  Selecting Manufacturing Processes.
PE-6  Computer Integrated Manufacturing.
PE-7  Quality Assurance and Total Quality Management.

WELDING
PE-8  Different types of Welds

SURFACE TECHNOLOGY
PE-9  Heat Treatment
PE-10 Corrosion Protection
PE-11 Surface Finishing

MODERN MACHINING TECHNOLOGY
PE-12 Basic Procedure of CNC machines

Reference Books:  ASM Hand Book “Casting”
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لا يجوز لأي مسلم سماح بتحريضه أو تشجيعه على الجريمة، ولا يجوز لأي مسلم تحميل نفسيه على أن يكون مسؤولاً عن جريمة أخرى.

الإنسان في الإسلام عبارة عن إنسان مخلوق ومخلوق، ومشارك في الدورة الخلقية، وليس له الحق في ممارسة أي نشاط يكره عليه الفطرة، ولا يحق له أن يحث على فعل أي نشاط يكره عليه الفطرة.

الإنسان في الإسلام مخلوق ومشارك في الدورة الخلقية، وليس له الحق في ممارسة أي نشاط يكره عليه الفطرة، ولا يحق له أن يحث على فعل أي نشاط يكره عليه الفطرة.
تدرس مقاصد

قرآن الكريم

المحترم مختصر سورتين اور آیات کي روشنی میں اسلام کے بیانی مقاصد اور عملات علی کے

قصوتوں میں محتویات: غلام طبر اور خدا یہویا گاکر

سورة الافق: ۳۸ آیات، سورة التجزیء: ۳۸ آیات

اور سورة اہلسunnah: ۳۸ آیات

طلاع طبر یور کی تفصیلات کے

رب بالائیں صرف اخلاق کے

الله تعالیٰ قسیمے کے

تیمور کے دین پر بیشتر اطلاع کی ہوگی

اور استحکام کا حکمران صرف اطلاع

طلاع طبر یور کی تفصیلات کے

الله تعالیٰ بہ خوشی سے یک بھی

اور پر اخلاق کے حکمران بھی

خدا کے ساتھ حسین کی اخلاق یہہ

قرآن کی نیا اخلاق: پر اخلاق اسلامی صرف

اسی کے جنگ کی اخلاق پر اخلاق اسلامی صرف

کر شکر طبر کے

اللہ تعالیٰ کا ساطیا منی، اس کا کسی شرک

تحقیق اصولیت

مخصوص مقصد: اصولیت کی روشنی میں اسلامی تعلیمات کے

اصولیت کا تزیدہ یوں کے
حقوق وفرائض

عمور: متعدد اسلامی مشترک کا اپنی اچھی فروظی کے

نما انداز کے فوائد و فوائض بیان کر کے

اسلام میں حقوق و فوائد اسلامی صورت میں لے لیا جانے والے طالب علم کی آمد سے ہے۔

احصائی اقدار

عمور متین: طالب علم بلد کے کاگز کی تعلیم کا تخمینہ جس اطلاعی سے معین شدہ ہے

نما انداز کے مبین حقوق اور فوائذ کو بیان کر کے

اسلام میں حقوق کو لیے بیان کر کے

قرآن و حدیث کی روشنی میں بھی استحکام کی ادائیت دیا جانے کے

اسلام میں حقوق و فوائذ کو ادائیت دیا جانے کے

الفاظہ عمدو کا ادائیت بلد کے

انحاء کے مبین حقوق کو بیان کر کے

انحاء اخلاقی کا ادائیت بلد کے

اسلام میں حقوق و فوائذ کو ادائیت دیا جانے کے

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GEN III

موضوعات

قیام پاکستان
پودری کپش
ریش کلف ایورژ
کشیدن بچلاول
تغییر بغل
سند صادر
ریست کا پت
راست طومار
کوچک
کمی مات
قرار و راه مقدم
علامہ کے پاس کلک

علماء کے پاس کلک

1956-1962 اور 1973 کے ویکٹو شاہی وحشات
پاکستان کا گل و ق Datensch پہلی جنگ انیسی کی اپیت
قدیمی و ساکل (پنجابی گیس-کونک)
مصالح پاکستان (حیدر دوست)

پیام پاکستان

تقریب معاصر

عملی معاصر: پیام پاکستان کے بھی بڑھتی سماکل سے آتفش حاصل کے اور بیان کے

خصوصی معاصر:

پاکستانی میں تفتیش اور اس کے فراش بیان کے

ریی کلف اور اس کے اہوڑے کے بارے میں بیان کے

بیگال اور اقلیت کی تفصیل کی وجوہات بیان کے

تختاب کی تفصیل کے بیان کے

مصنفین کی آمد سے بھی معاکل پہلا ہوا ہو گیا بیان کے

ریاست محمد کی تفصیل کے بارے میں بیان کے

لاست مون کی تفصیل کے بارے میں بیان کے

ضریب بالا کے نتائج کے بیان کے

قاضی و معاصر کی تفصیلات بیان کے

22 عہد کے مختلف اسلامی فکر بیان کے

پیام پاکستان کے بھی بڑھتی سماکل کی کوچون کو بیان کرکے

پیام پاکستان کے بھی بڑھتی سماکل کی تفصیلات بیان کے

پیام پاکستان کے بھی بڑھتی سماکل کی تفصیلات بیان کے

پیام پاکستان کے بھی بڑھتی سماکل کی تفصیلات بیان کے
تدریس مقاصر

نسب اعتمادات
سل سوم

مواد مقاسد

عوامی مقاسد: یہ سیریز کوی کہ لیے اصل اصل کے ساتھ بہت پروپی کل کو مرد کے
خاصی مقاسد: طالب علم اس قائل ہوگا کہ

مواد مقاسد کا مطلب بیان کے

عمالی زدگی سے متعلق ان کی نشاندگی کے
مواد مقاسد کی اثرات بیان کے

ایپ واقعیت اور معاصمے پر موذیحہ کے سیاسی اثرات پہاڑ اور ہر کے طریقہ بیان کے

شبہ ذائقہ کے ساتھ کام کے

عمل و اشارات سے اور بھی، دل اور ہی دل بیاہ ہو کے

باختی اخلاقی طور پر پیچھہ پاک کے

کارکنی کی بہت پریشانی متعال کے

کارکنوں میں اضافہ کے

باکی اخلاقی اخلاق کے استعمال کے
MGM-311 INDUSTRIAL MANAGEMENT AND HUMAN RELATION.

Total Contact Hours

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AIMS: The study of this subject will enable the student to develop the management skill Psychological approach to solve the labor problems.

COURSE CONTENTS

1. INDUSTRIAL PSYCHOLOGY. 2 Hrs
   1.1 History and definition.
   1.2 Nature and scope.

2. LEADERSHIP. 1 Hr
   2.1 Definition and types
   2.2 Qualities of a good leader

3. MOTIVATION. 2 Hrs
   3.1 Definition
   3.2 Types (Financial and non financial motives)
   3.3 Conflict of motives

4. MORALE. 1 Hr
   4.1 Importance.
   4.2 Development
   4.3 Measurement

5. HUMAN ENGINEERING. 1 Hr
   5.1 Importance of human factor in industry
   5.2 Man-machine system
   5.3 Strategy for making allocation decision

6. INDUSTRIAL FATIGUE AND BOREDOM. 2 Hrs
   6.1 Definition and destruction
   6.2 Psychology causes
   6.3 Objective causes
   6.4 Prevention

7. INDUSTRIAL ACCIDENTS. 2 Hrs
   7.1 Psychological causes
   7.2 Objective causes
   7.3 Prevention

8. INDUSTRIAL PREJUDICE. 2 Hrs
   8.1 Causes
   8.2 Remedies
9. PUBLIC RELATION. 2 Hrs
  9.1 Importance
  9.2 Functions

10. GUIDANCE AND COUNSELLING. 2 Hrs
  10.1 Importance
  10.2 Choice of Job
  10.3 During services

11. JOB EVALUATION. 2 Hrs
  11.1 Importance
  11.2 Methods
  11.3 Job satisfaction
  11.4 Work simplification

12. INDUSTRIAL MANAGEMENT. 2 Hrs
  12.1 Introduction
  12.2 Functions of management
  12.3 Subdivisions of management

13. PERSONNEL SELECTION. 2 Hrs
  13.1 Recruitment of Employees
  13.2 Training
  13.3 Effects of training on production

14. WORKING CONDITIONS. 2 Hrs
  14.1 Importance and consideration
  14.2 Effects on efficiency

15. TIME AND MOTION STUDY. 3 Hrs
  15.1 Concept and importance
  15.2 Sequence of motion study
  15.3 Principles of motion study
  15.4 Steps to time study
  15.5 Determination of operation time

16. QUALITY CONTROL. 2 Hrs
  16.1 Concept and advantages
  16.2 Methods

17. ROLE OF FOREMAN IN MANAGEMENT. 2 Hrs
  17.1 Foreman’s Ability
  17.2 Duties and functions
BOOKS RECOMMENDED:
4. Andrew R. Megill, the Process of management William M. New man
5. Richard N Omen, Management of Industrial Enterprises
INSTRUCTIONAL OBJECTIVES

At the completion of this course, the student 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 nature and scope of industrial psychology

2. **KNOW LEADERSHIP.**
   2.1 Define leadership
   2.2 Describe types of leadership
   2.3 State qualities of a good leader

3. **UNDERSTAND MOTIVATION.**
   3.1 Define motivation
   3.2 Describe financial and non financial motives
   3.3 Explain conflict of motives

4. **KNOW MORALE.**
   4.1 State importance of morale
   4.2 Describe development of morale
   4.3 State the method of measurement of morale

5. **UNDERSTAND HUMAN ENGINEERING.**
   5.1 Explain importance of human engineering in the industry
   5.2 Explain man-machine system
   5.3 Explain strategy for making allocation decisions

6. **UNDERSTAND INDUSTRIAL FATIGUE AND BOREDOM.**
   6.1 Define fatigue and boredom
   6.2 Describe psychology causes of fatigue and boredom
   6.3 Describe objective causes of fatigue and boredom
   6.4 Explain measures to prevent fatigue and boredom

7. **UNDERSTAND INDUSTRIAL ACCIDENTS.**
   7.1 Explain psychological causes of industrial accidents
   7.2 Explain objective causes of industrial accidents
   7.3 Explain measures to prevent industrial accidents

8. **UNDERSTAND INDUSTRIAL PREJUDICE.**
   8.1 Define prejudice
   8.2 Explain causes of industrial prejudice
   8.3 Explain remedies of industrial prejudice
9. **UNDERSTAND THE SIGNIFICANCE OF PUBLIC RELATIONS.**
   9.1 Explain importance of public relations
   9.2 Explain function of public relations

10. **UNDERSTAND THE NEED FOR GUIDANCE AND COUNSELLING.**
    10.1 State importance of guidance and counseling
    10.2 Explain the role of guidance and counseling in choosing the job
    10.3 Describe help of guidance and counseling during services

11. **UNDERSTAND JOB EVALUATION.**
    11.1 Explain importance of job evaluation
    11.2 Explain method of job evaluation
    11.3 Explain job satisfaction
    11.4 Explain work simplification

12. **UNDERSTAND INDUSTRIAL MANAGEMENT.**
    12.1 Define management
    12.2 State functions of management
    12.3 Enlist subdivision of management
    12.4 Explain objectives of industrial management

13. **UNDERSTAND TRAINING AND ITS EFFECTS.**
    13.1 Describe the recruitment procedure of employees in an industrial concern
    13.2 Explain training
    13.3 Identify the kinds of training
    13.4 Explain the effects of training on production and product cost

14. **UNDERSTAND THE EFFECTS OF WORKING CONDITION ON EFFICIENCY.**
    14.1 Explain importance of working condition
    14.2 Describe air-conditioning, ventilation, lighting and noise
    14.3 State the effects of good working conditions on efficiency and per unit cost

15. **UNDERSTAND TIME AND MOTION STUDY.**
    15.1 Explain the concept
    15.2 Describe the importance of work study
    15.3 Explain the sequence of motion study
    15.4 State the principles of motion study
    15.5 Describe the steps for carrying out time study
    15.6 Explain the method of determination of operation time

16. **UNDERSTAND THE METHODS OF QUALITY CONTROL.**
    16.1 Define quality control
    16.2 State advantages of quality control
    16.3 Explain methods of quality control
17. UNDERSTAND THE ROLE OF FOREMAN IN AN INDUSTRIAL UNDERTAKING.
   17.1 Explain ability of the Foeman
   17.2 Enlist duties of Foreman
   17.3 Describe functions of Foreman as middle management
AIM: To understand identification, causes and remedies of casting defects. Use of different chemicals to control the casting defects. Study of steels with respect to moulding, gating and casting techniques.

COURSE CONTENTS.

1. CASTING DEFECTS. 10 Hrs
   1.1 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)
   1.2 Causes of casting defects
   1.3 Remedies of casting defects

2. FLUXES. 4 Hrs
   2.1 Definition and purpose
   2.2 Fluxes used for Al, Cu, Zn, Brass, Grey iron and steel during melting & pouring

3. MELTING ATMOSPHERE. 10 Hrs
   3.1 Definition of furnace atmospheres, types of atmospheres (oxidizing, neutral, reducing)
   3.2 Atmosphere needed during melting of Cu, Brass, Al
   3.3 Different factors to be observed during melting to avoid absorption of gasses in Al, Cu, Brass, steel during melting
   3.4 Functions of oxidizers and De-oxidizers
   3.5 Deoxidizers for common metals
   3.6 Functions of scavengers
   3.7 Scavengers used for different metals

4. DEGASSING. 4 Hrs
   4.1 Use of Different Degassing Techniques

5. CAST IRONS. 8 Hrs
   5.1 Melting and casting of gray and SG irons
   5.2 Risering and gating system for cast irons.
   5.3 Calculation of sprues, runner, in-gate ratio
   5.4 Calculation of pouring time for gray iron and steel casting

6. HEAT TREATMENT OF CAST IRONS 6 Hrs
   6.1 Heat treatment of gray iron
   6.2 Heat treatment of SG iron
   6.3 Annealing of white cast iron to from malleable cast iron (white hearth and black hearth process)
7. CASTING OF STEELS
   7.1 Moulding methods for steel casting (dry sand mould, green sand mould, core sand, skin dry, cement bonded graphite, ceramics)
   7.2 General properties of moulding sands for steel castings
   7.3 Moulding mixtures for steel castings and their standards
   7.4 Facing materials
   7.5 Mould coatings
   7.6 Core sand mixtures for steel castings
   7.7 Gating and risering of steel castings
   7.8 Calculation of sprues, runner, in-gate ratio
   7.9 Calculation of pouring time for steel casting
   7.10 Choke area

8. SPECIAL CASTING PROCESS.
   8.1 Centrifugal casting.
   8.2 Plaster Moulds
   8.3 Investment Casting
   8.4 Slush Casting
   8.5 Shot Castings
   8.6 Ceramic Moulds
   8.7 CO₂ Process

RECOMMENDED BOOKS.

1. Principle 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 THE CASTING DEFECTS.
   1.1 Define each casting defects
   1.2 Explain the causes of each casting defects
   1.3 Describe possible remedies for each casting defects

2. UNDERSTAND FLUX USED FOR MELTING METALS.
   2.1 Define flux
   2.2 State the purpose of flux
   2.3 State the fluxes needed for Al, Cu, Zn, Brass, gray irons and steel during melting and pouring

3. UNDERSTAND FURNACE ATMOSPHERE.
   3.1 Define melting furnace atmosphere
   3.2 Distinguish oxidizing, reducing & neutral atmosphere
   3.3 State the function of oxidizer and deoxidizers
   3.4 Select the proper furnace atmosphere
   3.5 Select the function of oxidizers and Deoxidizers
   3.6 State the functions of scavenger
   3.7 Select proper scavenger for different metals

4. UNDERSTAND MELTING CONDITIONS.
   4.1 Recall different factor to be observed during melting of specific metals
   4.2 Describe gasses in Al, Cu, Brass & steel during melting

5. UNDERSTAND CAST IRON.
   5.1 Describe the types of cast iron
   5.2 State properties of each type of cast iron
   5.3 Distinguish each type to other
   5.4 State the effects of Si,, S, Mn, P and C on the properties of cast iron

6. UNDERSTAND ABOUT HEAT TREATMENT OF CAST IRON.
   6.1 Describe the functions of heat treatment
   6.2 State the types of heat treatment processes required for different cast irons
   6.3 Compare white heart and black heart →+malleable iron

7. UNDERSTAND THE MOULDING FOR STEEL CASTING.
   7.1 Describe the moulding methods for steel casting (i.e. dry sand mould, green sand mould, core sand, skin dry, cement bonded, graphite, ceramics)
   7.2 State the physical properties of moulding sand required for steel casting
   7.3 Enlist the moulding sand mixtures for steel casting and their standard
   7.4 Discuss facing material for steel casting
   7.5 Enlist mould casting (dressing) materials
   7.6 Describe core sand mixtures for steel casting
   7.7 Select the most suitable gating and rise ring for steel
7.8 Calculate and design the gating system
7.9 Calculate the ratio between sprue, runner, and in-gate ratio
7.10 Calculate the pouring time for grey iron and steel casting
7.11 Calculate choke area

8. UNDERSTAND SPECIAL CASTING PROCESSES.
8.1 Define each process
8.2 Explain procedure
8.3 State advantages and limitations.
AIM: Operating and maintain Pattern making Machines.

COURSE CONTENTS.

1. GENERAL SAFETY RULES. 1 Hr
   1.1 Lathe Machines
   1.2 Milling Machines
   1.3 Drilling Machines
   1.4 Surface planning machines
   1.5 Tool grinding machines
   1.6 CNC Wire cut machines
   1.7 CNC Milling and Lathe machines
   1.8 Band Saw machines
   1.9 Jointer machines
   1.10 Circular saw machines

2. BAND SAW MACHINE. 5 Hrs
   2.1 Construction (main parts)
   2.2 Ripping
   2.3 Cross cutting
   2.4 Tenon cutting
   2.5 Bevel and Chamfer
   2.6 Cutting speed
   2.7 Coiling of band saw blade
   2.8 Common faults and their prevention
   2.9 Sharpening of band saw blade
   2.10 Brazing of band saw blade

3. CIRCULAR SAW MACHINE. 6 Hrs
   3.1 Construction (main parts)
   3.2 Cutting with the grains and across the grain
   3.3 Miter cutting
   3.4 Grooving
   3.5 Rebutting
   3.6 Tenon
   3.7 Sharpening of circular saw blade
   3.8 Care and maintenance

4. JOINTER MACHINE. 6 Hrs
   4.1 Principle parts
   4.2 Surfacing
   4.3 Edging
   4.4 Straight edges
4.5 Bevel and chamfers
4.6 Sharpening
4.7 Adjustment of rear table
4.8 Care and maintenance

5. THICKNESS MACHINE.  
5.1 Function of main parts
5.2 Uses
5.3 Sharpening of blade
5.4 Safety precautions
5.5 Maintenance

6. WOOD TURNING LATHE.  
6.1 Function of main parts
6.2 Spindle turning
6.3 Face turning
6.4 Cylinder turning
6.5 Care and maintenance

7. WOOD TURNING CHISELS.  
7.1 Skin chisel
7.2 Parting chisel
7.3 Square Nose Chisel
7.4 Round Nose chisel
7.5 Gouges

8. LATHES ACCESSORIES.  
8.1 Dead center and live center
8.2 Universal chuck
8.3 Screw chuck
8.4 Face plate
8.5 Drill chuck

9. BORING MACHINE.  
9.1 Construction
9.2 Drilling and boring
9.3 Counter Sinking
9.4 Scalping
9.5 Cutting speed
9.6 Care and maintenance

10. SPINDLE MOULDERS.  
10.1 Function of principle parts
10.2 Shaping
10.3 Grooving
10.4 Moulding
10.5 Rabbeting
10.6 Core moulding
10.7 Safety rule
10.8 Care and Maintenance
11. **DISC SANDER/GRINDER MACHINE**  
   11.1 Main parts  
   11.2 Taper grinding  
   11.3 Bosses  
   11.4 Safety rule  
   11.5 Maintenance

12. **BELT GRINDER.**  
   12.1 Construction  
   12.2 Sanding  
   12.3 Care and maintenance

13. **TOOL GRINDER MACHINE.**  
   13.1 Main parts  
   13.2 Types  
   13.3 Uses  
   13.4 Dressing of grinding wheel

14. **CIRCULAR SAW GRINDER FOR SHARPENING CIRCULAR BLADE.**  
   14.1 Construction  
   14.2 Sharpening circular blade  
   14.3 Care and maintenance

15. **ELECTRIC PORTABLE DRILL.**  
   15.1 Main parts  
   15.2 Uses

16. **PORTABLE ROUTER.**  
   16.1 Main parts  
   16.2 Uses  
   16.3 Safety rules

17. **JIG SAW.**  
   17.1 Construction  
   17.2 Main parts  
   17.3 Uses

**BOOK RECOMMENDED:**
1. Principle of wood working by Herman H. Jorth  
2. Exploring Pattern Making and foundry by Harvey D. Muier
1. **KNOW ABOUT GENERAL SAFETY RULES.**
   1.1 State general safety rules for Pattern Making machines.
   1.2 Write safety precaution for work shop.

2. **UNDERSTAND THE OPERATION TECHNIQUE.**
   2.1 Define Band saw machine
   2.2 Write different parts of band saw machine
   2.3 Describe the function of each part
   2.4 Explain the ripping operation
   2.5 Distinguish between ripping and cross cutting operation
   2.6 Describe the tenon cutting on band saw
   2.7 State bevel and chamfer (different)
   2.8 Explain cutting speed of band saw blade
   2.9 Describe the coiling of band saw blade
   2.10 Explain common faults and their prevention of band saw blade
   2.11 Describe the sharpening of band saw blade
   2.12 State brazing of band saw blade

3. **UNDERSTAND CIRCULAR SAW.**
   3.1 Describe the main parts of circular saw
   3.2 Describe the function of each part
   3.3 Explain the procedure of cutting stock with and across the grains
   3.4 Discuss miter cutting
   3.5 Write procedure of groove cutting
   3.6 Describe rabbeting
   3.7 Explain sharpening procedure of circular saw blade
   3.8 Describe care and maintenance

4. **UNDERSTAND THE OPERATION OF JOINTER MACHINE.**
   4.1 State principle parts of the jointer machine
   4.2 State different types of jointer machine
   4.3 Describe the surface operation
   4.4 State edging operation
   4.5 Distinguish between sharpening and honing of jointer blade
   4.6 Compare bevel & chamfer
   4.7 Explain the procedure of adjustment of rear table of jointer machine
   4.8 Describe care and maintenance of jointer machine

5. **UNDERSTAND ABOUT THE OPERATION OF THICKNESS MACHINE**
   5.1 Describe main parts of thickness machine
   5.2 Explain the function of each part
   5.3 Discuss the uses of thickness machine
   5.4 Explain the procedure of sharpening of blades
   5.5 State safety precaution of thickness machine
   5.6 Describe care and maintenance
6. **UNDERSTAND WOOD TURNING LATHE.**
   6.1 Describe main parts of wood turning lathe
   6.2 Describe the function of each part
   6.3 Explain spindle turning
   6.4 Discuss face turning operation on lathe machine
   6.5 State cylinder turning operation
   6.6 Explain the care and maintenance

7. **UNDERSTAND ABOUT WOOD TURNING LATHE**
   7.1 Describe uses of gouges
   7.2 Write function of skew chisel
   7.3 Discuss uses of parting chisel
   7.4 State square nose chisel
   7.5 Explain function of round noise chisel

8. **UNDERSTAND THE LATHÉ ACCESSORIES.**
   8.1 Enlist the wood turning lathe accessories
   8.2 State live center
   8.3 Describe deal canter
   8.4 Explain universal chuck
   8.5 State screw chuck
   8.6 Describe the function of face plate
   8.7 Explain the uses of drill chuck

9. **UNDERSTAND BORING MACHINE.**
   9.1 State the main parts of boring machine
   9.2 Describe the function
   9.3 Define difference between drilling and boring.
   9.4 State the procedure of counter sinking.
   9.5 Describe shaping operation
   9.6 Explain the cutting speed of boring machine
   9.7 Describe the care and maintenance

10. **UNDERSTAND ABOUT SPINDLE MOULDER.**
    10.1 State principle part of spindle moulder
    10.2 State function of each part
    10.3 Describe shaping procedure
    10.4 State grooving
    10.5 Describe moulding procedure
    10.6 State rabbeting operation
    10.7 Describe core moulding process
    10.8 Describe necessary safety rule
    10.9 Describe care and maintenance
11. UNDERSTAND THE DISK GRINDER.
   11.1 Describe main parts of disk grinding
   11.2 Describe taper grinding
   11.3 State bosses
   11.4 Describe safety precautions of disk grinding
   11.5 Explain cares and maintenance

12. UNDERSTAND THE BELT GRINDER.
   12.1 Describe main parts
   12.2 Explain the function of each part.
   12.3 Describe the sanding procedure
   12.4 State the cares and maintenance

13. UNDERSTAND ABOUT TOOL GRINDER.
   13.1 Describe main parts
   13.2 Describe different types of tool grinding
   13.3 Explain the dressing procedure of grinding wheel

14. UNDERSTAND CIRCULAR SAW BLADE GRINDER.
   14.1 Describe construction of circular saw blade grinder
   14.2 Explain sharpening procedure of circular saw blade
   14.3 Describe cares and maintenance

15. UNDERSTAND THE ELECTRIC PORTABLE DRILL.
   15.1 State main parts
   15.2 Explain function of each part
   15.3 Describe uses of electric portable drill machine

16. UNDERSTAND THE PORTABLE ROUTER.
   16.1 Describe main parts
   16.2 State the various uses of portable router
   16.3 Explain the safety rules

17. UNDERSTAND THE JIG SAW.
   17.1 Describe construction of the machine
   17.2 Explain function of parts
   17.3 Describe uses of jig saw machine
CMFT-334  PRODUCT LAYOUT and CAD

Total contact hours:  
Theory: 96 hours  
Practical: 96 hours  

TIME DISTRIBUTION:  

AIM: To develop the skills to read different types of drawings and prepare pattern layout. Study of various symbols of Pattern layout and preparation Pattern drawing.

PART -A  

COURSE CONTENTS:

1. NEED OF LAYOUT.  (4 Hrs)  
   1.1 Layout of patterns  
   1.2 Allowances  
   1.3 Core  
   1.4 Core print  
   1.5 Colours  
   1.6 Machine allowance / Finish marks

2. LAYOUT TOOLS.  (4 Hrs)  
   2.1 Layout board  
   2.2 Shrinkage rule  
   2.3 Divider  
   2.4 Knife edge  
   2.5 Trammel points  
   2.6 Caliper rule

3. PIPE REDUCER.  (3 Hrs)  
   3.1 Core  
   3.2 Core print  
   3.3 Template  
   3.4 Core colour

4. BUSH.  (3 Hrs)  
   4.1 Self core pattern  
   4.2 Machine allowance  
   4.3 Draft  
   4.4 Segment

5. ELBOW.  (3 Hrs)  
   5.1 Core  
   5.2 Sizes of core prints  
   5.3 Flange  
   5.4 Machine provisions

6. CONICAL BUSH.  (3 Hrs)  
   6.1 Machine allowance  
   6.2 Shrinkage allowance
6.3 Core
6.4 Fitting of flange

7. PISTON.
   7.1 Cover / Hanging core
   7.2 Joints lines
   7.3 Loose piece in core

8. CORE BOX FOR PISTON CORE.
   8.1 Type of core box
   8.2 Core print
   8.3 Joints limits at the core box
   8.4 Loose pieces

9. LAG PATTERN.
   9.1 Pattern size (with allowances)
   9.2 Construction
   9.3 Core
   9.4 Size of core print

10. CORE BOX FOR LAG PATTERN.
    10.1 Types of core box
    10.2 Construction
    10.3 Allowances

11. WHEEL PATTERN.
    11.1 Size of segment determination
    11.2 Core print with ring core
    11.3 Sharp and measure for template

12. IMPELLER.
    12.1 Draft
    12.2 Core print
    12.3 Work technique
    12.4 Joints for impeller side

13. PUMP HOUSE.
    13.1 Draft
    13.2 Template for turning pattern
    13.3 Size of core print
    13.4 Colour for core
    13.5 Material thickness of pattern template

14. WATER SWIVEL.
    14.1 Segment of different dia
    14.2 Construction of pattern layout
    14.3 Template construction
    14.4 Half ring core
15. SURFACE PLATE. 3 Hrs
   15.1 Pattern lay out
   15.2 Shrinkage allowance
   15.3 Draft
   15.4 Core

PART – B       AUTO CAD

16. BASI CAD DRAWINGS TECHNIQUES 5 Hrs
   16.1 Loading the Soft Ware
   16.2 Setting the Display Format and Units
   16.3 Working with Prototype Drawings
   16.4 Coordinate System Basics

17 INTRODUCTION TO TOOL BARS 5 Hrs
   17.1 Draw tool bar
   17.2 Modify tool bar
   17.3 Layers tools bar
   17.4 Selection of objects

18 ADVANCE DRAWING TECHNIQUES 4 Hrs
   18.1 Dividing and Measuring an Object
   18.2 Drawing Rings and Ellipses
   18.3 Working with Multiline

19 LAYERS AND LINE TYPES 4 Hrs
   19.1 Working with Layers
   19.2 Understanding and Creating Line types

20 DIMENSIONING A DRAWING 4 Hrs
   20.1 Dimensioning Basics and Dimensioning with Precision
   20.2 Linear and Radial Dimensioning
   20.3 Angular Dimensioning
   20.4 Editing Dimensions

21 MODIFYING OBJECT CHARACTERISTICS 5 Hrs
   21.1 Changing Object Properties
   21.2 Extracting Information from your Drawing
22 SELECTING OBJECTS. 4 Hrs
22.1 Selecting by pointing
22.2 Removing objects
22.3 Selection with a regular window
22.4 Selection with crossing window
22.5 Selection with Polygon

23. TRIMMING & EXTRACTING. 4 Hrs
23.1 Change Command
23.2 O-snap
23.3 Rotate command
23.4 Extend command
23.5 Trimming & Circle

24. VIEWING AND PLOTTING A DRAWING 4 Hrs
24.1 Understanding the Display and Virtual Screen
24.2 Using ZOOM and PAN To Control the Display
24.3 Using the Aerial View Window and Creating Views

25. ANNOTATING A DRAWING WITH TEXT AND HATCHING 4 Hrs
25.1 Adding Text to a Drawing
25.2 Filling Areas with Hatching

26. BASIC EDITING SKILLS 5 Hrs
26.1 Deleting and Restoring Objects
26.2 Moving, Copying, and Offsetting Objects
26.3 Rotating, Mirroring, Scaling, and Stretching Objects
26.4 Editing Edges and Corners of Objects
26.5 Producing Arrays of Objects (ARRAY)

PRACTICAL LIST AUTO CAD:- 96 HRS.
1. Practice commands studied
2. Two lines and make them Horizontal with change command
3. Practice for Rotate command by moving object with in drawing
4. Practice for Breaking command for Pre drainy circle and Trim it
5. Draw a Hollow Cylinder
7. Draw Conical Bush pattern
8. Draw Pipe Reducer pattern using Auto CAD.
9. Draw a Pulley
10. Draw a wheel pattern

BOOK RECOMMENDED:

1. Exploring Pattern Making and Foundry by Harvey D. Miner
2. Advance Pattern Making by L. L. Cox
INSTRUCTIONAL OBJECTIVES:

1. **UNDERSTAND PATTERN LAYOUT.**
   1.1 Describe the need of layout
   1.2 State different allowance used in pattern layout
   1.3 Describe the various types of cores
   1.4 Explain core print
   1.5 State various Colour used in layout
   1.6 State machine allowance

2. **UNDERSTAND LAYOUT TOOLS.**
   2.1 Describe layout board
   2.2 State shrinkage rule
   2.3 Describe trammel points
   2.4 State uses of knife
   2.5 Describe uses of divider
   2.6 Explain uses of caliper rule

3. **UNDERSTAND PIPE REDUCER.**
   3.1 State template
   3.2 Explain core colour

4. **UNDERSTAND BUSH.**
   4.1 Discuss the self core pattern
   4.2 Describe machine allowance
   4.3 State draft allowance
   4.4 Explain segment construction

5. **UNDERSTAND ELBOW LAYOUT.**
   5.1 Calculate sizes of core print
   5.2 Explain Direction of wood fibers
   5.3 Explain Machine provisions

6. **UNDERSTAND CONSTRUCTION OF CONICAL BUSH.**
   6.1 State metal use for conical bush
   6.2 State shrinkage rule
   6.3 Describe machine allowance
   6.4 Collocate sizes of core
   6.5 Select fitting for flange

7. **UNDERSTAND PISTON LAYOUT.**
   7.1 Construction piston layout
   7.2 Describe hanging core
   7.3 Explain joints lines at core
   7.4 Explain loose pieces in core
8. UNDERSTAND LAYOUT FOR PISTON CORE BOX.
   8.1 State types for core boxes
   8.2 Describe proper type of core box
   8.3 Explain core print
   8.4 Explain loose pieces (shape and sizes)

9. UNDERSTAND CONSTRUCTION OF LAG PATTERN.
   9.1 Determine lag pattern construction
   9.2 Select the shape and sizes of core print for lag pattern
   9.3 Explain the sizes of core

10. UNDERSTAND THE CONSTRUCTION OF CORE BOX FOR LAG PATTERN
    10.1 State sizes and shape of core box
    10.2 Construction layout of core box
    10.3 State necessary allowance

11. UNDERSTAND WHEEL PATTERN.
    11.1 Describe direction of wood fiber for segment construction
    11.2 Determine sizes of segment
    11.3 Select core print shape and size
    11.4 Determine shape and measurement for template

12. UNDERSTAND IMPELLER LAYOUT.
    12.1 Describe draft allowance
    12.2 Determine size of core print
    12.3 Construct layout

13. UNDERSTAND PUMP HOUSE.
    13.1 Design segment with tongue
    13.2 Prepare template for turning pattern
    13.3 Determine size of core print
    13.4 Select colour for core print and pattern body

14. UNDERSTAND WATER SWIVEL LAYOUT.
    14.1 Describe designing of segment of different diameter
    14.2 State shrinkage rule
    14.3 Explain draft allowance
    14.4 Explain shape and sizes of core print

15. UNDERSTAND SURFACE PLATE LAYOUT.
    15.1 Construction pattern layout
    15.2 Determine shrinkage allowance
    15.3 Describe adding of draft in layout
    15.4 Explain shape and sizes of core
PART – B AUTO CAD

INSTRUCTIONAL OBJECTIVES

23. UNDERSTAND BASIC CAD DRAWINGS TECHNIQUES
   16.1 Loading the Software
   16.2 Setting the Display Format and Units
   16.3 Working with Prototype Drawings
   16.4 Coordinate System Basics

24. UNDERSTAND INTRODUCTION TO TOOL BARS
   17.1 Draw tool bar
   17.2 Modify tool bar
   17.3 Layers tools bar
   17.4 Selection of objects

25. UNDERSTAND ADVANCE DRAWING TECHNIQUES
   18.1 Dividing and Measuring an Object
   18.2 Drawing Rings and Ellipses
   18.3 Working with Multiline

26. UNDERSTAND LAYERS AND LINE TYPES
   19.1 Working with Layers
   19.2 Understanding and Creating Line types

27. UNDERSTAND DIMENSIONING A DRAWING
   20.1 Dimensioning Basics and Dimensioning with Precision
   20.2 Linear and Radial Dimensioning
   20.3 Angular Dimensioning
   20.4 Editing Dimensions

29. UNDERSTAND MODIFYING OBJECT CHARACTERISTICS
   21.1 Changing Object Properties
   21.2 Extracting Information from your Drawing
30  UNDERSTAND SELECTING OBJECTS.
   22.1  Selecting by pointing
   22.2  Removing objects
   22.3  Selection with a regular window
   22.4  Selection with crossing window
   22.5  Selection with Polygon

23.  UNDERSTAND TRIMMING & EXTRACTING.
   23.1  Change Command
   23.2  O-snap
   23.3  Rotate command
   23.4  Extend command
   23.6  Trimming & Circle

24.  UNDERSTAND VIEWING AND PLOTTING A DRAWING

   24.1  Understanding the Display and Virtual Screen
   24.2  Using ZOOM and PAN To Control the Display
   24.3  Using the Aerial View Window and Creating Views

25.  UNDERSTAND ANNOTATING A DRAWING WITH TEXT AND HATCHING

   25.1  Adding Text to a Drawing
   25.2  Filling Areas with Hatching

26.  UNDERSTAND BASIC EDITING SKILLS

   26.1  Deleting and Restoring Objects
   26.2  Moving, Copying, and Offsetting Objects
   26.3  Rotating, Mirroring, Scaling, and Stretching Objects
   26.4  Editing Edges and Corners of Objects
   26.5  Producing Arrays of Objects (ARRAY)
FP-342  CALCULATIONS

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COURSE CONTACT:
AIM : Designing capacities of cupola, estimating the weight of casting, designing of gating System, floating of core and lifting forces in the mould

1. ARITHMETIC. 12 Hrs
   1.1 Area of geometric figures
   1.2 Volume calculation of solids, hollow etc.
   1.3 Density of different metals
   1.4 Weight calculations of castings of different metals

2. FLUID METAL PRESSURE IN THE MOULD. 12 Hrs
   2.1 Floatation effect of metal on core
   2.2 Lifting forces on the core
   2.3 Estimation of weight of core of different sizes and shapes
   2.4 Floating forces of molten metal exerted in the mould

3. FURNACE CHARGE CALCULATIONS. 20 Hrs
   3.1 Find the percentage of each element of an alloy when weight of an individual is given.
   3.2 Find the weight of each element of an alloy when their percentage and weight of alloy is given.
   3.3 Calculate the weight of inoculates of given specification added to a ladle charge of known composition to get the required analysis of the metal to adjust the composition.
   3.4 To calculate the above charge in a cupola when there is a loss or gain of any Element during melting in the furnace.
   3.5 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.
   3.6 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 composition may be two or more than two.
   3.7 To calculate the weight of above irons when there is a loss or gain of any element during melting in the furnace.

4. CUPOLA DESIGNING FOR DIFFERENT CAPACITIES. 20 Hrs
   4.1 To estimate the size of a cupola when a specific amount of metal is required to melted per hour
   4.2 Internal diameter of cupola
   4.3 Thickness of the lining of cupola
   4.4 Shape of lining bricks/blocks
   4.5 Outer diameter of the shell of the cupola
   4.6 Approximate thickness of the shell and material
   4.7 Height of the cupola tuyers
   4.8 Number of tuyers, shape of tuyers, and size of tuyers.
   4.9 Height of cupola well
   4.10 Height of cupola slag hole.
4.11 Size and shape of slag hole
4.12 Height of the tap hole
4.13 Size and shape of the tap hole
4.14 Height of cupola shell
4.15 Capacity of the blower
4.16 Air pipe size estimation
4.17 Wind box size estimation
4.18 Height of the cupola legs
4.19 Estimation of the furnace charge (melting ratio, iron coke is given)
4.20 Weight of each coke charge layer
4.21 Size of coke lumps
4.22 Weight of each iron charge
4.23 Size of the iron charge lumps
4.24 Weight of the limestone for each charge

BOOK RECOMMENDED:
OBJECTIVES:

1. **UNDERSTAND FORMULA FOR WEIGHT ESTIMATION.**
   1.1 Calculate area of geometric figure
   1.2 Calculate volumes of solids & hollow castings
   1.3 Estimate weights of different shaped castings of different metals.

2. **UNDERSTAND THE FLOATING FORCES IN THE MOULD.**
   2.1 Define fluid metal pressure in the mould
   2.2 Define floating effect of molten metal on the core
   2.3 Discuss lifting forces on the 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 flotation effect.
   2.6 Design the cores used for cast iron, aluminium and brass.
   2.7 Explain floating forces of molten metal exerted in the mould.
   2.8 Apply governing laws (P=W x A).

3. **UNDERSTAND THE FURNACE CHARGE CALCULATION.**
   3.1 Determine percentage of each element of an alloy when weight of each element is given.
   3.2 Calculate weight of each element of an alloy when their percentage and total weight of alloy is given.
   3.3 Calculate weight of inoculates of given specification, added to a ladle charge of known composition to get required analysis of the metal to adjust the composition of more irons of different composition are added together.
   3.4 Describe composition of a charge on the spout of cupola or in a ladle when two or more iron of different composition are added.
   3.5 Calculate composition of a charge in a cupola when there is a loss or gain of any element during melting in the furnace.
   3.6 Adjust the quantity of different irons of known composition in a furnace to get the required analysis of final metal product.
   3.7 Calculate the weight of different irons to adjust the loss and gain type element.

4. **UNDERSTAND THE ASPECTS OF CUPOLA DESIGN.**
   4.1 Design the cupola for different capacities
   4.2 Calculate the internal dia, external dia of shell, thickness of lining size of bricks, thickness of outer shell.
   4.3 Calculate the height of the cupola shell, height of cupola well, height of tap hole, height of tuyers, hole, size, and shape of tuyers hole.
   4.4 Calculate the capacity of blower, estimate air pipe, and wind box sizes
   4.5 Calculate the weight of coke charge layer, weight of iron charge coke and flux
   4.6 State the proper size of coke, and iron charge lumps.
### METALLOGRAPHY AND HEAT TREATMENT

**Total Contact Hour**

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**COURSE CONTENTS:**

1. **INTRODUCTION TO MICROEXAMINATION OF THE METALS.**
   - 1.1 Macro Examination
   - 1.2 Micro Examination
   - 1.3 Sampling and Mounting
     - 1.3.1 Sampling
     - 1.3.2 Sectioning of a Sample
   - 1.4 Mounting process of a specimen
   - 1.5 Mounting materials (cold setting and hot setting)
   - 1.6 Specimen mounting press  
   - **4 Hrs**

2. **GRINDING AND POLISHING.**
   - 2.1 Rough cleaning (filling)
   - 2.2 Rough grinding (pedestal grinding)
     - 2.2.1 Polishing
     - 2.2.2 Polishing materials
   - 2.3 Types of polishing
     - 2.3.1 Mechanical polishing
     - 2.3.2 Electrolytic polishing
   - **4 Hrs**

3. **ETCHING.**
   - 3.1 Function of etching reagents
   - 3.2 Composition of etchants for different metals and alloys
     - 3.2.1 Steel
     - 3.2.2 Cast iron
     - 3.2.3 Copper and its alloys
     - 3.2.4 Aluminum alloys
   - **4 Hrs**

4. **METALLURGICAL MICROSCOPE.**
   - 4.1 Major parts
   - 4.2 Operation and working principle
   - 4.3 Magnification system
   - 4.4 Steps to adjust the microscope
   - **5 Hrs**

5. **EQUILIBRIUM DIAGRAMS.**
   - 5.1 Introduction to phase diagram
   - 5.2 Solid Solutions
   - 5.3 Types of solid solutions
     - 5.3.1 Interstitial Solid solutions
     - 5.3.2 Substitutional solid solutions
   - 5.4 Cooling curves
   - 5.4.1 Pure metals
   - 5.4.2 Alloys
   - 5.5 Define equilibrium diagram
     - 5.5.1 Equilibrium diagram for binary alloys soluble in both liquid and solid states solutions
   - **7 Hrs**
5.5.2 Equilibrium diagram for binary alloys soluble in liquids and insoluble in solid state
5.6 Construction of Iron Carbon diagram
5.7 Define Peritectic reaction
5.8 Define eutectic reactions
5.9 Define eutectoid reactions
5.10 Define ferrite, pearlite, cementite, ledubrite

6 ALLOTROPY OF IRON. 2 Hrs
6.1 Alpha iron
6.2 Delta iron
6.3 Gamma iron

7 HEAT TREATMENT. 5 Hrs
7.1 Definition of heat treatment
7.2 Objectives of heat treatment

8 HEAT TREATMENT FURNACES. 4 Hrs
8.1 Hardening furnaces
8.2 Annealing furnaces
8.3 Salt bath furnaces
8.4 Vacuum furnaces

9 CASE HARDENING. 5 Hrs
9.1 Purpose of case hardening
9.2 Carburizing
9.3 Nitriding
9.4 Cyaniding
9.5 Surface hardening
9.5.1 Flame hardening
9.5.2 Induction hardening
9.5.3 Laser hardening
9.5.4 Electron beam hardening etc

10 HEAT TREATING OPERATIONS. 4 Hrs
10.1 Stress relieving
10.2 Annealing
10.3 Normalizing
10.4 Hardening
10.5 Tempering
10.6 Austempering
10.7 Martempering
10.8 Solution heat treatment

11 INSTRUMENTS USED IN HEAT TREATMENT. 4 Hrs
11.1 Temperature measurement
11.2 Thermocouple
11.3 Optical pyrometer
11.4 Quenching apparatus and media

12 HEAT TREATMENT OF STEELS. 8 Hrs
12.1 Heat treatment of plain carbon steels
12.2 Heat treatment of spring steels
12.3 Heat treatment of tool steels
12.4 Heat treatment of heat resisting steels
12.5 Heat treatment of high speed steels
12.6 High manganese steels
12.7 High Silicon Steel
12.8 Heat treatment of stainless steel

13 HEAT TREATMENT OF NON FERROUS ALLOYS. 4 Hrs
13.1 Copper base alloys
13.2 Aluminum base alloys

14 HEAT TREATMENT OF CAST IRON. 4 Hrs
14.1 White cast iron
14.2 Grey cast iron
14.3 Malleable castings.
14.4 Nodular cast iron

Reference Books:
1. Microstructure Development During Metal Casting by John E.Gruzleski AFS.
2. Metallographic Polishing by Mechanical Method.
List of Practicals

Metallography & Heat Treatment  96 Hrs.

Metallography
1. Preparation of Specimen / Polishing of Specimen
2. Specimen Mounting
3. Etching Sample
4. Structure Study
5. Structure of C.I & Mild Steel
6. Structure of Aluminium & S.S

Heat Treatment Practicals
1. Specimen Preparation
2. Heat Treatment of C.I & Mild Steel
3. Heat Treatment of S.S. & Aluminium
4. Heat Treatment of High Carbon Steel
INSTRUCTIONAL OBJECTIVES:

1 **UNDERSTAND THE MICROSTRUCTURE OF DIFFERENT METALS.**
   1.1 Explain the method of preparing the specimen of cast iron for micro examination.
   1.2 Describe the process of mounting the specimen.
   1.3 Describe the different cold setting & hot setting materials used for mounting.

2 **KNOW SPECIMEN PREPARATION.**
   2.1 Enlist different steps of preparing the small pieces of brass
   2.2 Describe the precautions in polishing a specimen for micro examination
   2.3 Explain the reason for which the specimen is prepared for micro examination

3 **UNDERSTAND THE METALLURGICAL MICROSCOPE.**
   3.1 Define etching materials
   3.2 Describe the etching materials for different specimen for microscope examination.

4 **UNDERSTAND THE METALLURGICAL MICROSCOPE.**
   4.1 Describe the function of major parts of microscope
   4.2 Explain the principle of microscope
   4.3 Illustrate the magnification system of metallurgical microscope.

5 **UNDERSTAND THE HEAT TREATMENT OF DIFFERENT METALS AND ALLOYS.**
   5.1 Define construction of the metallic system
   5.2 Define the crystalline formation, solid state, solid solution.
   5.3 Explain cooling curves of pure metal, soluble alloys and insoluble alloys.

6 **KNOW ALLOTROPY OF IRON.**
   6.1 Define alpha iron, beta iron, and gamma iron
   6.2 Describe the phase transformation, hypo and hypereutectoid.

7 **UNDERSTAND HEAT TREATMENT FURNACES.**
   7.1 Describe muffle furnace
   7.2 Explain hardening furnaces
   7.3 Describe annealing furnaces
   7.4 Explain salt bath furnaces

8 **UNDERSTAND IRON AND IRON CARBON EQUILIBRIUM DIAGRAM.**
   8.1 Construct iron carbon diagram
   8.2 Describe solid solution, cementite, pearlite.
   8.3 Explain transformation, hypo and hyper eutectoid.
9 UNDERSTAND CASE HARDENING PROCESS.
9.1 Describe purpose of gas hardening
9.2 Describe method of cyaniding
9.3 Describe method of nitriding and pack carbonizing
9.4 Explain the processes of flame hardening and induction hardening.

10 UNDERSTAND THE HEAT TREATMENT EQUIPMENT.
10.1 Explain the method of measuring high temperature
10.2 Describe thermocouple and cigar cones
10.3 Explain optical pyrometer and quenching medias

11 UNDERSTAND HEAT TREATMENT OPERATIONS.
11.1 Explain the process of annealing and normalizing
11.2 Describe the method of tempering and hardening.

12 UNDERSTAND THE MANUFACTURING AND PROPERTIES OF ALLOY STEEL.
12.1 Define alloy steel
12.2 Describe the characteristics of alloying element
12.3 Describe the application and uses of alloy steels
12.4 Explain the heat treatment of spring and tool steel.

13 UNDERSTAND THE HEAT TREATMENT OF ALLOY STEEL.
13.1 Describe the method of heat treatment of stainless steel
13.2 Explain the method of heat treatment of high speed steel and magnet steel

14 UNDERSTAND THE HEAT TREATMENT OF NON FERROUS METALS.
14.1 Explain the heat treatment of copper and copper base alloys
14.2 Describe the heat treatment of zinc and zinc base alloys (brasses)
14.3 Describe the heat treatment of aluminum & aluminum base alloys.

15 UNDERSTAND HEAT TREATMENT OF CAST IRON.
15.1 Explain the method of heat treatment of white cast iron, grey iron and
15.2 Malleable iron and nodular iron.
COURSE CONTENTS:

1. **INTRODUCTION TO THE SUBJECT.** 3 Hrs
   1.1 Physical properties of metals
   1.2 Mechanical properties of metals and their relationship.
   1.3 Importance of material testing in industry.

2. **HARDNESS TESTING.** 4 Hrs
   2.1 Hardness testing principles
   2.2 Scratching, indenting.
   2.3 Rockwell hardness testing machine.
   2.4 Steel ball indentation
   2.5 Diamond point indentation

3. **BRINNEL HARDNESS TESTING.** 4 Hrs
   3.1 Relation between Rockwell and Brinnel hardness nos.
   3.2 Strength of metals and economy of testing.
   3.3 Brinnel hardness testing
   3.4 Measurement of indentation.

4. **STUDY OF VICKER PYRAMID HARDNESS TESTING.** 4 Hrs
   4.1 Machines
   4.2 Hardness methods used in industry
   4.3 Economy of the test
   4.4 Accuracy and speed of test
   4.5 Comparison between Brinnel and Vicker pyramid Nos.

5. **UNIVERSAL TESTING MACHINE.** 6 Hrs
   5.1 Its requirement
   5.2 Essential features
   5.3 Test pieces of ferrous metals
   5.4 Test pieces of non ferrous metals.
   5.5 Design of test specimens
   5.6 Extensometers.

6. **STRESS STRAIN DIAGRAM.** 4 Hrs
   6.1 Stress and strain
   6.2 Tensile
   6.3 Compressive stress.
   6.4 Shear stress
   6.5 Elasticity, Hooks Law.
7  COMPRESSION STRENGTH.  4 Hrs
   7.1 Elastic range
   7.2 Yield point
   7.3 Plastic range
   7.4 Ultimate stress
   7.5 Safety factor
   7.6 Graph of the points

8  BENDING MOMENT AND SHEAR FREE DIAGRAM.  3 Hrs
   8.1 Contentment concentrated and uniformly distributed loads.
   8.2 Simply supported beams.

9  COMPRESSION TEST.  4 Hrs
   9.1 Compression test
   9.2 Cement/concrete block
   9.3 Cast iron

10 TORSION TEST.  4 Hrs
   10.1 Shear testing
   10.2 Construction and working of machine.

11 NON-DESTRUCTIVE METHODS OF TESTING.  4 Hrs
   11.1 Visual examination
   11.2 Penetrate test
   11.3 Hammer test
   11.4 Sound test

12 RADIOGRAPHIC EXAMINATION AND ITS APPLICATION.  4 Hrs
   12.1 X-Ray test of a welded and cast piece
   12.2 Study of gamma rays testing
   12.3 Comparison between X-ray and gamma ray test.

13 MAGNETIC ANALYSIS.  4 Hrs
   13.1 General principles
   13.2 Magnetic testing for defects
   13.3 Magnetizing and demagnetizing methods

14 RIVETED JOINTS.  4 Hrs
   14.1 Types of riveted joints
   14.2 Efficiency of riveted joints
   14.3 Design of riveted joints
   14.4 Failure of riveted joints

15 WELDED JOINTS.  4 Hrs
   15.1 Types of welded joints
   15.2 Design of welded joints
   15.3 Failure of welded joints
16. **ULTRA SONIC TESTING.**  4 Hrs

16.1 Detection of ultra sonic test
16.2 Stethosporic test
16.3 Other method of testing.

**RECOMMENDED BOOKS:**

2. Elements of Heat Treatment.
3. Strength of Materials by Breneman
4. Design and Procurement of High –Strength Structural Aluminum Castings by AFS.
FP-362  STRENGTH OF MATERIALS AND TESTING OF MATERIALS.

INSTRUCTIONAL OBJECTIVES:

1  KNOW THE PROPERTIES OF METALS.
   1.1 Enlist the properties of metals
   1.2 Describe the mechanical properties of metals
   1.3 Describe the role of metals in industry.

2  UNDERSTAND THE HARDNESS TESTING.
   2.1 Define scratching and indenting
   2.2 Explain the procedure of testing on a Rockwell testing machine
   2.3 Explain Rockwell hardness testing with steel ball and diamond point.

3  UNDERSTAND BRINNEL HARDNESS TESTING.
   3.1 State the working principle of Brinnel hardness testing machine
   3.2 Explain the method of testing hardness on Brinnel hardness testing machine.
   3.3 Compare Rockwell testing and Brinnel hardness tests
   3.4 Describe the ratio between Brinnel hardness number and tensile strength

4  UNDERSTAND VICKER PYRAMID HARDNESS TESTING.
   4.1 State the working principle of Vicker pyramid testing machine.
   4.2 Explain the method of testing on a Vicker pyramid hardness testing machine.
   4.3 Compare the Brinnel and Vicker pyramid testing machines.

5  UNDERSTAND UNIVERSAL TESTING MACHINE.
   5.1 Enlist the test which can be performed on it
   5.2 Describe the essential features and working of a universal testing machine
   5.3 Describe the preparation of a test specimen for elongation test
   5.4 Draw the stress strain diagram showing the loads and yield points
   5.5 Describe the method of testing a concrete block on universal testing machine for compressive test

6  UNDERSTAND THE STRESS-STRAIN DIAGRAM
   6.1 Locate the plastic range and elastic range
   6.2 Practically draw a stress strain diagram showing the ultimate stress, yield point, proportional limit, breaking stress

7  UNDERSTAND COMPRESSION TEST
   7.1 Describe the test
   7.2 State terminology i.e. elastic range, yield point, plastic range

8  UNDERSTAND TORSION TEST
   8.1 Describe the construction and working of torsion testing machine
   8.2 Explain the method of torsion testing
   8.3 Propose specimen for the test
9 UNDERSTAND COMPRESSION TEST
9.1 Prepare specimens
9.2 Calculate stress and percent compression
9.3 Describe safety precautions

10 KNOWN NON-DESTRUCTIVE TESTS
10.1 Enlist the non-destructive tests
10.2 Describe hammer test and sound tests
10.3 Describe the welding defects found by visual examination

11 UNDERSTAND RADIOGRAPHIC EXAMINATION
11.1 Explain gamma rays testing
11.2 Describe the X-ray test of a welded piece or casting

12 UNDERSTAND THE MAGNETIC
12.1 State the principle of magnetic testing
12.2 Describe the defects found in magnetic testing
12.3 Explain the process of magnetizing and demagnetizing

13 UNDERSTAND RIVETED JOINTS
13.1 Sketch different types of welded joints
13.2 Explain method of failure of riveted joints
13.3 Describe strength and efficiency of riveted joints
13.4 Design a riveted lap joint

14 UNDERSTAND WELDING JOINTS
14.1 Sketch different types of welded joints
14.2 Explain welded joints
14.3 Design butt welded joint

15 UNDERSTAND ULTRASONIC TEST
15.1 Differentiate sonic and ultrasonic test
15.2 Explain ultrasonic test
15.3 Describe stethoscope.
CMFT-378 WORK SHOP PRACTICE-III

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COURSE CONTENTS:
CAST METALS ENGINEERING AND TECHNOLOGY

Unit-1 Material Evaluation and Product Development
- Chemical Analysis
- Structure Study
- Mode of Fabrication

Unit-2 Engineering Design & manufacturing
- Design, Gating, Risering & Pattern /Mould making.

Unit-3 Moulding & Casting Process
Unit-4 Engineering materials
Unit-5 Melting Procedure
Unit-6 Post Casting Processes
- Cleaning
- Blast cleaning
- Sawing
- Chipping
- Grinding
- Brazing and Welding

Unit-7 Troubleshooting
- Copper base alloy castings
- Chemically bonded mould and cores
- Die castings
- Ductile iron castings
- Gray iron castings
- Investment castings
- Non –ferrous castings
- Permanent mould castings
- Sand castings
- Shell mould castings
- Shell moulds

Unit-8 Testing & Quality Control
Unit-9 Environment & Safety

Reference Books:
1. Cleaning Castings Cast Metals Technology Series by AFS.
2. Finishing Casting in the Cleaning room Cast Metals Technology Series by AFS.
3. Green sand additives by AFS
5. Die Casting Engineering by Bill Andersen.
6. Fundamental Moulding Sand Technology Cast Metals Technology Series by AFS.
8. Mould and Core Coating manual by AFS.
9. ASM Hand Book.
13. Casting Defects Hand Book by AFS.
14. Design and Procurement of High –Strength Structural Aluminum Castings ,AFS
15. Basic Principles of Risering ,AFS
16. Pressure Die Casting by B. Upton
17. Pressure Die Casting by D. F Allsop.
18. Expendable Pattern Casting by Raymond W. Monore.
19. Principles of the Shell Process, AFS.
20. Basic Principles of Gating AFS.
21. Pattern Making Cast Metals Technology Series, AFS.
22. Chemically Bonded Core and Moulds. AFS.
23. Ductile Iron Handbook , AFS
24. Introduction to the Cast Metals Industry
25. Microstructure Development during Metal casting.
26. Finishing Casting in the Cleaning room, AFS.
**LIST OF MACHINERY & EQUIPMENT**

(Note: Ultimate Selection will base on State of the Art Equipment / Technology available through modification in each section.)

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<td>MOULDING SECTION</td>
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**SAND TESTING SECTION:**

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<td>Balance, electronic precision</td>
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<td>03.</td>
<td>Strength tester, type PFC, c/w accessories</td>
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<td>Miscellaneous Lab. Apparatus</td>
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<td>Methylene blue tester</td>
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**PATTERN MAKING SECTION:**

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<td>01.</td>
<td>CNC Universal Pattern Milling machine with all required accessories.</td>
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<td>02.</td>
<td>CNC Pattern makers Lathe with compound slide rest c/w all required accessories and tools</td>
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<tr>
<td>03.</td>
<td>Band saw for pattern making</td>
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<td>04.</td>
<td>Pattern makers bench vice, 120mm</td>
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<td>Swarf removal suction system</td>
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</tr>
<tr>
<td>06.</td>
<td>Pattern makers hand tools sets</td>
<td>01</td>
</tr>
<tr>
<td>07.</td>
<td>Wood humidity tester</td>
<td>01</td>
</tr>
<tr>
<td>08.</td>
<td>Pattern polishing device</td>
<td>01</td>
</tr>
</tbody>
</table>
# MOULDING SECTION

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>NAME OF ITEM</th>
<th>QTY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.</td>
<td>Moulding Machine</td>
<td>2 units</td>
</tr>
<tr>
<td>02.</td>
<td>Single Track Roller conveyors</td>
<td>2 units</td>
</tr>
<tr>
<td>03.</td>
<td>Mould Tools Complete</td>
<td>1 set</td>
</tr>
<tr>
<td>04.</td>
<td>Compressed Air Rammer</td>
<td>10 pcs.</td>
</tr>
<tr>
<td>05.</td>
<td>Square Rammer feet</td>
<td>30 pcs.</td>
</tr>
<tr>
<td>06.</td>
<td>Flasks Complete</td>
<td>1 lot</td>
</tr>
<tr>
<td>07.</td>
<td>Flasks Complete</td>
<td>1 lot</td>
</tr>
<tr>
<td>08.</td>
<td>Flask weights, 20 kg</td>
<td>60 pcs.</td>
</tr>
<tr>
<td>09.</td>
<td>Covering guides</td>
<td>204 pcs.</td>
</tr>
<tr>
<td>10.</td>
<td>Various hand tools</td>
<td>1 lot</td>
</tr>
<tr>
<td>11.</td>
<td>Sand barrows</td>
<td>1 pc.</td>
</tr>
<tr>
<td>12.</td>
<td>Casting transport</td>
<td>1 pc.</td>
</tr>
<tr>
<td>13.</td>
<td>Electric Forklift Trucks</td>
<td>1 pc.</td>
</tr>
<tr>
<td>14.</td>
<td>Wooden flask bottoms</td>
<td>1 lot</td>
</tr>
<tr>
<td>15.</td>
<td>Mould handling system</td>
<td>2 sets</td>
</tr>
<tr>
<td>16.</td>
<td>Moulding box trolley</td>
<td>1 pc</td>
</tr>
<tr>
<td>17.</td>
<td>Shake-out machine</td>
<td>1 unit</td>
</tr>
<tr>
<td>18.</td>
<td>Sand hopper</td>
<td>1 unit</td>
</tr>
<tr>
<td>19.</td>
<td>Vibrating sand through conveyor</td>
<td>1 unit</td>
</tr>
<tr>
<td>20.</td>
<td>Iron separator</td>
<td>1 unit</td>
</tr>
<tr>
<td>21.</td>
<td>Belt conveyor, return sand</td>
<td>1 unit</td>
</tr>
<tr>
<td>22.</td>
<td>Used sand Aerator</td>
<td>1 unit</td>
</tr>
<tr>
<td>23.</td>
<td>Used sand bucket elevator</td>
<td>1 unit</td>
</tr>
<tr>
<td>24.</td>
<td>Polygonal screen</td>
<td>1 unit</td>
</tr>
<tr>
<td>25.</td>
<td>Used sand silo</td>
<td>1 unit</td>
</tr>
<tr>
<td>26.</td>
<td>Silo for additives in powder form</td>
<td>3 units</td>
</tr>
<tr>
<td>27.</td>
<td>Dew axing oven for shells</td>
<td>1 unit</td>
</tr>
<tr>
<td>28.</td>
<td>Moulding sand mixer, type KB 20C</td>
<td>1 unit</td>
</tr>
<tr>
<td>29.</td>
<td>Hopper a discharge point of skip hoist</td>
<td>1 unit</td>
</tr>
<tr>
<td>30.</td>
<td>Skip hoist</td>
<td>1 unit</td>
</tr>
<tr>
<td>31.</td>
<td>Belt conveyor, ready sand</td>
<td>1 unit</td>
</tr>
<tr>
<td>32.</td>
<td>Prepared Sand Aerator</td>
<td>1 unit</td>
</tr>
<tr>
<td>33.</td>
<td>Belt conveyor, flat belt type</td>
<td>1 unit</td>
</tr>
<tr>
<td>34.</td>
<td>Belt ploughs, Electro pneumatic operation</td>
<td>3 units</td>
</tr>
<tr>
<td>35.</td>
<td>Belt conveyor, flat belt type</td>
<td>1 unit</td>
</tr>
<tr>
<td>36.</td>
<td>Shell moulding equipment complete</td>
<td>1 unit</td>
</tr>
<tr>
<td>37.</td>
<td>Silos for backing sand 2.5 M3</td>
<td>2 units</td>
</tr>
<tr>
<td>38.</td>
<td>Complete supporting frame work sand preparation and prepared sand conveyor system</td>
<td>1 set</td>
</tr>
<tr>
<td>39.</td>
<td>Wax injection machine</td>
<td>1 unit</td>
</tr>
<tr>
<td>40.</td>
<td>Exhaust air cleaning plant</td>
<td>1 unit</td>
</tr>
<tr>
<td>41.</td>
<td>Switching and control system</td>
<td>1 unit</td>
</tr>
<tr>
<td>42.</td>
<td>Synthetic resin agitator machine</td>
<td>1 unit</td>
</tr>
</tbody>
</table>
## CORE MAKING SECTION

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>NAME OF ITEM</th>
<th>QTY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.</td>
<td>Batch Mixer, 10 Lt</td>
<td>1 unit</td>
</tr>
<tr>
<td>02.</td>
<td>Batch Mixer, 50 Lt</td>
<td>1 unit</td>
</tr>
<tr>
<td>03.</td>
<td>Core Shotting and curing machine</td>
<td>1 unit</td>
</tr>
<tr>
<td>04.</td>
<td>Complete cold box gassing system for hand core making</td>
<td>1 unit</td>
</tr>
<tr>
<td>05.</td>
<td>Coating Mixer</td>
<td>1 unit</td>
</tr>
<tr>
<td>06.</td>
<td>Coating dip and flooding station</td>
<td>1 unit</td>
</tr>
<tr>
<td>07.</td>
<td>Core drying oven</td>
<td>1 unit</td>
</tr>
<tr>
<td>08.</td>
<td>Core storage racks</td>
<td>10 pcs.</td>
</tr>
<tr>
<td>09.</td>
<td>Balance for weighing 1-100Kg</td>
<td>02 pcs.</td>
</tr>
<tr>
<td>10.</td>
<td>Top loading balance up to 2Kg digital</td>
<td>1 pc</td>
</tr>
<tr>
<td>11.</td>
<td>Resin coated melting point apparatus</td>
<td>1 unit</td>
</tr>
</tbody>
</table>

## MELTING SHOP:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>NAME OF ITEM</th>
<th>QTY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.</td>
<td>Cupola Furnace</td>
<td>1 unit</td>
</tr>
<tr>
<td>02.</td>
<td>Complete system for trapping, ducting and cleaning flue gas from cupola</td>
<td>1 set</td>
</tr>
<tr>
<td>03.</td>
<td>High Freq. Induction Melting plant</td>
<td>1 unit</td>
</tr>
<tr>
<td>04.</td>
<td>Gas/Oil Fired Crucible Melting Plant</td>
<td>1 unit</td>
</tr>
<tr>
<td>05.</td>
<td>Pouring Ladles</td>
<td>4 units</td>
</tr>
<tr>
<td>06.</td>
<td>Gas/Oil Fired Ladle preheating stand</td>
<td>1 unit</td>
</tr>
<tr>
<td>07.</td>
<td>Molten metal test laboratory, type quick lab with printer</td>
<td>1 unit</td>
</tr>
<tr>
<td>08.</td>
<td>Station for spheroid graphite iron treatment</td>
<td>1 unit</td>
</tr>
<tr>
<td>09.</td>
<td>One non contact optical pyrometer</td>
<td>1 unit</td>
</tr>
<tr>
<td>10.</td>
<td>Rotary Furnace, melting capacity 50-80kg (Local or foreign)</td>
<td>1 unit</td>
</tr>
<tr>
<td>11.</td>
<td>Batch, balance, capacity 10 kg</td>
<td>1 unit</td>
</tr>
<tr>
<td>12.</td>
<td>Miscellaneous furnace tools</td>
<td>1 set</td>
</tr>
<tr>
<td>13.</td>
<td>Personnel protective materials</td>
<td>1 set</td>
</tr>
</tbody>
</table>
### MOULDING SHOP FOR NON-FERROUS METAL:

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>NAME OF ITEM</th>
<th>QTY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.</td>
<td>Pressure Die Casting Machine- 280 Tons</td>
<td>1 set</td>
</tr>
<tr>
<td>02.</td>
<td>Pressure Die Casting Machine- 50 Tons</td>
<td>1 set</td>
</tr>
</tbody>
</table>

### FETTLING, CLEANING AND FINISHING SHOP

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>NAME OF ITEM</th>
<th>QTY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.</td>
<td>Shot blasting machine, type FBS</td>
<td>1 unit</td>
</tr>
<tr>
<td>02.</td>
<td>Dust extraction and elimination type: T-08</td>
<td>-</td>
</tr>
<tr>
<td>03.</td>
<td>Hacksaw type BSM 253</td>
<td>1 unit</td>
</tr>
<tr>
<td>04.</td>
<td>Single wheel rough grinding machine, type: 600SK 30E</td>
<td>2 units</td>
</tr>
<tr>
<td>05.</td>
<td>High speed single wheel abrasive cut-off machine</td>
<td>1 unit</td>
</tr>
<tr>
<td>06.</td>
<td>Welding Rectifier</td>
<td>1 unit</td>
</tr>
<tr>
<td>07.</td>
<td>Exhaust air cleaning plant</td>
<td>1 unit</td>
</tr>
<tr>
<td>08.</td>
<td>Pneumatic hand tools</td>
<td>3 sets</td>
</tr>
<tr>
<td>09.</td>
<td>High frequency hand grinders</td>
<td>3 sets</td>
</tr>
<tr>
<td>10.</td>
<td>Three phase frequency converter</td>
<td>1 pc.</td>
</tr>
<tr>
<td>11.</td>
<td>Hand tools</td>
<td>1 set</td>
</tr>
<tr>
<td>12.</td>
<td>Set of personal protective material</td>
<td>1 set</td>
</tr>
<tr>
<td>13.</td>
<td>Disk sander. Complete with all required accessories</td>
<td>1 unit</td>
</tr>
</tbody>
</table>
### HEAT TREATMENT SHOP:

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>NAME OF ITEM</th>
<th>QTY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.</td>
<td>Heat treatment furnace, 1100 deg. C Gas fired 4x3x3</td>
<td>1 unit</td>
</tr>
<tr>
<td>02.</td>
<td>Exhaust air cleaning plant</td>
<td>1 unit</td>
</tr>
<tr>
<td>03.</td>
<td>High frequency hand grinders</td>
<td>3 sets</td>
</tr>
<tr>
<td>04.</td>
<td>Hand tools</td>
<td>1 set</td>
</tr>
<tr>
<td>05.</td>
<td>Set of personal protective material</td>
<td>1 set</td>
</tr>
<tr>
<td>06.</td>
<td>Electric Muffle Furnace( Local PCSIR)1000°C</td>
<td>2 unit</td>
</tr>
<tr>
<td>07.</td>
<td>Fume extraction fans</td>
<td>3 pcs.</td>
</tr>
<tr>
<td>08.</td>
<td>Electric Oven 300°C for precipitation hardening(PCSIR)</td>
<td>2 unit</td>
</tr>
<tr>
<td>09.</td>
<td>Quenching tanks with quenching media</td>
<td>4 units</td>
</tr>
<tr>
<td>10.</td>
<td>Induction hardening machine</td>
<td>1 unit</td>
</tr>
<tr>
<td>11.</td>
<td>Complete salt bath heat treatment set up</td>
<td>1 unit</td>
</tr>
<tr>
<td>12.</td>
<td>Basket type electric furnace for solution treatment of non-ferrous alloys Temperature up to 700°C</td>
<td>1 unit</td>
</tr>
</tbody>
</table>

### MACHINE SHOP - I:

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>NAME OF ITEM</th>
<th>QTY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pneumatic hand tools</td>
<td>3 sets</td>
</tr>
<tr>
<td>2</td>
<td>High frequency hand grinders</td>
<td>3 sets</td>
</tr>
<tr>
<td>3</td>
<td>CNC Boring machine complete with all required tools</td>
<td>1 unit</td>
</tr>
<tr>
<td>4</td>
<td>Standby Electric supply system</td>
<td>1 unit</td>
</tr>
<tr>
<td>5</td>
<td>Tool grinding machine</td>
<td>1 unit</td>
</tr>
<tr>
<td>6</td>
<td>Band and Circular saw grinding machine</td>
<td>1 unit</td>
</tr>
<tr>
<td>7</td>
<td>CNC Die sinking</td>
<td>1 unit</td>
</tr>
<tr>
<td>8</td>
<td>CNC Wire cut machine</td>
<td>1 unit</td>
</tr>
<tr>
<td>9</td>
<td>Horizontal Boring Machine</td>
<td>1 unit</td>
</tr>
<tr>
<td>10</td>
<td>Marking-out plates</td>
<td>2 pcs.</td>
</tr>
<tr>
<td>11</td>
<td>Surface Planning Machine c/w accessories</td>
<td>1 unit</td>
</tr>
<tr>
<td>12</td>
<td>Profile Band Grinding Machine</td>
<td>1 unit</td>
</tr>
<tr>
<td>13</td>
<td>Oscillatory Roll Grinding Machine</td>
<td>1 unit</td>
</tr>
</tbody>
</table>
**MECHANICAL TESTING LAB:**

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>NAME OF ITEM</th>
<th>QTY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.</td>
<td>Universal Tensile Testing Machine</td>
<td>1 unit</td>
</tr>
<tr>
<td>02.</td>
<td>Impact Testing Machine</td>
<td>1 unit</td>
</tr>
<tr>
<td>03.</td>
<td>Brinnel &amp; Rockwell Testing Machine</td>
<td>1 unit</td>
</tr>
</tbody>
</table>

**TESTING, CERTIFICATION & METALLOGRAPHY SHOP:**

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>NAME OF ITEM</th>
<th>QTY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Emission Spectrometer</td>
<td>1 unit</td>
</tr>
<tr>
<td>2.</td>
<td>Metal microscope, 50 to 400x.</td>
<td>1 unit</td>
</tr>
<tr>
<td>3.</td>
<td>Metal polishing &amp; mounting equipment with consumables</td>
<td>1 unit</td>
</tr>
<tr>
<td>4.</td>
<td>Gas analyzer for determining C and S content</td>
<td>1 unit</td>
</tr>
<tr>
<td>5.</td>
<td>Polishing device c/w tools</td>
<td>1 unit</td>
</tr>
<tr>
<td>6.</td>
<td>Apparatus for wet assaying for determining, Si, Mn, P, Ni, Cr</td>
<td>1 set</td>
</tr>
<tr>
<td>7.</td>
<td>Spectrophotometer</td>
<td>1 unit</td>
</tr>
</tbody>
</table>

**MACHINE SHOP - II:**

<table>
<thead>
<tr>
<th>Sr.No.</th>
<th>NAME OF ITEM</th>
<th>QTY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.</td>
<td>Drilling Machines, Pedestal type ø12 mm Drill chuck</td>
<td>06 Nos.</td>
</tr>
<tr>
<td>02.</td>
<td>Lathe Machine Training type, Height of Centre 100 mm + Bed Length – 500 mm</td>
<td>06 Nos.</td>
</tr>
<tr>
<td>03.</td>
<td>Milling Machine Universal, 400x700x300</td>
<td>06 Nos.</td>
</tr>
<tr>
<td>04.</td>
<td>Misc. Hand tools assorted</td>
<td>One set</td>
</tr>
</tbody>
</table>
## MINIMUM QUALIFICATION OF TEACHING STAFF

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of Post</th>
<th>Basic Scale</th>
<th>Qualification &amp; Experience</th>
<th>Subjects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Chief Instructor</td>
<td>B-18</td>
<td>(a) 1st Class Bachelor’s Degree in relevant field of Engineering</td>
<td>Physical Metallurgy Materials Science</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(b) Four years teaching experience in Polytechnic Institute</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Or</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(a) Master’s Degree in relevant field of Engineering</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(b) Two years teaching / research experience in recognized Engineering Institute</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Senior Instructor</td>
<td>B-17</td>
<td>Bachelor’s Degree in relevant field of Engineering</td>
<td>Metallurgy &amp; Materials Science</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Or</td>
<td>Physics</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>M.A / M.Sc. in relevant field</td>
<td>Chemistry</td>
</tr>
<tr>
<td>3</td>
<td>Instructor</td>
<td>B-16</td>
<td>B.Sc. Engineering Or DAE (Mechanical / Foundry)</td>
<td>Mechanical Foundry</td>
</tr>
</tbody>
</table>
EMPLOYABILITY OF PASSOUTS

- Cast Metals & Foundry Industry
- Automobile Industry
- Agriculture Machinery Industry
- Textile Units
- Cement and Sugar Plant Manufacturing Industry
- Educational Institutions
- Other related Industry
## TEXT BOOKS

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of Book</th>
<th>Author</th>
<th>Code</th>
<th>Publisher</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Engineering Drawing &amp; CAD-1</td>
<td>Muhammad Hafiz Ashrafi</td>
<td>MT-143</td>
<td>Allied Book Centre 34- Urdu Bazar, Lahore</td>
</tr>
<tr>
<td>2</td>
<td>A Text Book of Computer Application</td>
<td>Muhammad Asif</td>
<td>COMP-123</td>
<td>Azeem Academy 22- Urdu Bazar Lahore</td>
</tr>
<tr>
<td>3</td>
<td>Applied Physics</td>
<td>Rana Muhammad Ajmal Shrif</td>
<td>PHY-113</td>
<td>Allied Book Centre 34- Urdu Bazar, Lahore</td>
</tr>
<tr>
<td>4</td>
<td>Applied Chemistry</td>
<td>Muhammad Yousaf Qamar</td>
<td>CH-112</td>
<td>Allied Book Centre 34- Urdu Bazar, Lahore</td>
</tr>
<tr>
<td>5</td>
<td>Engineering Mathematics</td>
<td>Dr. Muhammad Iqbal Bhatti, Shaukat Ali, Mazhar Abbas</td>
<td>MATH-113</td>
<td>Allied Book Centre 34- Urdu Bazar, Lahore</td>
</tr>
</tbody>
</table>