PUNJAB BOARD OF TECHNICAL EDUCATION

21-A, Kashmir Block Allama Iqbal Town, Lahore

www.pbte.edu.pk- R&D Section Tel # 042-99260273

SAY NO TO CORRUPTION
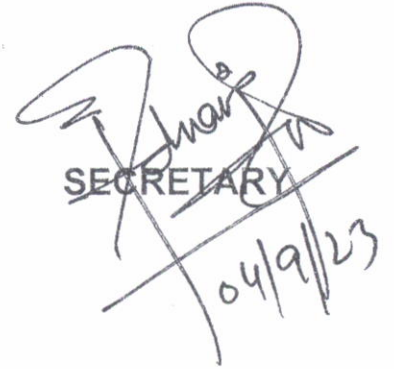
No: PBTE/R&D/2023/ *116*

Dated:- *05-09-23*

NOTIFICATION

In pursuance of the letter No. TEVTA/Acad/Cur/6-291 dated 03-05-2023, it is notified that newly developed curriculum of **"DAE Dies & Mould Technology (03 year)"** will be implemented in the affiliated institutes.

Punjab Board of Technical Education, Lahore will conduct the examinations of those students who are enrolled under this program for the academic session 2023-24 and onwards, accordingly. Soft copy of the curriculum of the said course may be downloaded from the website of PBTE i.e. http://www.pbte.edu.pk/Ptextbooks.aspx

SECRETARY

04/9/23

CC To.

1- PA to Chairman, PBTE, Lahore.
2- PA to DG Academics, TEVTA, Lahore.
3- PA to DG Operations, TEVTA, Lahore.
4- PA to Secretary, PBTE, Lahore.
5- PA to Controller of Examinations, PBTE, Lahore.
6- The Principals concerned.
7- Deputy Controller of Examinations (Conduct), PBTE, Lahore.
8- Deputy Controller of Examinations (Secrecy), PBTE, Lahore.
9- In Charge Computer Section, PBTE, Lahore.
10- Assistant Controller of Examinations (Technical), PBTE, Lahore.
11- Assistant Controller of Examinations (Conduct), PBTE, Lahore.
12- Assistant Controller of Examinations (Secrecy), PBTE, Lahore.
13- Assistant Controller of Examinations (P&P-I), PBTE, Lahore.
14- Assistant Controller of Examinations (P&P- II), PBTE, Lahore.
15- Assistant Secretary (Recognition), PBTE, Lahore.
16- Assistant Secretary (Certificate), PBTE, Lahore.
17- Assistant Secretary (Registration), PBTE, Lahore.
18- Web Administrator, PBTE Lahore to upload on Board Website.

GOVERNMENT OF THE PUNJAB

TECHNICAL EDUCATION & VOCATIONAL TRAINING AUTHORITY

Curriculum For

DAE in

DIES & MOULD Technology

(Adapted from SBTE / S-TEVTA & notified-2023)

CURRICULUM SECTION

ACADEMICS DEPARTMENT

96-H, GULBERG-II, LAHORE

Ph # 042-99263055-9, 99263064

gm.acad@tevta.gop.pk, manager.cur@tevta.gop.pk

D.A.E in Dies & Moulds Technology (3-Year)
(Scheme of Studies)

First Year Courses

S.No	Code No	Course Title	Hours		
			T	P	C
1	Gen 111	Islamiat/Pakistan Studies	1	0	1
2	Eng 112	English	2	0	2
3	Math 113	Applied Mathematics-I	3	0	3
4	Phy113	Applied Physics	2	3	3
5	DMT 113	Technical Drawing & CAD	1	6	3
6	DMT 126	Bench Work(Metal & Wood Works)	2	12	6
7	Ch 112	Applied Chemistry	1	3	2
8	DMT131	Introduction to Dies & Moulds	1	0	1
9	DMT142	Applied Electricity & Electronics	1	3	2
		Total	**14**	**27**	**23**

Second Year Courses

S. No	Code No	Course Title	Hours		
			T	P	C
1	Gen 201	Islamiat/Pakistan Studies	1	0	1
2	Math 213	Applied Mathematics –II	3	0	3
3	Mgm 221	Business Management & Industrial Economics	1	0	1
4	DMT 212	Metrology	1	3	2
5	DMT 223	Machine Design	2	3	3
6	DMT 233	Die Design – I	1	6	3
7	Phy 212	Applied Mechanics	1	3	2
8	DMT 242	Material Science & Heat Treatment	1	3	2
9	DMT 254	Mould Design – I	2	6	4
10	DMT 263	Machine Shop Practices(Lathe,Milling,Drilling, Surface Grinding & Welding)	2	3	3
		Total	**15**	**27**	**24**

Third Year Courses

S. No	Code No	Course Title	Hours		
			T	P	C
1	Gen 301	Islamiat/Pakistan Studies	1	0	1
2	Mgm 311	Industrial Management & Human Relations	1	0	1
3	DMT 314	Die Design – II	2	6	4
4	DMT 323	CNC Machines & CAM	2	3	3
5	DMT 332	Industrial Quality Control	2	0	2
6	DMT 344	Mould Design – II	2	6	4
7	DMT 353	Jigs & Fixture Design	2	3	3
8	MT 332	Industrial Engineering	1	3	2
9	DMT 361	Compression & Rubber Mould	1	0	1
10	DMT 373	Die & Mould Maintenance	2	3	3
		Total	**16**	**24**	**24**

COURSE OUTLINE YEAR – 1

سال اول

اسلامیات

	سی	پی	ٹی
گھنٹے	۱	۰۰	۱
نشانات	۵۰	۰۰	۵۰

موضوعات

کتاب وسنت

الف: قرآن مجید

(۱) تعارف قرآن مجید (۲) نزول قرآن (۳) مکی ومدنی سورتوں کی خصوصیات (۴) وحی کی اقسام

(۵) پندرہ منتخب آیات معہ ترجمہ

۱۔ لن تنالوا البر حتی تنفقوا مما تحبون

۲۔ واعتصموا بحبل اللہ جمیعا ولا تفرقوا

۳۔ ولا یجرمنکم شنان قوم علی ان لا تعدلوا

۴۔ ان اللہ یامرکم ان تؤدوا الامانات الی اھلھا

۵۔ ان اللہ یامرکم بالعدل والاحسان

۶۔ ان الصلوۃ تنھی عن الفحشاء والمنکر

۷۔ لقد کان لکم فی رسول اللہ اسوۃ حسنۃ

۸۔ ان اکرمکم عنداللہ اتقاکم

۹۔ وما اتاکم الرسول فخذوہ وما نھی فخذوہ

۱۰۔ واوفوا بعھد اللہ

۱۱۔ وعاشروھن بالمعروف

۱۲۔ یمحق اللہ الربو ویربی الصدقات

۱۳۔ واصبر علی ما اصابک

۱۴۔ وقولوا قولا سدیدا

۱۵۔ ان الدین عنداللہ الاسلام

2

سبق: سنت

۱۔ سنت کی اہمیت

۲۔ دس منتخب احادیث معہ ترجمہ وتشریح

۱۔ انما الاعمال بالنیات

۲۔ انما بعثت لاتمم مکارم الاخلاق

۳۔ لایومن احدکم حتی یحب الاخیہ مایحب النفسہ

۴۔ المسلم من سلم المسلمون من لسانہ ویدہ

۵۔ قل امنت بااللہ ثم استقم

۶۔ خیرکم خیرکم لاھلہ

۷۔ سباب المسلم فسوق وقتالہ کفر

۸۔ المومن اخو المومن

۹۔ کل المسلم علی المسلم حرام دمہ ومالہ وعرضہ

۱۰۔ آیۃ المنافق ثلاث اذا احدث کذب واذا اوتمن خان واذا وعد اخلف

۳۔ دین اسلام

۳۔۱ اسلام کے بنیادی عقائد کی وضاحت اور انسان کی انفرادی واجتماعی زندگی پر ان کے اثرات

۱۔ توحید   ۲۔ رسالت   ۳۔ آخرت   ۴۔ ملائکہ   ۵۔ آسمانی کتاب

۳۔۲ عبادات

۱۔ نماز   ۲۔ روزہ   ۳۔ حج   ۴۔ زکوۃ

مندرجہ بالا عبادات کی اہمیت وفضیلت، حکمتیں اور انسان کی انفرادی ومعاشرتی زندگی پر ان کے اثرات

۴۔ دین اسلام

عمومی مقصد

دین اسلام کے بنیادی عقائد اور عبادات میں جان سکے اور بیان کر سکے

خصوصی مقاصد

- لفظ دین اسلام کے لغوی اور اصطلاحی معنی بیان کر سکے

- دین اسلام کے بنیادی عقائد کی اہمیت بیان کر سکے

- دین اسلام کے بنیادی عقائد کے انسان کی انفرادی واجتماعی زندگی پر پڑنے والے اثرات بیان کر سکے

- عبادات کے لفظی واصطلاحی معنی بیان کر سکے

- عقیدے اور عبادات کا فرق بیان کر سکے

- عبادات (نماز، روزہ، حج، زکوۃ) کے فوری احکامات اور انسانی زندگی پر ان کے اثرات بیان کر سکے

- اسلامی عقائد اور عبادات کے مطابق اپنی زندگی ڈھال کر ایک اچھا مسلمان بن سکے

3

سال اول

تدریسی مقاصد

اسلامیات

الف۔ قرآن مجید

عمومی مقصد

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

خصوصی مقاصد   :   طالب علم اس قابل ہو جائے گا کہ

ـ   قرآن مجید کی تعریف کر سکے گا

ـ   قرآن مجید کے نزول کی صورت بیان کر سکے گا

ـ   قرآن مجید کی مکی و مدنی سورتوں کی پہچان کر سکے گا

ـ   منتخب آیات کا ترجمہ و تشریح کر سکے گا

عمومی مقصد   :   طالب علم یہ سمجھنے کے قابل ہو جائے گا کہ منتخب قرآنی آیات کے ذریعے اسلام
کی تعلیمات کا مفہوم کیا ہے

خصوصی مقاصد   :   طالب علم اس قابل ہو جائے گا کہ

ـ   قرآنی آیات کا ترجمہ و تشریح کر سکے گا

ـ   قرآنی تعلیمات کی روشنی میں اپنی اور معاشرتی اصلاح کر سکے گا

ب۔   سنت

عمومی مقصد   :   طالب علم نبوی کی اہمیت و ضرورت کو اچھی طرح سمجھنے کے قابل ہو جائے گا

خصوصی مقاصد

ـ   سنت کی تعریف بیان کر سکے گا

ـ   سنت کی اہمیت و ضرورت کی وضاحت کر سکے گا

ـ   سنت کی روشنی میں اسوۃ حسنہ پر عمل کر سکے گا

ج۔   منتخب احادیث نبوی

عمومی مقصد   :   طالب علم احادیث کی روشنی میں اخلاقی اقدار سے آگاہی حاصل کرے گا

خصوصی مقاصد

ـ   احادیث کا ترجمہ و تشریح کر سکے گا

ـ   رسول اللہ ﷺ کے اسوۃ حسنہ کی پیروی کا جذبہ پیدا ہوگا

4

سال اول

اخلاقیات

(غیر مسلم طلباء کیلئے)

سی	پی	ٹی	
۱	۰۰	۱	گھنٹے
۵۰	۰۰	۵۰	نشانات

سال اول

موضوعات

اخلاقیات کی تعریف اور اہمیت

اخلاقیات کا معیار (قانون، عقل، علمی کتب)

مندرجہ ذیل اخلاق کی وضاحت

- دیانت داری
- وفاداری
- نظم و ضبط
- راست گوئی
- صبر و استقلال
- حوصلہ مندی
- وقت کی پابندی
- صفائی
- اعتماد
- باہمی احترام
- مصلحت

5

سال اول

مطالعہ پاکستان

سی	پی	ٹی	
۱	۰۰	۱	گھنٹے
۵۰	۰۰	۵۰	نشانات

حصہ دوم

موضوعات

- حریتِ فکر، مسلمان قوم میں آزادیٔ فکر کی تاریخ، مسلمانوں میں سیاسی آزادی کی اہمیت اور ضرورت، ذہنی و جسمانی غلامی کے نقصانات

- نظریہ پاکستان، قیام پاکستان کی اساس (دینِ اسلام) قیام پاکستان کی غرض و غایت

- نظریہ پاکستان کی وضاحت، نظریہ پاکستان علامہ اقبال اور قائداعظم کے ارشادات کی روشنی میں

- نظریہ پاکستان کا تاریخی پہلو، محمد بن قاسم کی آمد

- مجدد الف ثانی اور شاہ ولی اللہ کی تعلیمی خدمات

- سید احمد شہید کی تحریک مجاہدین

- تعلیمی تحریکیں

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

6

تدریسی مقاصد

مطالعہ پاکستان

حصہ دوم

تدریسی مقاصد

حریت فکر

عمومی مقصد

طالب علم یہ جان لے کہ اسلام میں اور مسلمان میں آزادی فکر کی کیا اہمیت ہے

خصوصی مقاصد

- حریت فکر کے معنی و مفہوم بیان کر سکے
- آزادی فکر کی اہمیت بیان کر سکے
- خصوصاً اسلام میں آزادی اظہار رائے کی اہمیت بیان کر سکے
- ذہنی غلامی کے قومی سطح پر نقصانات بیان کر سکے
- جسمانی غلامی کے قومی سطح پر نقصانات بیان کر سکے

نظریہ پاکستان

عمومی مقصد

نظریہ پاکستان (دین اسلام) سے پوری طرح واقفیت ہو جائے

خصوصی مقاصد

- نظریہ کی تعریف کر سکے اور اس کی وضاحت کر سکے
- نظریہ پاکستان کی تعریف کر سکے اور اس کا مفہوم بیان کر سکے
- علامہ اقبال اور قائد اعظم کے ارشادات کی روشنی میں نظریہ پاکستان بیان کر سکے

نظریہ پاکستان کا تاریخی پہلو

عمومی مقصد

نظریہ پاکستان کے تاریخی پس منظر سے واقفیت ہو سکے

خصوصی مقاصد

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

علمی تحریک

عمومی مقصد

برصغیر کی علمی تحریکوں سے آگاہی حاصل ہو سکے

خصوصی مقاصد

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

ENGLISH

T	P	C
2	0	2

Total Contact Hours:	
Theory:	64
Practical:	0

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

COURSE CONTENTS

ENGLISH PAPER "A"
1   PROSE/TEXT   **16 hours**
     1.1   First eight essays of Intermediate English Book-II
2   CLOZE TEST   **4 hours**
     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"
3   GRAMMAR   **26 hours**
     3.1   Sentence Structure.
     3.2   Tenses.
     3.3   Parts of speech.
     3.4   Punctuation.
  3.5   Change of Narration.
  3.6   One word for several
  3.7   Words often confused
4.   COMPOSITION   **8 hours**
  4.1   Letters/Messages
     4.2   Job application letter
     4.3   For character certificate/for grant of scholarship
     4.4   Telegrams, Cablegrams and Radiograms, Telexes, Facsimiles
     4.5   Essay writing
     4.6   Technical Education, Science and Our life, Computers, Environmental Pollution, Duties of a Student.
5.   TRANSLATION   **10 hours**
     5.1   Translation from Urdu into English.
  For Foreign Students: A paragraph or a dialogue.

RECOMMENDED TEXT BOOK
1.   Technical English developed by Mr. Zia Sarwar, Mr. Habib-ur –Rehman, Evaluated by

     Mr.Zafar Iqbal Khokhar, Mr. Zahid Zahoor, Vol - I, National Book Foundation

ENG-112   ENGLISH

INSTRUCTIONAL OBJECTIVES

PAPER-A

1.   DEMONSTRATE   BETTER   READING,   COMPREHENSION   AND VOCABULARY
1.1   Manipulate, skimming and scanning of the text.
1.2   Identify new ideas.
1.3   Reproduce facts, characters in own words
    1.4   Write summary of stories

2.   UNDERSTAND FACTS OF THE TEXT
2.1   Rewrite words to fill in the blanks recalling the text.
2.2   Use own words to fill in the blanks.

PAPER-B

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

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

5.   APPLIES RULES OF TRANSLATION
5.1   Describe confusion.
5.2   Describe rules of translation.
    5.3   Use rules of translation from Urdu to English in simple paragraph and sentences.

APPLIED MATHEMATICS-I

	T	P	C
	3	0	3

Total Contact Hours:	
Theory:	96
Practical:	0

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

AIMS After completing the course the students will be able to

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

COURSE CONTENTS

1   QUADRATIC EQUATIONS   6 Hrs
1.1   Standard Form
1.2   Solution
1.3   Nature of roots
1.4   Sum & Product of roots
1 .5   Formation
1.6   Problems

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

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

4   BINOMIAL THEOREM   6 Hrs
4.1   Factorials
4.2   Binomial Expression
4.3   Binomial Co-efficient
4.4   Statement

11   VECTORS   **9 Hrs**
11.1   Sealers & Vectors
11.2   Addition & Subtraction
11.3   The unit Vectors I, j, k
11.4   Direction Cosines
11.5   Sealer or Dot Product
11.6   Deductions
11.7   Dot product in terms of orthogonal components
11.8   Deductions
11.9   Analytic Expression for a x b.
11.10 Problems.

12   MATRICES AND DETERMINANTS   **9 Hrs**
12.1   Definition of Matrix
12.2   Rows & Columns
12.3   Order of a Matrix
12.4   Algebra of Matrices
12.5   Determinants
12.6   Properties of Determinants
12.7   Solution of Linear Equations
12.8   Problems

REFERENCE BOOKS

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

Math-113   APPLIED MATHEMATICS-I

INSTRUCTIONAL OBJECTIVES

1   USE DIFFERENT METHODS FOR THE SOLUTION OF QUADRATIC EQUATIONS
1.1   Define a standard quadratic equation.
1.2   Use methods of factorization and method of completing the square for solving the equations.
1.3   Derive quadratic formula.
1.4   Write expression for the discriminant
1.5   Explain nature of the roots of a quadratic equation.
1.6   Calculate sum and product of the roots.
1.7   Form a quadratic equation from the given roots.
1.8   Solve problems involving quadratic equations.

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

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

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

5   RESOLVE   A   SINGLE FRACTIONINTO PARTIALFRACTIONS USINGDIFFERENT METHODS.
5.1   Define a partial fraction, a proper and an improper fraction.
5.2   Explain all the four types of partial fractions.
5.3   Set up equivalent partial fractions for each type.
5.4   Explain the methods for finding constants involved.
5.5   Resolve a single fraction into partial fractions.
5.6   Solve problems involving all the four types.

6   UNDERSTAND SYSTEMS OF MEASUREMENT OF ANGLES.

6.1   Define angles and the related terms.

6.2   Illustrate the generation of angle.

6.3   Explain sexagesimal and circular systems for the measurement of angles

6.4   Derive the relationship between radian and degree.

6.5   Convert radians to degrees and vice versa.

6.6   Derive a formula for the circular measure of a central angle.

6.7   Use this formula for solving problems.

7 APPLY BASIC CONCEPTS AND PRINCIPLES OF TRIGONOMETRICFUNCTIONS

7.1   Define the basic trigonometric functions/ratios of an angle as ratios of the sides of a right triangle.

7.2   Derive fundamental identities.

7.3   Find trigonometric ratios of particular angles.

7.4   Draw the graph of trigonometric functions.

7.5   Solve problems involving trigonometric functions.

8 USE TRIGONOMETRIC IDENTITIES IN SOLVING TECHNOLOGICALPROBLEMS

8.1   List fundamental identities

8.2   Prove the fundamental law

8.3   Deduce important results

8.4   Derive-sum and difference formulas

8.5   Establish half angle, double angle & triple angle formulas

8.6   Convert sum or difference into product& vice versa

8.7   Solve problems

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

9.1   Define angle of elevation and angle of depression.

9.2   Prove the law of sins and the law of cosines.

9.3   Explain elements of a triangle.

9.4   Solve triangles and the problems involving heights and distances.

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

10.1   Define menstruation of plane and solid figures

10.2   List formulas for perimeters & areas of plane figure.

10.3   Define pyramid and cone.

10.4   Define frusta of pyramid and cone.

10.5   Define a sphere and a shell.

10.6   Calculate the total surface and volume of each type of solid.

10.7   Compute weight of solids.

10.8   Solve problems of these solids.

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

11.1   Define vector quantity.

11.2   Explain addition and subtraction of vector

11.3   Illustrate unit vectors I, j, k.

11.4   Express a vector in the component form.

11.5   Explain magnitude, unit vector, direction cosines of a vector.

11.6   Derive analytic expression for dot product and cross product of two vector.

11.7   Deduce conditions of perpendicularly and parallelism of two vectors.

11.8   Solve problems

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

12.1   Define a matrix and a determinant.

12.2   List types of matrices.

12.3   Define transpose, ad joint and inverse of a matrix.

12.4   State properties of determinants.

12.5   Explain basic concepts.

12.6   Explain algebra of matrices.

12.7   Solve linear equation by matrices.

12.8   Explain the solution of a determinant.

12.9   Use Crammers Rule for solving linear equations

APPLIED PHYSICS

	T	P	C
	2	3	3

Total Contact Hours:	
Theory:	64
Practical:	96

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

COURSE CONTENTS

1 **MEASUREMENTS. 2 Hours.**
    1.1   Fundamental units and derived units
    1.2   Systems of measurement and S.I. units
    1.3   Concept of dimensions, dimensional formula
    1.4   Conversion from one system to another
    1.5   Significant figures

2 **SCALARS AND VECTORS. 4 Hours.**
    2.1   Revision of head to tail rule
    2.2   Laws of parallelogram, triangle and polygon of forces
    2.3   Resolution of a vector
    2.4   Addition of vectors by rectangular components
    2.5   Multiplication of two vectors, dot product and cross product

3 **MOTION 4 Hours.**
    3.1   Review of laws and equations of motion
    3.2   Law of conservation of momentum
    3.3   Angular motion
    3.4   Relation between linear and angular motion
    3.5   Centripetal acceleration and force
    3.6   Equations of angular motion

4 **TORQUE, EQUILIBRIUM AND ROTATIONAL INERTIA. 4 Hours.**
    4.1   Torque
    4.2   Centre of gravity and centre of mass
    4.3   Equilibrium and its conditions
    4.4   Torque and angular acceleration
    4.5   Rotational inertia

5 **WAVE MOTION. 5 Hours**
    5.1   Review Hook's law of elasticity
    5.2   Motion under an elastic restoring force

5.3   Characteristics of simple harmonic motion
5.4   S.H.M. and circular motion
5.5   Simple pendulum
5.6   Wave form of S.H.M.
5.7   Resonance
5.8   Transverse vibration of a stretched string

6   SOUND.   5 Hours
6.1   Longitudinal waves
6.2   Intensity, loudness, pitch and quality of sound
6.3   Units of Intensity, of level and frequency response of ear
6.4   Interference of sound waves, silence zones, beats
6.5   Acoustics
6.6   Doppler effect.

7   LIGHT.   5 Hours
7.1   Review laws of reflection and refraction.
7.2   Image formation by mirrors and lenses
7.3   Optical instruments
7.4   Wave theory of light
7.5   Interference, diffraction, polarization of light waves
7.6   Applications of polarization of light waves

8   OPTICAL FIBER.   2 Hours
8.1   Optical communication and problems
8.2   Review total internal reflection and critical angle
8.3   Structure of optical fiber
8.4   Fiber material and manufacture
8.5   Optical fiber - uses.

9   LASERS.   3 Hours
9.1   Corpuscular theory of light
9.2   Emission and absorption of light
9.3   Stimulated absorption and emission of light
9.4   Laser principle
9.5   Structure and working of lasers
9.6   Types of lasers with brief description.
9.7   Applications (basic concepts)
9.8   Material processing
9.9   Laser welding
9.10   Laser assisted machining
9.11   Micro machining
9.12   Drilling, scribing and marking
9.13   Printing
9.14   Laser in medicine

10   HEAT.   4 Hours

10.1   Review of calorimetric and gas laws and mode of transfer of heat
10.2   Thermal expansion of solids, liquids and gases
10.3   Heat of fusion, vaporization
10.4   Humidity, absolute and relative
10.5   Law of cooling
10.6   Thermoelectricity
10.7   Thermocouple.

11   THERMODYNAMICS.   4 Hours

11.1   Heat energy and internal energy
11.2   First law of thermodynamics & applications
11.3   Isometric and adiabatic processes
11.4   Efficiency of heat engine
11.5   Second law of thermodynamics (both statements)
11.6   Heat engine and refrigerator.

12   TRANSFER OF HEAT.

5 Hours

12.1   Review: Modes of transfer of heat
12.2   Emission and absorption of heat
12.3   Black body radiation
12.4   Laws of energy distribution
12.5   Planck's quantum theory
12.6   The photoelectric effects
12.7   X-ray, production, properties and uses

13   ELECTROMAGNETIC WAVES.

3 Hours

13.1   Magnetic held around a current carrying conduction
13.2   Electric field induced around a changing magnetic flux
13.3   Moving fields
13.4   Types of electromagnetic waves
13.5   Generation of radio waves
13.6   Spectrum of electromagnetic waves

14   ATOMIC NUCLEUS.

5 Hours

14.1   Structure of the nucleus
14.2   Radioactivity
14.3   Radioactive series
14.4   Transmutation of elements
14.5   The fission reaction
14.6   The fusion reaction
14.7   The nuclear reactor

15   NUCLEAR RADIATIONS.

5 Hours

15.1   Properties and integration with matter

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 ELECTRO-MAGNETIC WAVES.
14.1   Explain magnetic field due to current and electric field due to changing magnetic flux

14.2 Explain moving fields
14.3 Describe types of electromagnetic waves
14.4 Explain generation of ratio waves
14.5 Explain spectrum of electromagnetic waves

15. UNDERSTAND THE STRUCTURE OF THE ATOMIC NUCLEUS AND RELEVANT ACTIVITIES.
15.1 Describe the structure of the nucleus
15.2 Explain Radioactivity and Radioactive series
15.3 Explain transmutation of elements
15.4 Distinguish between fission reaction and fusion reaction
15.5 Explain the structure and working of the nuclear reactor

16. UNDERSTAND NUCLEAR RADIATIONS THEIR EFFECTS AND USES.
16.1 Describe properties of nuclear radiations and their interaction with matter
16.2 Explain working of radiations detectors
16.3 Explain damaging effects of nuclear radiation
16.4 Explain radiations therapy
16.5 Describe radioactive tracers

17. UNDERSTAND TYPES AND USES OF ARTIFICIAL SATELLITES.
17.1 Explain escape velocity
17.2 Explain orbital velocity
17.3 Distinguish between geosynchronous and geostationary satellite
17.4 Describe uses of artificial satellite in data communications

18. UNDERSTAND BASIC CONCEPTS AND CLASSIFICATION OF MAGNETIC MATERIALS.
18.1 Explain domains theory of magnetism
18.2 Distinguish between Para, dia and ferromagnetism and magnetic materials
18.3 Distinguish between B and H
18.4 Describe B.H. Curve
18.5 Describe hysterisis loop.

19. UNDERSTAND BASIC CONCEPTS OF SEMI-CONDUCTOR MATERIALS AND THEIR USES.
19.1 Explain crystalline structure of solids
19.2 Distinguish between conductors, semi conductors and insulators
19.3 Describe semi conductors giving example with reference to their structure
19.4 Distinguish between P-type and N-type materials
19.5 Explain working of P-N junction as a diode
19.6 Explain working of solar cell

LIST OF PRACTICAL   **96 Hours**

1.   Draw graph representing the functions:
   a) $Y = mx$ for m=0, 0.5, 1, 2
   b) $Y = X2$
   c) $Y = 1/x$
2.   Find the volume of a given solid cylinder using vernier calipers.
3.   Find the area of cross-section of the given wire using micrometer screw gauge.
4.   Prove that force is directly proportional to (a) mass, (b) acceleration, using fletchers' trolley.
5.   Verify law of parallelogram of forces using Grave-sands apparatus.
6.   Verify law of triangle of forces and Lami's theorem
7.   Determine the weight of a given body using
   a)   Law of parallelogram of forces
   b)   Law of triangle of forces
   c)   Lami's theorem
8.   Verify law of polygon of forces using Grave-sands apparatus
9.   Locate the position and magnitude of resultant of like parallel forces
10.   Determine the resultant of two unlike parallel forces
11.   Find the weight of a given body using principle of moments
12.   Locate the centre of gravity of regular and irregular shaped bodies
13.   Find Young's Modules of Elasticity of a metallic wire.
14.   Verify Hook's Law using helical spring.
15.   Study of frequency of stretched string with length
16.   Study of variation of frequency of stretched spring with tension
17.   Study resonance of air column in resonance tube and find velocity of sound.
18.   Find the frequency of the given tuning fork using resonance tube.
19.   Find velocity of sound in rod by Kundt's tube.
20.   Verify rectilinear propagation of light and study shadow formation
21.   Study effects of plane mirror on reflection
22.   Compare the reflective indices of given glass slabs
23.   Find focal length of concave mirror by locating centre of curvature
24.   Find focal length of concave mirror by object and image method
25.   Find focal length of concave mirror with converging lens
26.   Find reflective index of glass by apparent depth
27.   Find reflective index of glass by spectrometer
28.   Find focal length of converging lens by plane mirror
29.   Find focal length of converging lens by displacement methods
30.   Find focal length of diverging lens using converging lens
31.   Find focal length of diverging lens using concave mirror
32.   Find angular magnification of an astronomical telescope.
33.   Find angular magnification of a simple microscope (magnifying glass)
34.   Find angular magnification of a compound microscope
35.   Study working and structure of camera
36.   Study working and structure of sextant
37.   Compare the different scales of temperature and verify the conversion formula

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

TECHNICAL DRAWING & CAD

T	P	C
1	6	3

Total Contact Hours:	
Theory:	32
Practical:	192

Aims: After completing this section the students will be able to:

1- Develop sketches, solid models, surfaces and assemblies.

1. **USES AND APPLICATIONS OF TECHNICAL DRAWING** 1 Hours
   - 1.1. Technical drawing and the technician.
   - 1.2. Use of technical drawing.
   - 1.3. Common drawing formats.
   - 1.4. Application of drawing formats.
   - 1.5. Title Block

2. **DRAWING TOOLS AND ACCESSORIES.**   2 Hours
   - 2.1. Drawing pencil & Drawing pen
   - 2.2. Technical Drawing Scales
   - 2.3. Drawing Instruments
   - 2.4. Use and care of drawing instruments and material.

3. **LETTERING.**   2 Hours
   - 3.1. Importance of good lettering.
   - 3.2. Single stroke of gothic.
   - 3.3. Letter guidelines.
   - 3.4. Inclined single stroke gothic
   - 3.5. Application of font size

4. **GEOMETRICAL CONSTRUCTIONS**   3Hours
   - 4.1. Introduction to sketching techniques
   - 4.2. Sketching lines
   - 4.3. Sketching circles and arcs
   - 4.4. Sketching ellipse.
   - 4.5. Sketching views of objects, square and rectangle
   - 4.6. Polygon
   - 4.7. Bisection of a straight line
   - 4.8. Division of straight line in different parts
   - 4.9. Drawing of different angles and their bisectors
   - 4.10. Introduction to geometry
   - 4.11. Basic geometrical constructions

4.12. Construction of ellipse, parabola & hyperbola

4.13. Involutes and cycloids

5. DEVELOPMENTS OF GEOMETRICAL SOLIDS   2 Hours

5.1. Cylinder

5.2. Cone

5.3. Prism

5.4. Pyramid

6. CONIC SECTIONS   2 Hours

6.1. Description of conic sections

6.2. Definition of circles ellipse parabola & Hyperbola

6.3. Drawing of ellipse parabola Hyperbola

6.4. Construction of auxiliary views and sections

7. INTERSECTIONS OF GEOMETRICAL SOLIDS   2 Hours

7.1. Intersection of plane surfaces.

7.2. Intersection of Geometrical solids:

7.2.1. Curved surfaces

7.2.2. Cylinder & Cylinder

7.2.3. Cylinder & Cube

7.2.4. Cylinder & Cone

8. INTRODUCTION TO MULTI-VIEW PROJECTIONS   2 Hours

8.1. Definition and concept of Multi-view drawings

8.2. Orthographic projections

8.3. Principal views

8.4. Arrangement of views

8.5. Multi-view drawings, cross-sectional views

9. INTRODUCTION TO PICTORIAL DRAWINGS.   2 hours

9.1. Definition of pictorial views

9.2. Three types of pictorial views

9.3. Isometric sketching of rectangular block

9.4. Isometric sketching of cylinder & cube,

10. SECTIONAL VIEWS.   2 Hours

10.1. Definition and purpose.

10.2. Cutting planes position and cutting plane lines

10.3. Types of sectional views.

10.4. Conventional section lines of different materials.

10.5. Practice sectioned views (H.I-section, channels, angles)

11. FASTNERS   2 Hours

11.1. Terminology, types and drawing of rivets and riveted joints

11.2. Terminology, Types and drawing of screw threads

11.3. Terminology and drawing of keys and cotters

12. BASIC DIMENSIONING.   1 Hours
12.1. Definition of dimensioning.

12.2. Types of dimensioning.

12.3. System of measurements.

12.4. Dimensioning of Multi-view drawings.

12.5. Dimensioning rules and practices.

12.6. Notes and specification

12.7. Part list

13. DRAWING SYMBOLS   2 Hours
13.1. Welding symbols

13.2. Thread symbols External & internal

14. INTRODUCTION OF CAD   1 Hour
14.1. Introduction of CAD

14.2. Requirement of CAD

14.3. Introduction of Software

15. SOLID MODELING   2 Hours
15.1. Creating Sketches

15.2. Constraining

15.3. Feature Modeling

15.4. Arrays/Patterns

16. FREE FORM MODELING   2 Hours
16.1. Using meshes of curves

16.2. Swept and N sided surfaces

16.3. Styled surfaces

16.4. Blending surfaces

16.5. Editing free form surfaces

                                                                   1 Hour
17. ASSEMBLY MODELING
17.1. Creating new assembly models

17.2. Understanding assembly constraints status

17.3. Creating and managing explode states

18. STANDARD DRAFTING   1 Hour
18.1. Introduction to drafting

18.2. Placement of views

18.3. Sectional views

18.4. Dimensioning

18.5. Assembly drawing

18.6. Exploded views

TECHNICAL DRAWING & CAD

INSTRUCTIONAL OBJECTIVES

1. **USES AND APPLICATIONS OF TECHNICAL DRAWING**
   - 1.1. **Know the uses of Technical Drawing**
     - 1.1.1. Describe & Explain the importance of Technical Drawing from the point of view of a Technician
   - 1.2. **Recognizes the different application of Technical drawing**
     - 1.2.1. Identify, Illustrate and differentiate the commonly used drawing formats

2. **DRAWING TOOLS AND ACCESSORIES**
   - 2.1. Identify the uses of different pencils for Technical Drawing.
   - 2.2. Identify different paper sizes for drawing.
   - 2.3. Identify different types of papers suitable for drawing.
   - 2.4. Identify different types of erasers and their uses.
   - 2.5. Maintain a will sharpened pencil for drawing.
   - 2.6. Describe the working of drawing instruments.

3. **LETTERING**
   - 3.1. Know the importance of lettering in a Technical engineering drawing.
   - 3.2. Identify the letter style used in Technical drawing.
   - 3.3. State letter strokes and guide lines.
   - 3.4. Observe stability and pleasing appearance of letters in printing

4. **GEOMETRICAL CONSTRUCTIONS**
   - 4.1. Draw circular an arc using circular line method.
   - 4.2. Draw a circular arc using square method.
   - 4.3. Draw an ellipse using rectangular method.
   - 4.4. Sketching of elapse (Concentric, Four Centre)
   - 4.5. Draw views of simple objects.
   - 4.6. Bisection of a straight line
   - 4.7. Division of a straight line in different parts
   - 4.8. Construct various triangles
   - 4.9. Define common terms used in geometrical construction.
   - 4.10. Explain different geometrical shapes, surfaces of objects.
   - 4.11. Draw involutes & cycloids.

5. **DEVELOPMENT OF GEOMETRICAL SOLIDS**
   - 5.1. **Knows the development of lateral surfaces of geometrical solids**
     - 5.1.1. Describe the principle and step by step procedure of development
   - 5.2. **Understand procedure of development of solids bounded by plane surfaces and single curved surfaces**
     - 5.2.1. Draw development of truncated right prism and cylinder
     - 5.2.2. Draw development of frustum, truncated right cone and pyramid

6. CONIC SECTIONS
6.1.   **Understand conic sections**
6.1.1. Define conic sections

6.1.2. Explain principles of developing circle, ellipse, parabola and hyperbola

6.1.3. Draw ellipse, parabola and hyperbola by different methods.

7. INTERSECTIONS OF GEOMETRICAL SOLIDS
7.1.   **Understand concept of intersection**
7.1.1. Develop intersectional curves between intersectional solids

8. INTRODUCTION TO MULTI VIEW PROJECTIONS
8.1.   The concept of mutli-view

8.2.   Principle planes of projections.

8.3.   Orthographic method of projection.

8.4.   Explain the 1st and 3rd angle projections.

9. INTRODUCTION TO PICTORIAL DRAWINGS
9.1.   Concept of pictorial drawing

9.2.   The pre-requisite of pictorial drawing.

9.3.   Drawing of isometric views of Various 3-D projects

10. SECTIONAL VIEWS.
10.1.   The purpose and concept of sections

10.2.   Describe cutting planes and lines.

10.3.   State types of sectional views.

11. FASTNERS.
11.1.   Importance and types of fasteners

11.2.   Applications of various fasteners

11.3.   Threads and their types

12. BASIC DIMENSIONS
12.1.   Definition of dimensioning.

12.2.   Identify the types of dimensioning.

12.3.   Identify the system of measurements.

12.4.   The general rules for dimensioning.

12.5.   Indicate notes and Bill of Material generation

13. DRAWING SYMBOLS
13.1.   **Understand the basic concept of drawing symbols**
13.1.1. Describe graphical symbol representation
13.2.   **State the usage and application of graphical symbols**
13.2.1. Detail description of welding symbols

14. INTRODUCTION TO CAD

    14.1.   Importance and application of CAD

15. SOLID MODELING
    15.1.   Creation of sketches
    15.2.   Applications of dimensional and geometric constraints
    15.3.   Edit/modify sketches
    15.4.   Applying Position form features
    15.5.   Creating Primitives

16. FREE FORM MODELING
    16.1.   Application of curves and surfaces
    16.2.   Constraining (continuity) of curves & surfaces
    16.3.   Edit, modify, bridging and patching of surfaces

17. ASSEMBLY THEORY
    17.1.   Assembly approaches (Top-down & Bottom-up)
    17.2.   Understanding assembly constraints
    17.3.   Creation of exploded assemblies
    17.4.   Virtual sectioning

18. STANDARD DRAFTING
    18.1.   Importance of drafting
    18.2.   Annotation and Preferences setup
    18.3.   Views creation
    18.4.   Section views
    18.5.   Dimensioning
    18.6.   Format creation
    18.7.   Assembly drawing and ballooning
    18.8.   Creation of Bill of Material (BOM)

TECHNICAL DRAWING & CAD

LIST OF TECHNICAL DRAWING PRACTICALS   192 Hours

1. Lettering 5mm height
2. Use of Tee Square and set squares for drawing horizontal, vertical and inclined lines.
3. Use of compass, circles, half circles, radius.
4. Construction of Lettering
5. Draw round corners, figure inside and outside circle.
6. Construction of quadrilateral square rhombus, rectangle and parallelogram
7. Construction of parallel-lines, perpendicular, bisector line and angles.
8. Construction of equal division of line & various radii with the help of compass & set square.
9. Construction of inscribes and circumscribes square, triangle and hexagon.
10. Construction of polygon, five, six, seven and eight sides.
11. Construction of inscribe pentagon in a circle-12. Construction of tangent of circle inside and outside
13. Construction of elliptical curve.
14. Construction of parabola curve
15. Construction of hyperbola curve
16. Construction of involutes and cycloids
17. Orthographic projection 1 and 3rd angle of a cube
18. Orthographic projection 1 and 3rd angle of a Step Block
19. Orthographic projection 1 and 3rd angle of a Vee block
20. Orthographic projection 1 and 3rd angle of any Given Block
21. Different types of sectioning
22. Section of a cube, Step Block, Vee Block or any given Block
23. Isometric drawings of a cube, Step Block, Vee Block or any Given Block
24. Finding the mistakes and errors in the given drawings
25. Isometric scale and development of cube
26. Development of Prism, Cylinder, Cone and Pyramid
27. Development of the truncated Prism, Cylinder, Cone and Pyramid
28. Isometric and orthographic views of hexagonal nut and bolt.
29. Different types of threads and their drawings
30. Different types of rivets and their drawings 31. Different types of joints and their drawings
32. Drawing of welding symbols.
33. Draw sectioning symbols for different materials.

LIST OF CAD PRACTICALS

1. Drafting sheet selection and setting its preferences
2. Opening Software pan, zoom, rotate commands
3. Planes orientation and selection
4. Sketch Creation, line, circle, rectangle, ellipse, close profile
5. Using extrude , revolve, blend commands
6. Using Position form features
7. Application of edge blends, shell, chamfer, mirror, scale, copy, paste commands
8. Understanding Splines
9. Understanding and creation of different types of curves
10. Creation of primitives
11. Application of face, soft, styled blends and corners
12. Application of Mesh surfaces
13. Application of Sweep commands
14. Drafting of different models in isometric and orthographic views
15. Drafting of assembly with BOM generation

RECOMMENDED BOOKS

1) Engineering Drawing. by French &Vierck.
2) Geometrical Drawing by N.D. Bhatt.
3) 1st Year Engineering Drawing by A.C. Parkinson.
4) NX 8 for Designers by Prof. Sham Tickoo Purdue Univ. and CADCIM Technologies

BENCH WORK

(GENERAL METAL, WOODWORK)

	T	P	C
	2	12	6

Total Contact Hours:	
Theory:	64
Practical:	384

AIMS: The student will be familiarized with the Tools, Equipments, Machines used in the metal work,. The student will achieve the basic skills in the above fields by preparing specific jobs in each part of the subject.

COURSE CONTENTS

1. **Working Safely**   04 Hours
    1.1. Introduction
    1.2. Importance Of Safety
    1.3. Rules For Working Safely

2. **Work Holding Devices**   04 Hours
    2.1. Leg vice
    2.2. Pipe vice
    2.3. Parallel vice
    2.4. Soft jaws
    2.5. Machine vice
    2.6. Hand vice
    2.7. Pin vice
    2.8. C-clamp

3. **Filing**   06 Hours
    3.1. Introduction Files
    3.2. The Convexity Of The Files
    3.3. The Corse Section Of Files
    3.4. File Cut
    3.5. Forms Of File Teeth
    3.6. Needle Files
    3.7. Rotary Files
    3.8. Filing Cutting Speed And Feeds

4. **Hacksaw**   04 Hours
    4.1. The Hacksaw Blades
    4.2. Cutting Of Hack Sawing
    4.3. The Slotting Saw

4.4. Hole Saws

5. Machine Saw   02 Hours
  5.1. Power Saw
  5.2. Power Saw Blades

6. Hand Tools   04 Hours
  6.1. Chisels
  6.2. Scrapers
  6.3. Hand Shear
  6.4. Wire Cutters
  6.5. Hammers

7. Assembly Tools   04 Hours
  7.1. Screwdrivers
  7.2. wrenches and spanners

8. Layout Tools /Marking Tools   04 Hours
  8.1. Center Punch
  8.2. Pin Punch
  8.3. Letter And Number Punch
  8.4. Scriber
  8.5. Spring Dividers
  8.6. Squares
  8.7. Surface Plate

9. Measuring Tools   05 Hours
  9.1. Scale
  9.2. Vernier Caliper
  9.3. Vernier Depth Gauge
  9.4. Vernier Height Gauge
  9.5. Protractor
  9.6. Micrometers
  9.7. Dial Indicators
  9.8. Dividers
  9.9. Calipers
  9.10. Surface Gauge

10 .Comparing Tools   05 Hours
  10.1   Angle Measuring Instruments
  10.2   Grinding Gauges
  10.3   Radius Gauge
  10.4   Thread Pitch Gauges
  10.5   Feeler Gauge
  10.6   Slip Gauges
  10.7   Try Square
  10.8   Bevel Edge
  10.9   Straight edge

11. Drilling   05 Hours
  11.1   Drilling Machine

11.2　　Hand Drill Machine
　　　11.3　　Pedestal Drilling Machine
　　　11.4　　Vertical Drilling Machine
　　　11.5　　Multi Spindle Drilling Machine

12.　Hand Reamers　　　　　　　　　　　　　　　　　　　　　02 Hours

　　　12.1　　Introduction reamers
　　　12.2　　Types of reamers
　　　12.3　　Uses of reamers

13.　Wood Working Tools.　　　　　　　　　　　　　　　　　05 Hours

　　　　　13.1　　Wood working shop orientation.
　　　　　13.2　　Impact Tools.
　　　　　13.3　　Measuring Tools.
　　　　　13.4　　Cutting Tools.
　　　　　13.5　　Marking Tools.
　　　　　13.6　　Holding Tools.

14.　　Wood Working Machines.　　　　　　　　　　　　　05 Hours

　　　　　14.1　　Introduction
　　　　　14.2　　Radial saw
　　　　　14.3　　Circular Saw.
　　　　　14.4　　Band Saw.
　　　　　14.5　　Jointer
　　　　　14.6　　Wood turning lathe

15. WOOD CUTS AND WOOD JOINTS.　　　　　　　　　05 Hours

　　　15.1.　　Types and uses of wood cuts.
　　　15.2.　　Classification and uses of wood joints.
　　　15.3.　　Making wood cuts and wood joints.
　　　15.4.　　Wood glue and wood fastener.
　　　15.5.　　Kind & seasoning of wood.

BENCH WORK
(**GENERAL METAL AND WOODWORK**)

INSTRUCTIONAL OBJECTIVES

A) GENERAL METAL

1. **FAMILIAR THE STUDENT WITH THE SHOP LAYOUT & RULES AND ITS ENVIRONMENTS.**
   1.1. Describe the shop working policies
   1.2. Describe the basic concept of general metal shop
   1.3. Name Shop Tools
   1.4. Explain power driven tools
   1.5. Describe safety rules of the shop

2. **METAL WORK TOOLS AND MACHINES**
   2.1. Understand metal working hand tools.
      2.1.1. Classify metal working hand tools
      2.1.2. Describe measuring tools
      2.1.3. Describe Layout tools & Practice
      2.1.4. Describe cutting tools & practice
      2.1.5. Describe chisels & chiseling
      2.1.6. Describe files and filling
      2.1.7. Describe Hack saw and Hack sawing
      2.1.8. Describe drills and drilling
      2.1.9. Describe hand Threading
      2.1.10. Describe miscellaneous tools and related practice
   2.2. Understand the metal working machines.
      2.2.1. Explain the construction and working of drilling machine
      2.2.2. State safety precautions and proper care of metal working tools.

B) WOOD WORK

3. **UNDERSTAND WOOD WORKING SHOP POLICIES, HAND TOOLS AND EQUIPMENT SUPPORTING WOOD WORKING SHOP**
   3.1. Describe the shop working policies
   3.2. Describe the basic concept of wood work shop
   3.3. Classify different wood working hand tools
   3.4. Classify different wood working hand tools according to functions
   3.5. Describe the use of Impact tools
   3.6. Describe the use of various cutting tools.
   3.7. Describe the use of various measuring tools.
   3.8. Describe the use of different marking tools.
   3.9. Describe the use of holding tools.
   3.10. Describe sharpening of wood cutting tools.
   3.11. State safety precautions and proper care of wood working hand tools.

4. **OPERATES EFFECTIVELY ALL WOOD WORKING MACHINES**
    4.1. Name various wood working machines.
    4.2. Classify wood working machine according to their uses.
    4.3. Explain the radial saw.
    4.4. Explain the circular saw.
    4.5. Explain the Band saw.
    4.6. Explain the jointer and planner. 4.7. Explain the wood turning lathe.
    4.8. Explain the application of radial saw.
    4.9. Explain the application of circular saw.
    4.10. Explain the application of band saw.
    4.11. Explain the application of jointer and planner.
    4.12. Explain the application of wood turning lathe.
    4.13. Describe safety precaution and proper care of wood working machines

5. **PREPARE THE WOOD CUTS AND WOOD JOINTS ACCORDING TO THE SPECIFICATION AND SIZES.**
    5.1. Describe the woodcuts and types of joints.
    5.2. Explain the use of wood joints
    5.3. Select the appropriate joint for the given application
    5.4. Describe cross halving wood joint.
    5.5. Describe dovetail joint.
    5.6. Describe mortise and tenon joints.
    5.7. Describe dado joint.
    5.8. Describe the open corner joint.
    5.9. Describe the hidden corner joint.
    5.10. Describe wood joint glue.
    5.11. Describe wood fasteners.
    5.12. Describe sharpening of hand tools.
    5.13. Describe kind of wood.
    5.14. Explain seasoning methods of wood.

BENCH WORK
(GENERAL METAL AND WOODWORK)

LIST OF PRACTICALS

A) Metal Shop   288 Hours
1. Preparation of name plate.
2. Introduction to file and filing
3. Sawing exercise
4. Preparation of inside caliper.
5. Preparation of Bottle opener.
6. Preparation of dove-tail joint.
7. Preparation of small size Try-square
8. Preparation of Spanner (small size)

B) Wood Working Shop   96 Hours
1. Safety precautions in wood working shop.
2. Assembly and disassembly of jack-plane.
3. Using of various wood working planes. (Tool exercise.)
4. Planning and squaring to dimensions.
5. Sharpening plane- iron.
6. Introducing different wood working, layout and measuring tools.
7. Sawing exercise.
8. Identifying different types of 'handsaws' and making sketches of all saws.
9. Sharpening band saws.
10. Wood chiseling (Chipping).
11. Making mortise &tanon joint.
12. Sharpening wood chisel.
13. Making dado-joint.
14. Making cross-lap joint.
15. Observing wood structure.
16. Identifying and comparing soft and hard wood.
17. Spirit polishing (preparing wood surface for polishing, staining and lacquering.
18. Boring process, making holes of different diameters in wood.
19. Nailing and wood screwing process.
20. Making middle half cross- lap joint.
21. Making dove-tail joint.
22. Wood working projects etc.

Ch-112

APPLIED CHEMISTRY

	T	P	C
	1	3	2

Total Contact Hours:		
Theory:		32
Practical:		96

CH – 112   APPLIED CHEMISTRY

Total Contact Hours   **128**   **T**   **P**   **C**
Theory   32 hours   1   3   2
Practical   96 hours
Pre-requisites: The student must have studied the subject of elective chemistry at secondary

school level.

COURSE 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 acquired with the basic principles of chemistry as applied in the study of relevant technology.
3.   Know the scientific methods for production, and use of materials of industrial & technological significance.
4.   Gains 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 & pie 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 and removal)

   4.4   Scales of measuring hardness (degrees Clark French, PPM, Mg-   per liter)

   4.5   Boiler feed water, scales and treatment

   4.6   Sea water desalination, sewage treatment

5.   ACIDS, BASES AND SALTS   2 Hours

   5.1   Definitions with examples

   5.2   Properties, their strength, basicity and acidity

   5.3   Salts and their classification with examples

   5.4   Ph – value and scale

6.   OXIDATION & REDUCTION   2 Hours

   6.1   The process, definition and examples

   6.2   Oxidizing and reducing agents

   6.3   Oxides and their classifications

7.   NUCLEAR CHEMISTRY   2 Hours

   7.1   Introduction

   7.2   Radioactivity (alpha, beta and gamma rays)

   7.3   Half life process

   7.4   Nuclear reaction and transformation of elements

8.   CEMENT   2 Hours

   8.1   Introduction

   8.2   Composition and manufacture

   8.3   Chemistry of setting and hardening

   8.4   Special purpose cements

9.   GLASS   2 Hours

   9.1   Composition and raw material

   9.2   Manufacture

   9.3   Varieties and uses

10.   PLASTICS AND POLYMERS   2 Hours

   10.1   Introduction and importance

   10.2   Classification

   10.3   Manufacture

   10.4   Properties and uses

11.   PAINTS, VARNISHES AND DISTEMPER   2 Hours

11.1 Introduction

11.2 Constituents

11.3 Preparation and use

12.   CORROSION   2 Hours

12.1 Introduction with causes

12.2 Types of corrosion

12.3 Rusting of iron

12.4 Protective measures against corrosion

13.   REFRACTORY MATERIALS AND ABRASIVE   2 Hours

13.1 Introduction to refractories

13.2 Classification of refractories

13.3 Properties and uses

13.4 Introduction to abrasives

13.5 Artificial and natural abrasives and their uses

14.   ALLOYS   2 Hours

14.1 Introduction with need

14.2 Preparation and properties

14.3 Some important alloys and their composition

14.4 Uses

15.   FUELS AND COMBUSTION   2 Hours

15.1 Introduction of fuels

15.2 Classification of fuels

15.3 Combustion

15.4 Numerical problems of combustion

16.   LUBRICANTS   1 Hours

16.1 Introduction

16.2 Classification

16.3 Properties of lubricants

16.4 Selection of lubricants

17.   POLLUTION   1 Hours

17.1 The problems and its dangers

17.2 Causes of pollution

17.3 Remedies to combat the hazards of pollution

RECOMMENDED BOOKS

1. Text Book of Ch-112, Vol-I, developed by Curriculum Section, Academics wing TEVTA and published by National Book Foundation (NBF)

CH – 112   APPLIED CHEMISTRY
INSTRUCTIONAL OBJECTIVES

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

   Define chemistry and its important terms

   State the units of measurements in the study of chemistry

   Write chemical formula of common compounds

   Describe types of chemical reactions with examples

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

   Define atom

   State the periodic law of elements

   Describe the fundamentals sub atomic particles

   Distinguish between atomic no. And mass no. Isotopes and isobars

   Explain the arrangements of electrons in different shells and sub energy levels

   Explain the grouping and placing of elements in the periodic table

3. **UNDERSTAND THE NATURE OF CHEMICAL BOND**

   Define chemical bond

   Describe the nature of chemical bond

   Differentiate between electrovalent and covalent bonding

   Explain the formation of polar and non polar, sigma and pi-bond with examples

   Describe the nature of coordinate bond with examples

4. **UNDERSTAND THE CHEMICAL NATURE OF WATER**

   Describe the chemical nature of water with its formula

   Describe the general impurities present in water

   Explain the causes and methods to removing hardness of water

   Express hardness in different units like mg / liter, p.p.m, degrees clark and degrees French

   Describe the formation and nature of scales in boiler feed water

   Explain the method for the treatment of scales

   Explain the sewage treatment and desalination of sea water

5. **UNDERSTAND THE NATURE OF ACIDS, BASES AND SALTS**

   Define acids, bases and salts with examples

   State general properties of acids and bases

   Differentiate between acidity and basicity and use the related terms

   Define salts, state their classification with examples

   Explain p-h value of solution and pH-scale

6. **UNDERSTAND THE PROGRESS OF OXIDATION AND REDUCTION**

Define oxidation

Explain the oxidation process with examples

Define reduction

Explain reduction process with examples

Define oxidizing and reducing agents and give at least six examples of each

Define oxides

Classify the oxides and give examples

7.   UNDERSTAND THE FUNDAMENTALS OF NUCLEAR CHEMISTRY

Define nuclear chemistry and radioactivity

Differentiate between alpha, beta and gama particles

Explain half life process

Explain at least six nuclear reactions resulting in the transformation of some elements

State important uses of isotopes

8.   UNDERSTAND THE MANUFACTURE, SETTING AND HARDENING OF CEMENT

Define Portland cement and give its composition

Describe the method of manufacture

Describe the chemistry of setting and hardening of cement

Distinguish between ordinary and special purpose cement

9.   UNDERSTAND THE PROCESS OF MANUFACTURE OF GLASS

Define glass

Describe its composition and raw materials

Describe the manufacture of glass

Explain its varieties and uses

10.   UNDERSTAND THE NATURE AND IMPORTANCE OF PLASTIC AND POLYMERS

Define plastics and polymers

Explain the mechanism of polymerization

Describe the preparation and uses of some plastic / polymers

11.   KNOW THE CHEMISTRY OF PAINTS, VARNISHES AND DISTEMPERS

Define paints, varnishes and distemper

State composition of each

State methods of preparation of each and their uses

12.   UNDERSTAND THE PROCESS OF CORROSION WITH ITS CAUSES AND TYPES

Define corrosion

Describe different types of corrosion. State the causes of corrosion

Explain the process of rusting of iron

Describe methods to prevent/ control corrosion

13.   UNDERSTAND THE NATURE OF REFRACTORY MATERIALS ABRASIVE

Define refractory materials

Classify refractory materials

Describe properties and uses of refractory

Define abrasive

Classify natural and artificial abrasives

Describe uses of abrasives `

14. UNDERSTAND THE NATURE AND IMPORTANCE OF ALLOYS

Define alloy

Describe different methods for the preparation of alloys

Describe important properties of alloys

Enlist some important alloys with their composition, properties and uses

15. UNDERSTAND THE NATURE OF FUELS AND THEIR COMBUSTION

Define fuels

Classify fuels and make distinction of solid, liquid and gaseous fuels

Describe important fuels

Explain combustion

Calculate air quantities in combustion gases

16. UNDERSTAND THE NATURE OF LUBRICANTS

Define a lubricant

Explain the uses of lubricants

Classify lubricants and site examples

State important properties of oils, greases and solid lubricants

State the criteria for the selection of lubricant for particular purpose / job

17. UNDERSTAND THE NATURE OF POLLUTION

Define pollution (air, water, food)

Describe the causes of environmental pollution

Enlist some common pollutants

Explain methods to prevent pollution

Ch-112   **APPLIED CHEMISTRY**

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 he scheme of IV group radicals.
20. To detect and confirm An_{++} and Mn_{++} radicals of IV group.
21. To detect and conform Co_{++} and Ni_{++} radicals of IV group.
22. To get introduction with the Acid Radical Scheme.
23. To detect dilute acid group.
24. To detect and confirm CO''_3 and HCO'_3 radicals.
25. To get introduction with the methods/apparatus of conducting volumetric estimations.
26. To prepare standard solution of a substance.
27. To find the strength of a given alkali solution.
28. To estimate HCO'_3 contents in water.
29. To find out the %age composition of a mixture solution of KNO_3 and KOH volumetrically.
30. To find the amount of chloride ions (Cl') in water volumetrically.

DMT-131

INTRODUCION TO DIES & MOULDS

T	P	C
1	0	1

Total Contact Hours:	
Theory:	32
Practical:	0

AIMS: At the end of this course, the students will be able to adopt safety standards, Codes, Rules etc. to be desired in Industries. He/ She will be able to understand basic concept of dies and moulds manufacturing.

COURSE CONTENTS

1. INTRODUCTION TO DIE & MOULD   3 Hours
   1.1.   Difference b\w die and mould
   1.2.   Sheet metal die
   1.3.   Plastic mould
   1.4.   Pressure die casting die
   1.5.   Rubber mould

2. DIE & MOULD SET   4 Hours
   2.1.   Difference b\w die and mould base
   2.2.   Die set
   2.3.   Mould base
   2.4.   Pressure die casting mould set

3. MAIN PARTS   4 Hours
   3.1.   Guiding system
   3.2.   The die
   3.3.   The punch
   3.4.   Ejector
   3.5.   Injection
   3.6.   Parting line

4. PRODUCTION MACHINES   4 Hours
   4.1.   Injection moulding machine
   4.2.   Pressure die casting machine
   4.3.   Press

5. GENERAL SAFETY   3 Hours
    5.1.   general safety instructions
    5.2.   safety procedures
    5.3.   schedules and planning's

6. ACCIDENTS IN MECHANICAL INDUSTRY.   3 Hours
    6.1.   Material handling and transportation.
    6.2.   Accidents due to hand tools.
    6.3.   Accidents in machines shop.
    6.4.   Accidents in Metal work shop.
    6.5.   Accidents in wood working shop.
    6.6.   Accidents in Foundry welding & forging shop.

7. PERSONNEL PROTECTIVE EQUIPMENTS.   3 Hours
    7.1.   For face and hand protection.
    7.2.   For body protection.
    7.3.   For protection from chemicals & gases

8. ANALYZING CAUSES OF ACCIDENTS.   3 Hours
    8.1.   Accident prevention fundamentals.
    8.2.   Plan inspections. 8.3. Safety inventory.
    8.4. Accidents investigation.
    8.5. Records and reports.

9. FIRST AID.   2 Hours
    9.1.   Importance.
    9.2.   Procedure.
    9.3.   Extended medical services.

10. SAFETY LAWS.   3 Hours
    10.1. Pakistan factory act (laws concerning to safety).
    10.2. Workman compensation act.
    10.3. Industrial insurance.

INTRODUCION TO DIES & MOULDS

INSTRUCTIONAL OBJECTIVES

1. **KNOW THE DIFFERENCE BETWEEN DIFFERENT TYPES OF MOULDS**
   1.1. Difference b\w die and mould
   1.2. Sheet metal die
   1.3. Plastic mould
   1.4. Pressure die casting die
   1.5. Rubber mould

2. **KNOW ABOUT DIE & MOULD SET**
   2.1. Know Difference b\w die and mould base
   2.2. Know about Die set
   2.3. Know about Mould base
   2.4. Know about Pressure die casting mould set

3. **ENLIST MAIN PARTSOF A MOULD AND ITS FUNCTIONS**
   3.1. Guiding system
   3.2. The die
   3.3. The punch
   3.4. Ejector
   3.5. Injection
   3.6. Parting line

4. **KNOW ABOUT THE PRODUCTION MACHINES USED FOR PLASTICS, ALUMINUM AND SHEET METAL**
   4.1. Know the working of Injection moulding machine
   4.2. Know the working of Pressure die casting machine
   4.3. Know the working of Press

5. **KNOW IMPORTANCE OF SAFETY PRACTICES AND ITS NECESSITY IN THE INDUSTRY**
   5.1. Describe safety, accident
   5.2. Describe the importance of safety practices in Institute work shop
   5.3. Describe hazards for not observing safety
   5.4. State necessity of observing safety in the industry

6. **KNOW PRINCIPLE METHOD AND IMPORTANCE OF PERSONAL PROTECTIVE DEVICE**
   6.1. State protective devices
   6.2. List personal protective device
   6.3. State Importance of personal protective devices
   6.4. Describe protection devices for protecting hand and faces
   6.5. Describe protection devices for protecting human body
   6.6. Describe protection devices for protection from chemical gases

7. KNOW THE METHOD OF PROVIDING FIRST AID

   7.1. State the importance of first-aid
   7.2. Explain the methods of providing first aid
   7.3. Describe the step by step procedure of providing medical services

8. UNDERSTAND LAWS REGARDING SAFETY

   8.1. Describe clauses of Pakistan factory act related to safety.
   8.2. Describe workman compensation act.

****

APPLIED ELECTRICITY AND ELECTRONICS

DMT-142

T	P	C
1	3	2

Total Contact Hours:	
Theory:	32
Practical:	96

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

COURSE CONTENTS

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

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

3. **MOTORS, GENERATORS AND TRANSFORMERS**   5 Hours
    3.1. Construction and working of AC and DC generators

3.2. Construction and working of transformers, emf and current equation types

3.3. Welding transformers, ratings

3.4. Types and working of AC motors

    3.4.1. 1- Phase induction motor

    3.4.2. 3- Phase induction motors

3.5. Principle of Induction heating, construction, ratings of induction furnaces

4. **BATTERIES AND CELLS**   2 Hours

4.1. Types of cells, primary, secondary

4.2. Types of secondary cells, voltage ratings

4.3. Charging and discharging of lead acid battery

4.4. Precautions in handling batteries

4.5. Alkaline batteries, ratings

5. **FUNDAMENTALS OF ELECTRONICS**   4 Hours

5.1. Semiconductor theory, doping, P & N type materials

5.2. PN Junction diode, potential barrier, forward and reverse bias

5.3. Use of PN Diode as rectifier

5.4. Half-wave, full-wave and bridge rectifiers

5.5. Filtering

6. **TRANSISTORS**   5 Hours

6.1. PNP & NPN transistors, biasing, working

6.2. Use of transistors as amplifies, gains in CE, CB and CC amplifiers

6.3. Field effect transistors, construction and uses

6.4. Transistors as oscillators

7. **SPECIAL PURPOSE DIODES AND DEVICES**   5 Hours

7.1. Zener diodes, uses, ratings

7.2. Photodiodes, uses

7.3. DIAC, uses

7.4. TRIAC, uses

7.5. Saturable core reactor

8. **THYRISTORS**   3 Hours

8.1. UJT, working, uses as oscillators

8.2. SCR, working, uses as control devices

8.3. Phase control of SCR's

APPLIED ELECTRICITY AND ELECTRONICS

DMT-142

INSTRUCTIONAL OBJECTIVES

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

2. UNDERSTAND FUNDAMENTAL CONCEPT OF ELECTROMAGNETISM
   2.1. State molecular theory of magnetism
   2.2. Define various units involving magnetism
   2.3. State the magnetic properties of materials and permeability
   2.4. state the magnetism associate with current carrying conductors and coils
   2.5. State flemings right hand rule
   2.6. Explain the force experienced by the current carrying conductors in magnetic fields according to flemings right hand rule
   2.7. State faraday's laws of electromagnetic induction.
   2.8. Explain the production of A.C. in a simple coil rotating in a uniform magnetic field
   2.9. State the self induction in a coil and the mutually induced voltage in a nearby coil due to fuse linkage
   2.10. Explain the working of magnetic relays and contractors.

3. UNDERSTAND WORKING OF ELECTRIC MOTORS, AND GENERATORS AND TRANSFORMERS
   3.1. State the main parts of D.C. Electric Motors and D.C. generator
   3.2. State the construction of Alternator
   3.3. State the construction of three phase induction motor and single phase induction motors
   3.4. Explain the working principal of transformers
   3.5. State various parts of a transformer
   3.6. State the emf equation of transformer and transformation ratio equation

3.7. Explain the working of transformer specially designed for welding purpose and its settings.

3.8. Explain the working of different types of electric furnaces.

3.9. Explain the working of electric spot welding machine

4. UNDERSTAND THE ELECTRO CHEMICAL EFFECT AND ITS APPLICATION IN VARIOUS TYPES OF BATTERIES AND CELLS

4.1. Define the primary and secondary cells

4.2. state different types of secondary cells and their voltage rating

4.3. Explain the method of charging of a lead Acid battery

4.4. Enlist the precautions in handling batteries

4.5. State the construction of Alkaline Batteries and their ratings.

5. UNDERSTAND THE FUNDAMENTALS OF ELECTRONICS

5.1. State the Semi conductor theory

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

5.3. State the action of potential barrier in a P.N junction and the effect of forward and reverse bias on the junction.

5.4. Draw the circuit diagram for half wave and full wave rectifier 5.5. Draw the Bridge Rectifier circuit with filter circuit

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

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

6.2. Draw the circuit indicating the method of biasing the NPN and PNP transistors

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

6.4. State the working of field effect transistors

6.5. Enlist the comparative properties and usage of two types of transistor (Bipolar verses F.E.T.)

6.6. State the working of a transistor Oscillator and draw its circuit diagram.

7. UNDERSTAND THE WORKING OF SPECIAL PURPOSE DEVICES

7.1. State the working of zanier diode

7.2. Draw the connection for a practical regulated power supply

7.3. State the working of photodiode and its uses

7.4. State the working of DIAC and its uses

7.5. State the working of TRIAC and its uses

7.6. State the working of saturable core reactor and its use

8. UNDERSTAND THE APPLICATION OF THYRISTORS IN CONTROL CIRCUITS

8.1. Explain the working of Unijunction transistor and its use as an Oscillator

8.2. Draw circuit of a UJT relaxation oscillator

8.3. Explain the working of silicon controlled rectifier and its use as a control device.

8.4. Explain the phase control with the help of S.C.R. for A.C. Loads.

8.5. Draw circuits using phase control by SCR's

APPLIED ELECTRICITY AND ELECTRONICS

LIST OF PRACTICAL

96 Hours

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

RECOMMENDED BOOKS:

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

اسلامیات/مطالعہ پاکستان

سی	پی	ٹی		GEN211	نصاب سال دوئم
1	0	1			حصہ اول اسلامیات

کل وقت 20 گھنٹے: حصہ دوئم مطالعہ پاکستان

موضوعات:

1۔ سورۃ المومنون ایک تا گیارہ آیات کا ترجمہ مع تشریح

2۔ دس منتخب احادیث مع ترجمہ و تشریح

() خیر کم من تعلم القرآن و علمہ

() لا ایمان لمن لا امانتہ لہ ولا دین لا من لا اعھد لہ

() و یاکم والظن ان الظن اکرب الحدیث

() من احدث فی امرنا ھذا ما لیس منہ فھورد

() من حمل علینا السلاح فلیس منا

() انا و کافل الیتیم فی الجنہ

() لا ضرور ولا ضرار فی السلام

() کلکم راع و کلکم راع و کلکم مسول عن رعیتہ

3۔ سیرۃ طیبہ

() مکی زندگی۔ولادت۔بعثت۔ہجرت

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

4۔ حضورﷺ بحیثیت

() خطبہ حجۃ الوداع۔انسانی حقوق کا اعلامیہ/حقوق انسانی پالیسی 2018

() معلم کامل۔سربراہ خاندان

5۔ اسلامی معاشرہ

نظام تعلیم اور اس کے مقاصد۔عدل وانصاف۔امر بالمعروف۔نہی عن المنکر۔انسانی حقوق کا معاشرتی اور معاشی ترقی میں کردار

جہاد۔کسب حلال۔مسجد(اہمیت وفضیلت)

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

حقوق آگاہی/رمعلومات تک رسائی

۔ملازم پیشہ خواتین کا تحفظ

حقوق آگاہی/رمعلومات تک رسائی

۔ملازم پیشہ خواتین کا تحفظ

اسلامیات

تدریس مقاصد:

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

( )   قرآن مجید   ( )   منتخب آیات قرآنی

خصوصی مقاصد:

( )   قرآنی آیات کا ترجمہ

( )   قرآنی آیات کی تشریح

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

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

احادیث نبوی:

عمومی مقاصد:

( )   احادیث کی روشنی میں اسلامی اخلاقی اقدار (انفرادی و اجتماعی) سے آگاہ ہو سکے

خصوصی مقاصد:

( )   احادیث کا ترجمہ بیان کر سکے

( )   احادیث کی تشریح کر سکے

( )   احادیث کی روشنی میں اسلام کی اخلاقی اقدار کی وضاحت کر سکے

( )   احادیث کی دی گئی تعلیمات کے مطابق اپنی زندگی گزار سکے

سیرت طیبہ:

( )   عمومی مقاصد: حضورﷺ کی سیرت طیبہ کے بارے میں جان سکے

خصوصی مقاصد:

( )   حضورﷺ کی ابتدائی زندگی اختصار کے ساتھ بیان کر سکے

( )   حضورﷺ کی ہجرت کا واقعہ بیان کر سکے

( )   حضورﷺ کی مدنی زندگی اختصار سے بیان کر سکے

( )   حضورﷺ کی بطور معلم خصوصیات بیان کر سکے

( ) حضورﷺ کی بطور سربراہ بیان کر سکے

حضورﷺ بحیثیت

( ) خطبہ حجۃ الوداع۔انسانی حقوق کا اعلامیہ/حقوق انسانی پالیسی 2018 کے بارے جان سکے

اسلامی معاشرہ:

عمومی مقاصد: اسلامی معاشرہ کی خصوصیات سے آگاہی حاصل کر سکے

خصوصی مقاصد:

( ) اسلامی معاشرہ کا معنی و مفہوم کر سکے

( ) اسلامی معاشرہ کی امتیازی خصوصیات بیان کر سکے

( ) اسلامی معاشرہ میں عدل و احسان کی اہمیت بیان کر سکے

( ) تبلیغ کے لغوی معنی بیان کر سکے

( ) تبلیغ کی اہمیت اور ضرورت بیان کر سکے

( ) جہاد کے لفظی و اصطلاحی معنی بیان کر سکے

( ) جہاد کی اہمیت بیان کر سکے

( ) جہاد اور قتل میں فرق بیان کر سکے

( ) جہاد کی مختلف اقسام بیان کر سکے

( ) لفظ مسجد کی تعریف بیان کر سکے

( ) مسجد کی سابقہ حیثیت کو بحال کرنے کے بارے میں اقدامات کو مان سکے

( ) انسانی حقوق کی معاشی اور معاشرتی ترقی میں اہمیت اور کردار بیان کر سکے

اسلامی ریاست:

عمومی مقاصد:

( ) اسلامی ریاست کی خصوصیات بیان کر سکے

خصوصی مقاصد:

( ) ریاست کی تعریف بیان کر سکے

( ) اسلامی ریاست میں طرز حکومت سے آگاہی حاصل کر سکے

( ) اسلامی ریاست کی خصوصیات بیان کر سکے

( )   اسلامی ریاست کے اغراض و مقاصد بیان کر سکے

( )   اسلامی ریاست کے قیام کی لیے جدوجہد کر سکے

( )   حقوق آگاہی؍ معلومات تک رسائی کا قانون جان سکے

( )   ملازمت پیشہ خواتین کے حقوق کا تحفظ جان سکے اور

( ) معاشرے میں خواتین کے حقوق کا تحفظ یقینی بنائے

نصاب مطالعہ پاکستان

سی	پی	ٹی	
1	0	1	سال دوئم
			حصہ دوم
	کل وقت 12 گھنٹے		

موضوعات:

(   )   دو قومی نظریہ

(   )   تحریک پاکستان

(   )   انڈین کانگریس

(   )   مسلم لیگ

(   )   تقسیم بنگال

(   )   میثاق لکھنو

(   )   تحریک خلافت

(   )   سندھو تحریک

(   )   تجاویز دہلی

(   )   نہرو رپورٹ

(   )   قائد اعظم کے چودہ نکات

(   )   خطبہ آلہ آباد

(   )   انتخابات 1938 اور انتقال اقتدار

(   )   قرارداد پاکستان

حصہ دوم

مطالعہ پاکستان

تدریس مقاصد:

تحریک پاکستان:

عمومی مقاصد:

( )   قیام پاکستان کے اسباب و تحریک کو بیان کر سکے

خصوصی مقاصد:

( )   قومیت کے مفہوم کو بیان کر سکے

( )   دو قومی نظریہ کی تعریف و توضیح کر سکے

( )   دو قومی نظریہ کی اہمیت بیان کر سکے

( )   ہندوستانی مسلمانوں کی محرومیوں کو بیان کر سکے

( )   قومی تشخص کو بحال رکھنے کے لیے مسلمانان ہند کی مساعی بیان کر سکے

( )   آزادی ہند اور قیام پاکستان علامہ اقبال اور قائداعظم کی مساعی بیان کریں

( )   قیام پاکستان سے مستقبل اسلامی مملکت کے قیام کے لیے مسلم عوام کی کوششوں کو بیان کر سکے

( )   مسلم لیگ کے قیام پاکستان کے لیے جدوجہد بیان کر سکے

سی	پی	ٹی	
			نصاب اخلاقیات
1	0	1	سال دوم

کل وقت 20 گھنٹے

موضوعات:

معاشرتی اقتدار بلحاظ ہمسایہ۔قوم۔قومی سطح۔شہری سطح۔صنعتی اداروں کی سطح۔ضروریات۔ورثہ

( ) حقوق و فرائض

( ) قوت برداشت

( ) قوت ارادی

( ) لگن و جذبہ

( ) وسیع النظری

( ) بے غرضی

( ) انسانی دوستی

( ) حفاظتی شعور

( ) پاس آزادی

( ) کامل آگاہی

( ) تغیرات کو قبول کرنا

( ) خودشناسی

( ) انسانی حقوق کا اعلامیہ،حقوق انسانی پالیسی2018

( ) انسانی حقوق کا معاشرتی اور معاشی ترقی میں کردار

( ) حقوق آگاہی،معلومات تک رسائی۔ملازم پیشہ خواتین کا تحفظ

نصاب اخلاقیات

سال دوم

تدریس مقاصد:

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

خصوصی مقاصد: طالب علم اس قابل ہو کہ

( ) موضوعات کا مطلب بیان کر سکے

( ) عملی زندگی سے مثالوں کی نشاندہی کر سکے

( ) اپنی شخصیت اور معاشرے پر موضوعات کے مطابق اثرات پیدا کرنے کے طریقے بیان کر سکے

( ) اعلیٰ اخلاقی اقدار میں سے قوت برداشت۔ قوت ارادی۔ لگن و جذبہ۔ وسیع النظری۔ بے غرض۔ انسانی دوستی

شعور۔ پاس آزادی۔ کامل آگاہی اور خود شناسی کی اہمیت

( ) اخلاقیات سے متصف ہو کر قومی خدمت بہتر طور پر انجام دے سکے

( ) انسانی حقوق کا اعلامیہ/ حقوق انسانی کی پالیسی 2018 کے بارے میں جان سکے

( ) انسانی حقوق کا معاشرتی اور معاشی ترقی میں اہمیت اور کردار بیان کر سکے

( ) حقوق آگاہی/ معلومات تک رسائی کے قانون کو جان سکے

( ) ملازم پیشہ خواتین کا تحفظ کو اخلاقیات کا حصہ تصور کرے

COURSE OUTLINE YEAR – 2

APPLIED MATHEMATICS-II

	T	P	C
	3	0	3

Total Contact Hours:	
Theory:	96
Practical:	0

MATH-213　　　　　　　　**Applied Mathematics-II**

	T	P	C
Total Contact Hours:	3	0	3

Theory:　　　96 Hours.
Practical:　　0

Aims & Objectives:

After completing the course the students will be able to:

Solve the problems of calculus and analytical Geometry.

Course Contents:

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

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

3. HIGHER DERIVATIVES AND APPLICTION OF DIFFERENTIAL CALCULUS.　9 Hours
   3.1　Second derivative of a function.
   3.2　3rd derivative of a function.
   3.3　Increasing and decreasing function.

3.4 Maximum and minimum values.
3.5 Criteria for maximum and minimum values.
3.6 Methods of finding maxima and minima.
3.7 Problems.

4. INTEGRATION. 10 Hours
    4.1 Basic concepts of integration.
    4.2 Fundamental formulae & important rules.
    4.3 Integration by substitution.
    4.4 Integration by trigonometric substitution.
    4.5 Integration by parts.
    4.6 Definite integrals and its applications.

5. INTEGRATION BY USING PARTIAL FRACTIONS. 15 Hours
    5.1 Introduction to partial fractions.
    5.2 Linear distinct factors case-I
    5.3 Linear repeated factors case-II
    5.4 Quadratic distinct factors case-III
    5.5 Quadratic repeated factors case-IV
    5.6 Integration of rational fractions.
    5.7 Problems.

6. DIFFERENTIAL EQUATIONS. 6 Hours
    6.1 Introduction
    6.2 Differential equation of order-1
    6.3 Differential equation of order-2
    6.4 Solution of 1st and 2nd order differential equations
    6.5 Problems

7. FUNDAMENTALS OF PLANE ANALYTIC GEOMETRY AND STRAIGHT LINE. 10 Hours
    7.1 Rectangular coordinate system.
    7.2 Distance formula.
    7.3 Ratio formula.
    7.4 Slope of a line.
    7.5 Slope formula and angle formula.
    7.6 Parallel and perpendicular lines.
    7.7 Equation of lines parallel to X-axis and Y-axis.
    7.8 Important forms of equation of the straight line.
    7.9 Intersection of two lines.
    7.10 Distance between a line and a point.

8. CONIC SECTIONS. 9 Hours
    8.1 Circle
    8.2 Standard equation of a circle
    8.3 General equation of a circle
    8.4 Radius and coordinates of centre
    8.5 Parabola
    8.6 Standard equation of parabola
    8.7 Four forms of standard equation
    8.8 General equation of parabola
    8.9 Ellipse
    8.10 Standard equation and related definitions
    8.11 Hyperbola
    8.12 Standard equation and related definitions

8.13   Problems.

9. STATISTICS.   6 Hours
    9.1   Concept of mean, media and mode
    9.2   Standard deviation
    9.3   Laws of probability
    9.4   Problems.

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RECOMMENDED BOOKS

1. Thomas Finny, Calculus and Analytic Geometry
2. Ghulam Yasin Minhas, Technical Mathematics Vol-1 & II Ilmi Kitab Khana
3. Riaz Ali Khan, Polytechnic Mathematic Series Vol-1 & II Majeed Sons, Faisalabad
4. Sana Ullah Bhatti, Calculus and Analytic Geometry, Punjab Text Book Board, Lahore
5. Mathematics II Published by PSTC-PCSIR

BUSINESS MANAGEMENT AND INDUSTRIAL ECONOMICS

T	P	C
1	0	1

Total Contact Hours:	
Theory:	32
Practical:	0

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

COURSE CONTENTS

1. ECONOMICS 2 Hours

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

2. BASIC CONCEPTS OF ECONOMICS 1 Hours

2.1 Utility
2.2 Income
2.3 Wealth
2.4 Saving
2.5 Investment
2.6 Value.

3. DEMAND AND SUPPLY. 2 Hours

3.1 Definition of demand.
3.2 Law of demand.
3.3 Definition of supply.
3.4 Law of supply.

4. FACTORS OF PRODUCTION. 2 Hours

4.1 Land
4.2 Labour
4.3 Capital
4.4 Organization.

5. BUSINESS ORGANIZATION. 3 Hours

5.1   Sole proprietorship.

5.2   Partnership

5.3   Joint stock company.

6.   ENTERPRENEURIAL SKILLS   4 Hours

6.1   Preparing, planning, establishing, managing, operating and evaluating relevant resources in small business.

6.2   Business opportunities, goal setting.

6.3   Organizing, evaluating and analyzing opportunity and risk tasks.

7.   SCALE OF PRODUCTION.   2 Hours

7.1   Meaning and its determination.

7.2   Large scale production.

7.3   Small scale production.

8.   ECONOMIC SYSTEM 3 Hours

8.1   Free economic system.

8.2   Centrally planned economy.

8.3   Mixed economic system.

9.   MONEY.   1 Hour

9.1   Barter system and its inconveniences.

9.2   Definition of money and its functions.

10.   BANK. 1 Hour

10.1   Definition

10.2   Functions of a commercial bank.

10.3   Central bank and its functions.

11.   CHEQUE   1 Hour

11.1   Definition

11.2   Characteristics and kinds of cheque.

11.3   Dishonor of cheque.

12.   FINANCIAL INSTITUTIONS   2 Hour

12.1   IMF

12.2   IDBP

12.3   PIDC

13.   TRADE UNION   2 Hour

13.1   Introduction and brief history.

13.2   Objectives, merits and demerits.

13.3   Problems of industrial labour.

14.   INTERNATIONAL TRADE.   2 Hour

14.1	Introduction

14.2	Advantages and disadvantages.

**15.	MANAGEMENT	1 Hour**

15.1	Meaning

15.2	Functions

**16.	ADVERTISEMENT	2 Hour**

16.1	The concept, benefits and draw-backs.

16.2	Principal media used in business world.

**17.	ECONOMY OF PAKISTAN	1 Hour**

17.1	Introduction

17.2	Economic problems and remedies.

BOOKS RECOMMENDED

1.	Nisar-ud-Din, Business Organization, Aziz Publisher, Lahore

2.	M. Saeed Nasir, Introduction to Business, Ilmi Kitab Khana, Lahore.

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

BUSINESS MANAGEMENT AND INDUSTRIAL ECONOMICS

INSTRUCTIONAL OBJECTIVES

1.   UNDERSTAND THE IMPORTANCE OF ECONOMICS.

1.1   State definition of economics given by Adam Smith, Alfred Marshall and
            Professor Robins.

1.2   Explain nature and scope of economics.

1.3   Describe importance of study of economics for technicians.

2.   UNDERSTAND BASIC TERMS USED IN ECONOMICS.

2.1   Define basic terms, utility, income, wealth, saving, investment and value.

2.2   Explain the basic terms with examples **3.   UNDERSTAND LAW OF DEMAND
AND LAW OF SUPPLY.**

3.1   Define Demand.

3.2   Explain law of demand with the help of schedule and diagram.

3.3   State assumptions and limitation of law of demand.

3.4   Define Supply.

3.5   Explain law of Supply with the help of schedule and diagram.

3.6   State assumptions and limitation of law of supply.

4.   UNDERSTAND THE FACTORS OF PRODUCTION   4.1   Define the four factors of
production.

4.2   Explain labour and its features.

4.3   Describe capital and its peculiarities.

5.   UNDERSTAND FORMS OF BUSINESS ORGANIZATION.

5.1   Describe sole proprietorship, its merits and demerits.

5.2   Explain partnership, its advantages and disadvantages.

5.3   Describe joint stock company, its merits and demerits.

5.4   Distinguish public limited company and private limited company.

6.   UNDERSTAND ENTERPRENEURIAL SKILLS

6.1   Explain preparing, planning, establishing and managing small business set-up

6.2   Explain evaluating all relevant resources

6.3   Describe organizing analyzing and innovation of risk of task

7.   UNDERSTAND SCALE OF PRODUCTION.

7.1   Explain scale of production and its determination.

7.2 Describe large scale production and it merits.

7.3 Explain small scale of production and its advantages and disadvantages.

8. UNDERSTAND DIFFERENT ECONOMIC SYSTEMS.

8.1 Describe free economic system and its characteristics.

8.2 Explain centrally planned economic system, its merits and demerits.

8.3 State mixed economic system and its features.

9. UNDERSTAND WHAT IS MONEY

9.1 Define money

9.2 Explain barter system and its inconveniences.

9.3 Explain functions of money.

10. UNDERSTAND BANK AND ITS FUNCTIONS.

10.1 Define bank.

10.2 Describe commercial bank and its functions.

10.3 State central bank and its functions.

11. UNDERSTAND CHEQUE AND DISHONOR OF CHEQUE.

11.1 Define cheque.

11.2 Enlist the characteristics of cheque.

11.3 Identify the kinds of cheque.

11.4 Describe the causes of dishonor of a cheque.

12. UNDERSTAND FINANCIAL INSTITUTIONS.

12.1 Explain IMF and its objectives.

12.2 Explain organizational set up and objectives of IDBP.

12.3 Explain organizational set up and objectives of PIDC.

13. UNDERSTAND TRADE UNION, ITS BACKGROUND AND FUNCTIONS.

13.1 Describe brief history of trade union.

13.2 State functions of trade union.

13.3 Explain objectives, merits and demerits of trade unions.

13.4 Enlist problems of industrial labour.

14. UNDERSTAND INTERNATIONAL TRADE.

14.1 Explain international trade.

14.2 Enlist its merits and demerits.

15. UNDERSTAND MANAGEMENT

15.1 Explain meaning of management.

15.2   Describe functions of management.

15.3   Identify the problems of business management.

16.   UNDERSTAND ADVERTISEMENT.

16.1   Explain the concept of advertisement.

16.2   Enlist benefits and drawbacks of advertisement.

16.3   Describe principal media of advertisement used in business world.

17.   UNDERSTAND THE ECONOMIC PROBLEMS OF PAKISTAN.

17.1   Describe economy of Pakistan.

17.2   Explain economic problems of Pakistan

17.3   Explain remedial measures for economic problems of Pakistan.

METROLOGY

	T	P	C
	1	3	2

Total Contact Hours:	
Theory:	32
Practical:	96

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

COURSE OUTLINE:

1. INTRODUCTION TO TECHNICAL MEASUREMENTS   06 Hours

1.1. History of measurements

1.2. Importance and purpose of measurements

1.3. Systems of measurements

1.3.1. English system

1.3.2. Metric system

1.3.3. ISO standards.

1.3.4. Source of errors

1.3.5. Fits, Tolerance & Allowances.

1.4. Meaning of Inspection

1.4.1. Object of Inspection

1.4.2. Principle of Inspection

1.4.3. Importance of inspection

1.4.4. Inspection Standards

1.4.5. Quality of Inspector

1.4.6. Duties and responsibility of chief inspector

1.4.7. Function of inspection department

1.4.8. Kinds of inspection

1.4.9. Method of inspection

1.4.10. Floor of patrolling inspection and centralized inspection

1.4.10.1. Advantages and Disadvantages

2. QUALITY CONTROL 02 Hours

2.1. Introduction of Quality Control

2.2. Definition of quality control

2.3. Objective of quality control

2.4. Functions of quality control department

2.5. Dimensional variations on quality control

2.6. Terms use in quality control

2.7. Tools for quality control

3. LINER MEASURING INSTRUMENTS. 01 Hours

3.1. Direct reading instruments

3.2. Indirect reading instruments

4. MEASURING TOOLS 03 Hours

4.1. Introduction

4.2. Insides / Outside Caliper

4.3. Combination set

4.4. Steel rule

4.5. Measuring tape

4.6. Micrometers

4.7. Vernier calipers

4.8. Protectors

4.9. Combination set

5. MARKING TOOLS 06 Hours

5.1. Application of marking tools

5.1.1. Scribers

5.1.2. Steel rules

5.1.3. Height Stand

5.1.4. Straight edges

5.1.5. Squares

5.1.6. Steel set squares

5.1.7. Combination squares

61

5.1.8. Divider

5.1.9. Odd leg caliper

5.1.10. Trammels

5.1.11. Jenny calipers

5.1.12. Scribing blocks

5.1.13. Vernier height gauge

5.1.14. Hammers

5.1.15. Prick punches

5.1.16. Centre Punches
5.1.17. Levels
5.2. Marking off equipments
5.2.1. Marking off table
5.2.2. Angle plates
5.2.3. Parallel strips
5.2.4. V Block
5.2.5. Clamps
5.2.6. Jacks
5.2.7. Packing and Wedges
5.3. Marking off medium
5.3.1. Chalk
5.3.2. White wash
5.3.3. Copper sulphate solution
5.3.4. Sprit based metal mark out stain
5.3.5. White marking off paint

6. FIXED VALUE MEASURING TOOLS   04 Hours

6.1. Ring gauges

6.2. Radius gauges

6.3. Slip gauges. (Gauge blocks)

6.4. Go No Go gauges

6.5. Thread gauges

6.6. Feeler gauge

6.7. Plug gauge

6.8. Wire gauge

6.9. Snap Gauge

6.10. Pin gauge

6.11. Plain plug gauge

6.12. Dove tail

6.13. Templates

6.14. Grinding gauge

6.15. Drill gauge

6.16. Universal surface gauge

7. THREAD MEASUREMENT   02 Hours

7.1. Introduction thread terminology
7.2. Screw thread terminology

7.3. Inspection procedure of external threads

8. GEAR INSPECTION AND MEASUREMENTS   06 Hours

8.1. Two types of gear inspection
8.1.1. Analytical.
8.1.2. Functional.

8.2. Gear tooth measurements.

8.2.1. Gear tooth vernier caliper method

8.2.2. Constant cord method

8.2.3. Base tangent method

8.2.4. Test plug method

9. Comparators   02 Hours

9.1. Introduction of comparator

9.2. Characteristic of comparator

9.3. Mechanical comparator

9.4. Uses of comparator

9.5. Advantages and disadvantages of comparator

RECOMMENDED BOOKS:

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

METROLOGY

INSTRUCTIONAL OBJECTIVES

1. MEASUREMENT HISTORY
- 1.1.　　　Explain history of measurement
- 1.2.　　　Explain purpose of measurement
- 1.3.　　　Explain system of measurement
  - 1.3.1.　English system
  - 1.3.2.　Metric system
  - 1.3.3.　ISO system
- 1.4.　　　Explain source of errors
- 1.5.　　　Explain fits, tolerance and allowances
- 1.6.　　　Tolerance, Limits And Allowance
- 1.7.　　　Understand Tolerance, Limits and Allowance
  - 1.7.1.　Describe Tolerance
  - 1.7.2.　Discuss the importance of Tolerance in production
  - 1.7.3.　Explain types & importance of Tolerance
- 1.8.　　　Limits
  - 1.8.1.　Define Limits
  - 1.8.2.　Identify upper Limit and Lower Limit size
  - 1.8.3.　Explain various dimension Limit Including standard size Nominal size, Normal size, Basic size, actual size and design size
- 1.9.　　　FITS
  - 1.9.1.　Understand the terminology of Fits
  - 1.9.2.　Define fits
  - 1.9.3.　Explain the types of fits
  - 1.9.4.　Distinguish clearance, interference, Transition fits
- 1.10.　　Allowance
  - 1.10.1. Define Allowance
  - 1.10.2. Explain positive and Negative allowance (clearance and Interference allowance)

2. QUALITY CONTROL
- 2.1.　　　**Understand the concept of quality control**
  - 2.1.1.　Describe quality control
  - 2.1.2.　Discuss the importance of quality control in industry

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

3. LINER MEASURING INSTRUMENTS
  3.1.   Direct reading instruments
  3.2.   Indirect reading instruments

4. MEASURING INSTRUMENTS
  4.1.**Understand the instruments used in semi precision and precision measurements**
    4.1.1. Semi Precision Instruments
    4.1.2. Explain Transfer Instrument
        4.1.2.1. Inside/Outside caliper
        4.1.2.2. Combination set
    4.1.3. Practice use of transfer instruments
    4.1.4. Describe the function of following instruments
        4.1.4.1. Steel Rule
        4.1.4.2. Hook Rule
        4.1.4.3. Folding Rule
        4.1.4.4. Measuring Tape
    4.1.5. Practice the use of graduated instruments
    4.1.6. Apply the Linear measuring devices State use of following
        4.1.6.1. Plates
            4.1.6.1.1. Surface plates
            4.1.6.1.2. Tool makers surface plate
            4.1.6.1.3. Glass surface plates
            4.1.6.1.4. Angle plates
        4.1.6.2. Cast iron cubes
        4.1.6.3. Vee block
        4.1.6.4. Straight edge
        4.1.6.5. Spirit level
        4.1.6.6. Engineers parallel
    4.1.7. Practice use of linear measuring devices
  4.2. **Precision Measuring Instruments**
    Apply the working and use of precision measuring instruments
    4.1.1.   Explain the working and use of following instruments
        4.1.1.1.   Micrometer
            4.1.1.1.1. Out-side micrometer
            4.1.1.1.2. In-side micrometer
            4.1.1.1.3. Depth micrometer or Depth gauge
            4.1.1.1.4. Plug micrometer
            4.1.1.1.5. Vernier micrometer
        4.1.1.2.   Vernier Caliper English
            4.1.1.2.1. Vernier caliper
            4.1.1.2.2. Vernier height gauge
            4.1.1.2.3. Vernier depth gauge
            4.1.1.2.4. Dial vernier caliper
    4.1.2.   Practice use of Precision measuring Instruments

4.3. **Angular Measurement**

Apply the correct use of various Angle measuring instruments

4.3.1. Identify the various angle measuring instruments

4.3.2. Observe proper care and use of following instruments

 4.1.2.1. Bevel protractor

 4.1.2.2. Bevel protractor vernier

 4.1.2.3. Sine Bar

5. **MARKING TOOLS**

 5.1. **Apply different Marking Tools**

  5.1.1. Describe application of following marking tools like

   5.1.1.1. Scriber

   5.1.1.2. Steel rules

   5.1.1.3. Height stand

   5.1.1.4. Straight edges

   5.1.1.5. Squares

   5.1.1.6. Steel set squares

   5.1.1.7. Combination squares

   5.1.1.8. Divider

   5.1.1.9. Odd leg caliper

   5.1.1.10. Trammels

   5.1.1.11. Jenny caliper

   5.1.1.12. Scribing blocks

   5.1.1.13. Vernier height gauge

   5.1.1.14. Hammers

   5.1.1.15. Prick punches

   5.1.1.16. Centre punches

   5.1.1.17. Levels

  5.1.2. Describe marking off equipments

   5.1.2.1. Marking off table

   5.1.2.2. Angle plates

   5.1.2.3. Parallel stripes

   5.1.2.4. V blocks

   5.1.2.5. Clamps

   5.1.2.6. Jacks

   5.1.2.7. Packing and wedges

  5.1.3. Describe marking off medium

   5.1.3.1. Chalk

   5.1.3.2. White wash

   5.1.3.3. Copper sulphate solution

   5.1.3.4. Sprit base metal mark out stain

   5.1.3.5. White marking off paint

6. **FIX VALUE MEASURING TOOLS**

 6.1. **Understand gauge and gauging**

        6.1.1.   Describe Go, not Go gauges & their uses

        6.1.2.   Classify various types of gauges i.e.

            6.1.2.1.   Fixed Gauges

                6.1.2.1.1. Ring gauge, Ring Thread gauge

                6.1.2.1.2. Plug gauge, Plug Thread gauge

                6.1.2.1.3. Snap gauge

                6.1.2.1.4. Feeler gauge

                6.1.2.1.5. Radius gauge

                6.1.2.1.6. Slip gauge or gauge block

                6.1.2.1.7. Sheet metal and wise gauge

                6.1.2.1.8. Form gauge

                6.1.2.1.9. Pin gauge

                6.1.2.1.10. Height gauge

                6.1.2.1.11. Template gauge

                6.1.2.1.12. Receiver gauge

                6.1.2.1.13. Flush pim gauge

                6.1.2.1.14. Screw thread pitch gauge

                6.1.2.1.15. Dove tail gauge

                6.1.2.1.16. Drill gauge

                6.1.2.1.17. Master gauge

             6.1.2.2.   Adjustable gauges

                6.1.2.2.1. Surface gauge

                6.1.2.2.2. Depth gauge

                6.1.2.2.3. Height gauge

                6.1.2.2.4. Dial gauge

                6.1.2.2.5. Adjustable Limit snap gauge

             6.1.2.3.   Indicating Type gauges

                6.1.2.3.1. Plug indicating gauge

                6.1.2.3.2. Parallel indicating gauge

                6.1.2.3.3. Depth indicating gauge

                6.1.2.3.4. Combine indicating gauge and universal angle gauge

                6.1.2.3.5. Indicating type snap gauge

7. THREAD MEASUREMENT AND THREAD GAUGES

Apply thread measurement and thread gauges techniques

    7.1.   Describe Terminology of thread

    7.2.   Sketch a thread showing nomenclature

    7.3.   Explain classes of thread fit

        7.3.1.   Class 1 (Loose fit)

        7.3.2.   Class 11 (Free fit)

        7.3.3.   Class 111 (Medium fit)

        7.3.4.   Class iv (close fit)

  7.4.Select proper inspecting procedure for checking of external thread

        7.4.1.   Three wise Method

        7.4.2. Zies Micrometer

8. GEAR INSPECTION AND MEASUREMENTS 8.1. Two types of gear inspection

        8.1.1.   Analytical.

8.1.2. Functional.
8.2. Gear tooth measurements.
    8.2.1. Gear tooth vernier caliper method
    8.2.2. Constant cord method
    8.2.3. Base tangent method
    8.2.4. Test plug method

9. COMPARATORS
9.1.   Understand comparator terminology
9.2.   Define Comparator
9.3.   Explain the working principle of :
    9.3.1.   Mechanical comparator

RECOMMENDED BOOKS:

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

METROLOGY

LIST OF PRACTICALS 96 Hours

1. Practice of following marking tools.
   1.1. Divider
   1.2. Scriber
   1.3. Trammel
   1.4. Oddleg caliper
2. Practice of inside and outside calipers
3. Practice of combination set
4. Practice of following graduated instruments.
   4.1. Steel Rule
   4.2. Hook Rule
   4.3. Folding Rule
   4.4. Measuring Tape
5. Practice of Linear Measurement with following instruments.
   5.1. Surface plate
   5.2. Angle plate
   5.3. Vee block
   5.4. Straight Edge
   5.5. Spirit level
6. Practice of precision instruments i.e.
   6.1. Micrometer
      6.1.1. Outside micrometer
      6.1.2. Inside micrometer
      6.1.3. Depth Micrometer
      6.1.4. Plug Micrometer
   6.2. Vernier caliper
   6.3. Vernier Height gauge
   6.4. Vernier depth gauge
   6.5. Dial vernier caliper
7. Practice of different angle measuring instruments
   7.1. Bevel protector
   7.2. Sine bar
8. Study of gauges and their uses
   8.1. Fix gauges
   8.2. Adjustable gauges
9. Practice of 3-wire method for checking of external Thread
10. Practice and use of following comparators.
    10.1. Mechanical comparator

MACHINE DESIGN

T	P	C
2	3	3

Total Contact Hours:	
Theory:	64
Practical:	96

AIMS At the end of the course the student will:
1. Acquire practice in analyzing stresses set-up in Machine parts.
2. Practice design of welded joints, pressure vessels, shafts, helical springs and spur gears.

COURSE CONTENTS:

PART A- MACHINE DESIGN

1. SIMPLE STRESSES IN MACHINE PARTS.   06 Hours

1.1.   Load and its types.
1.2.   Stress and strain.
1.3.   Tensile stress and strain.
1.4.   Compressive stress and strain.
1.5.   Modulus of elasticity.
1.6.   Shear stress and strain.
1.7.   Modulus of rigidity.
1.8.   Stress strain diagram.
1.8.1. Proportional limit.
1.8.2. Elastic Limit.
1.8.3. Yield Point.
1.8.4. Ultimate stress.
1.8.5. Breaking stress.
1.8.6. Percentage reduction in area.
1.9.   Working stress.
1.10. Factor of safety
1.11. Solution of simple problems of the above topics by direct application of formula.

2. PRESSURE VESSELS.   06 Hours

2.1.   Introduction.

2.2.   Classification of pressure vessels.

2.2.1. According to dimensions.

2.2.2. According to End construction.

2.3.   Stresses in a thin cylindrical shell due to internal pressure.

2.3.1. Hoop stress.

2.3.2. Longitudinal stress.

2.4.   Calculation of thickness of cylinder by direct application of formula, while all parameters are provided (e.g. p, d, hoop or longitudinal stress are given).

2.5.   Calculation of hoop or longitudinal stress by direct application of formula, while p, d, t is given.

2.6.   Thin spherical shells subjected to internal pressure.

2.7.   Calculation of thickness of spherical shell when all other parameters are provided, by direct application of formula

2.8.   Thick cylindrical shell subjected to internal pressure.

2.9.   Calculation of thickness from above formula, while all other parameters are given.

3. WELDED JOINTS.   06 Hours

3.1. Advantages and disadvantages.

3.2. List types of various welding joints.

3.3. Strength of transverse fillet welded joint.

3.4. Strength of parallel fillet welded joint.

3.5. Calculation of length of weld, when load, plate thickness, plate width,   shears stress is given.

4. SCREWED JOINTS.   04 Hours

4.1. Introduction.

4.2. Advantages and disadvantages

4.3. Definitions.

    4.3.1. Major diameter.

    4.3.2. Minor diameter.

    4.3.3. Pitch diameter

    4.3.4. Pitch

    4.3.5. Lead.

4.4. Stress in screwed fastening due to static loading.

4.5. Initial stress due to screwing up forces.

4.6. Solution of simple problem by direct formula application.

5.   KEYS & COTTERS   06 Hours

5.1. Introduction.

5.2. Types of keys & cotters.

5.3. Sunk keys.

    5.3.1. Rectangular

    5.3.2. Square.

    5.3.3. Parallel

    5.3.4. Gib head

    5.3.5. Feather

    5.3.6. Wood-ruff.

5.4. Forces acting on a sunk key

5.5. Strength of a sunk key.

5.6. Calculate length of sunk key by direct application of formula, while all parameters are provided.

5.7. Calculate the diameter of cotter pin.

6. SHAFTS & COUPLINGS.   10 Hours

6.1. Introduction

6.2. Material Used For Shaft

6.3. Types Of Shafts.

6.4. Standard sizes.

6.5. Stress in shafts.

6.6. Shafts subjected to twisting moment.

6.6.1. Solid shaft.

6.6.2. Hallow shaft.

6.7. Calculate diameter of solid and hollow shafts by direct application of formula.

6.8. Shafts subjected to bending moment

6.8.1. Solid shaft.

6.8.2. Hollow shaft.

6.9. Calculate diameter of solid and hollow shaft (bending only) by direct application of formula.   6.10. Introduction of coupling

6.11. Types of couplings

6.12. Calculations of proportional sizes of Flange Coupling

7. SPRINGS.   06 Hours

7.1. Introduction

7.2. Types of springs.

7.2.1. Helical spring.

7.2.2. Leaf spring.

7.3. Material for helical springs.

7.3.1. Solid length.

7.3.2. Free length.

7.3.3. Spring index

7.3.4. Pitch.

7.3.5. Stress in helical springs of circular wire, solution of problems on helical strengths of circular wire by direct application of formula

7.3.6. Solution of simple problem on helical springs of circular wire by direct application of formula with or without compression & also problems on torsion springs & spiral spring.

8. SPUR GEAR.   08 Hours

8.1.   Introduction.

8.2.   Friction wheels   8.3.   Classification of gears.

8.4.   Terminology of gears.

8.2.1.   Pitch circle.

8.2.2.   Pitch circle diameter.

8.2.3.   Pitch point.

8.2.4.   Addendum circle.

8.2.5.   Dedendum circle.

8.2.6.   Circular pitch.

8.2.7.   Diameteral pitch.

8.2.8.   Module.

8.2.9.   Clearance.

8.2.10.   Tooth thickness.

8.2.11.   Tooth space.

8.5.   System of gear teeth.

8.6.   Gear material.

Part –B Drawing

Pre-requisites: BASIC ENGINEERING DRAWING

1   FASTENERS DESCRIPTION AND DRAWING   02 Hours

1.1. Screw threads

1.2. Studs, nuts & Bolts

1.3. Cap screws

1.4. Machine screws

1.5. Set screws

1.6. Lock nuts and locking devices

2   KEYS & COTTERS   04 Hours

2.1. Key nomenclature

2.2. Square & rectangular

2.3. Gib head

2.4. Wood Ruff

2.5. Cotters

3   SHAFT COUPLING   02 Hours

3.1. Types of coupling

3.2. Proportional sizes

3.3. Uses

4   STEAM ENGINE PARTS   04 Hours

4.1. List of parts

4.2. Sketch each part

BOOKS
- Engineering Drawing By French &Verk.

MACHINE DESIGN

Part A   MACHINE DESIGN

INSTRUCTIONAL OBJECTIVES

1. SIMPLE STRESSES IN MACHINE PARTS.
   1.1.   Review common terms of mechanics
   1.1.1. Define load
   1.1.2. Describe types of load
   1.1.3. Define stress and strain
   1.1.4. Define tensile stress and strain
   1.1.5. Define compressive stress and strain 1.1.6. Describe modulus of elasticity
   1.1.7. Describe modulus of rigidity.
   1.1.8. State & apply relationship between moduli & poison's ratio
   1.2.   Interpret stress - strain diagram
   1.2.1. Sketch stress strain diagram
   1.2.2. Define proportional limit, elastic limit, yield point, ultimate stress, breaking stress
   1.2.3. Describe percentage reduction in area.
   1.3.   Apply hook's law equation to evaluate the missing parameter.
   1.3.1. Define working stress
   1.3.2. Define factor of safety
   1.3.3. Describe working/safe/design/permissible stress/allowable stress
   1.3.4. Compute modulus of elasticity using Hook's Law
   1.3.5. Solve simple problems on Stress, strain, Poisson's Ratio &moduli

2. INTRODUCTION TO PRESSURE VESSELS
   2.1.   **Know basic concepts of pressure vessels.**
   2.1.1. Define pressure vessel
   2.1.2. Describe types of pressure vessels
   2.1.3. Describe pressure vessel according to end construction
   2.1.4. Describe pressure vessel according to dimensions.
   2.1.5. Describe the use of pressure vessels
   2.1.6. Define hoop stress
   2.1.7. Define longitudinal stress
   2.1.8. Describe formula of longitudinal stress
   2.2.   Solve problems on hoop stress in designing thin cylinders
   2.2.1. State all parameters used in hoop stress formula (P, d, t, ft.)
   2.2.2. State hoop stress formula (ft, = pd/2tn)
   2.2.3. Compute thickness of thin cylinder, while p, d, t, and are given.
   2.2.4. Compute hoop stress, when p, d, t, are known
   2.2.5. Compute diameter of thin cylinder when p, t, ft,   are provided.

2.3.   Solve problem on longitudinal stress in designing thin cylinders.

2.3.1.   State all parameters use in longitudinal stress formula (p, d, t, n, ft)

2.3.2.   Describe hoop and longitudinal stress formula

2.3.3.   Compute longitudinal stress, when p, d, t and   are given

2.3.4.   Compute thickness of thin cylinder when p, d, ft, and   are provided.

2.3.5.   Describe the importance of hoop stress in designing thin cylinders.

2.4.   Understand spherical shell

2.4.1.   Describe spherical shell formula

2.4.2.   Explain terminology of the formula 2.4.3. Compute thickness of spherical shell

2.5.   Solve problems of thick cylinder.

2.5.1.   Describe formula

2.5.2.   Explain terms used in the formula

2.5.3.   Compute any one missing parameter of the formula when all others are provided.

3. WELDED JOINTS.

3.1.   **Understand welded joints.**

3.1.1.   State advantages & disadvantages of welded joints.

3.1.2.   Describe welding processes

3.1.3.   Explain types of welded joints

3.2.   Apply formula for calculation of length of weld for parallel and transverse fillet welded joint

3.2.1.   Describe formula used for transverse fillet welded joints.

3.2.2.   Explain terms used in the formula

3.2.3.   Compute length of weld from above formula

3.2.4.   Describe formula for parallel fillet welded joint.

3.2.5.   Explain terms used in formula

3.2.6.   Compute length of weld from above formula

4. SCREWED JOINTS

4.1.   Understand screwed joints.

4.1.1.   Describe advantages of screwed joints

4.1.2.   Describe disadvantages of screwed joints.

4.1.3.   Define various terms used in screw joints.

4.1.4.   Difference between major and minor diameters.

4.1.5.   Name stresses set-up due to screwed joints.

4.1.6.   Explain initial stresses due to screwing up forces.

4.1.7.   Calculate stress set-up due to inial tightening

4.2.   Solve problems on stresses in the bolts due to external forces.

4.2.1.   Describe tensile stress effect

4.2.2.   Explain formula

4.2.3.   Describe shear stress effect

4.2.4.   Explain formula

4.2.5.   Solve simple problems based on above two types of formula

5. KEYS & COTTERS

5.1.   Understand keys, Cotters and their types.

5.1.1. Define key & cotter

5.1.2. Explain types of keys commonly used

5.1.3. Sketch various types of sunk keys

5.1.4. Explain the forces acting on a sunk key.

5.1.5. Explain cotter pins & their uses

5.2.   Solve problems on determining length of sunk keys.

5.2.1. Explain formula for calculation of length of a sunk key

5.2.2. Describe various terms used in formula.

5.2.3. Compute length of sunk key when all other parameters are provided.

6. **SHAFTS & COUPLINGS**

6.1.   Understand shafts and their types.

6.1.1. Define shaft

6.1.2. Describe material used for shaft 6.1.3. Describe standard sizes of shafts

6.1.4. Explain types of shafts.

6.2.   Solve problems on design of solid shaft subjected to bending moments and twisting moments

6.2.1. State formula for design of solid shaft subjected to twisting moment

6.2.2. Explain terms used in the formula

6.2.3. Solve simple problems based on above formula

6.2.4. State formula for design of solid shaft subjected bending moment.

6.2.5. Explain terms used in the formula

6.2.6. Solve simple Problems

6.3.   Solve problems on design of hollow shafts subjected to bending moments and twisting moments

6.3.1. State formula for hollow shafts subjected to twisting moment

6.3.2. Explain terminology of above formula

6.3.3. Solve simple problems based on above formula

6.3.4. Describe formula for hollow shafts subjected to bending moment

6.3.5. Explain terminology of formula

6.3.6. Solve simple problems based on formula of hollow shafts subjected to bending moment only.

6.4.   Understand coupling & their types

6.4.1. Describe coupling

6.4.2. Classify couplings

6.4.3. Solve problems on calculation of size & no. of bolts in flange coupling 6.4.4. Solve problems on proportional sizes of flange coupling

7. **UNDERSTAND SPRINGS**

7.1.   Describe function of springs in machine elements

7.2.   Describe types of springs.

7.2.1. State material used for springs.

7.3.   Explain terminology used for springs.

7.4.   Explain stresses induced in helical springs of circular wire

7.5.   Solve simple problems on Helical spring

8. UNDERSTAND PROBLEMS ON GEARS
8.1.   Describe friction wheels.

8.2.   State classification of gears.

8.3.   Explain terminology of gears commonly used in gear design.

8.4.   Explain systems of gear teeth

8.5.   Describe different types of materials for a variety of gear types

8.6.   Solve simple problems to calculate diametric pitch, circular pitch, no. of teeth, module etc.

RECOMMENDED BOOK:

1. A Text book of Machine Design by R.S. Khurmi.
2. A Text book on Machine Design by Winston.

Part- B MACHINE DRAWING

INSTRUCTIONAL OBJECTIVES

1. FASTENERS DESCRIPTION AND DRAWING
1.1.   Know fasteners and their principal usage

1.1.1. Define fasteners

1.1.2. Describe difference between temporary and permanent fastening

1.1.3. Define nomenclature of screw thread

1.1.4. Describe types of threads

1.1.5. State different types of screw thread fasteners

1.2.   Draw common threaded fasteners

1.2.1. Draw derailed representation vee of and square threads

1.2.2. Draw hexagonal nut, nut and bolt

2. KEYS AND COTTERS
2.1.   Understands the purpose and usage of keys and cotters

2.1.1. Define keys and cotters

2.1.2. Compare keys and cotters

2.1.3. Describe the types and usage of key and cotters

2.2.   Draw common keys and cotters

2.2.1. Draw keys in shafts an hubs

2.2.2. Draw gib and cotter joint

3. SHAFT COUPLINGS
3.1.   **Understand shaft coupling**

3.1.1. Define shaft coupling

3.1.2. List shaft couplings

3.1.3. Describe uses of shaft coupling

3.1.4. Explain Orthographic views of shaft coupling

3.1.5. Flange coupling (Protected, unprotected)

3.1.6. Muff coupling

3.1.7. Flexible coupling

4. STEAM ENGINE PARTS

4.1. **Understand steam engine parts**

4.1.1. List steam engine parts

4.1.2. Describe uses of steam engine parts

4.1.3. Draw steam engine parts

4.1.4. Piston

4.1.5. Connecting Rod and

4.1.6. Stuff box

5. WORKING DRAWING

5.1. Describe working drawing

5.1.1. Describe set of working drawing

5.1.2. Explain detail and assembly drawing

5.1.3. Explain title blades and record strips

5.1.4. Explain types of assembly drawing

5.2. Prepare set of working drawing

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

MACHINE DESIGN

LIST OF PRACTICALS   96 Hours

ENGINEERING DRAWING

1.   Draw hexagonal/square bolt and nut.
2.   Practice in drawing sectional views from the objects enlisted below or similar.
3.   Gland for stuffing box.
4.   Fork for Hooke's coupling.
5.   Centre for Hooke's coupling.
6.   Shackle bolts.
7.   Flange coupling.
8.   Bushed Bearings.
9.   Open bearing
10.   Arm Pulley.
11.   Cone and step pulley.
12.   Wall bracket 13.   Engine cross head.
14.   Funnel.
15.   Rivet head.
16.   Drawing of single/double riveted lap and butt joints in chain/zigzag riveting.
17.   Draw detail and answering drawing/working drawing selecting from the following:
17.1.   Gib and cotter joint.
17.2.   Gear shifter.
17.3.   Conveyor hanger.
17.4.   Bracket plate.
17.5.   Relief valve body.
17.6.   Torque tube support.
17.7.   Automotive connecting rod.
17.8.   Cone hook.
17.9.   Jig tables.
17.10. Vee belt drive.
17.11. Pivot hanger.
17.12. Anti vibration mount.
17.13. Boring bar holder.
17.14. Hydraulic clock values.
17.15. Stay rod pivoted.
17.16. Arbor pin.
17.17. Flanged vice.

MACHINE DESIGN

1. Solve problems on calculation of stress, strain, modulus of elasticity, % elongation, % reduction, FOS, ultimate stress, bearing stress.
1. Design of simple compression members
2. Design of simple tension members
3. Calculate force required to punch a hole.
4. Solve problems for calculation of thickness of Thin cylinders.
5. Solve problems in calculating thickness for Thick cylinders.
6. Solve problems for calculating thickness of Spherical shell.
7. Calculate length of weld for welded joint.
8. Solve problems on stress setup due to initial tightening of screws by direct application of formula.
9. Sketch various types of sunk keys & cotters.
10. Calculate length of a sunk key by direct application of formula.
11. Calculate diameter of solid shafts subjected to twisting moment.
12. Calculate diameter of hollow shafts subjected to twisting moment.
13. Calculate diameter of solid shaft subjected to bending moment & calculate diameter of shaft subjected to both bending & twisting.
14. Calculate diameter of hollow shafts subjected to bending moment only.
15. Calculate helical spring wire-diameter by direct formula application in different situations & also simple calculations on helical, torsion & spiral spring.
16. Solve problems on calculation of size and number of bolts in flange coupling.
17. Sketch spur gear indicating various terms on sketch of spur gears.

DIE DESIGN-I

T	P	C
1	6	3

Total Contact Hours:	
Theory:	32
Practical:	192

AIMS At the end of the course the student will be:
1. Able to understand sheet metal applications, types of dies and tools.
2. Able to design and develop Blanking, Piercing and Bending tools for a component

1. INTRODUCTION TO DIE DESIGN   03 HOURS

1.1. Press Tool
1.2. Press Tools Applications
1.3. Classification of Press Tools/ Operation

    1.3.1. Shearing Process
    1.3.2. Blanking
    1.3.3. Piercing
    1.3.4. Cutting off
    1.3.5. Parting off
    1.3.6. Perforating
    1.3.7. Trimming
    1.3.8. Notching
    1.3.9. Shaving
    1.3.10. Lancing
    1.3.11. Dinking
    1.3.12. Broaching
    1.3.13. Planishing
    1.3.14. Embossing
    1.3.15. Coining
    1.3.16. Extrusion
    1.3.17. Bending
    1.3.18. Forming
    1.3.19. Drawing
    1.3.20. Curling
    1.3.21. Flaring or Lugging
    1.3.22. Side cam Tool
    1.3.23. Compound Tool
    1.3.24. Progressive Tool

2. CLASSIFICATION OF SHEETS MATERIAL AND THEIR APPLICATION   03 HOURS

    2.1. Sheet Material
    2.2. Ferrous Metals
        2.2.1. Hot Rolled Sheet
        2.2.2. Cold Rolled Sheet
        2.2.3. Stainless Steel
        2.2.4. Silicon Steel
        2.2.5. Spring Steel
    2.3. Non-Ferrous Metals
        2.3.1. Copper
        2.3.2. Brass
        2.3.3. Bronze
        2.3.4. Aluminium
        2.3.5. Tin
        2.3.6. Zinc
    2.4. Non-Metallic Materials
        2.4.1. Plastic
        2.4.2. Rubber
        2.4.3. Wood
        2.4.4. Cloth
        2.4.5. Paper
    2.5. Nomenclature of Sheet Material
        2.5.1. Codes
        2.5.2. Standards

3. DIE SET   02 HOURS

    3.1. Die Set
    3.2. Advantages of Die Set
    3.3. Types of Die Sets
        3.3.1. Precision
        3.3.2. Commercial
    3.4. Die Set Materials
    3.5. Die Set Components
    3.6. Classification of Die Sets according to Design

        3.6.1. Standard Die Set
        3.6.2. Non-standard Die Set

4. COMPONENTS OF DIES AND THEIR FUNCTIONS   04 HOURS

    4.1. Blanking Die
    4.2. Forming Die
    4.3. Draw Die

4.4. Trimming Die

4.5. Piercing Die

4.6. Bending Die

5. COMPOUND AND PROGRESSIVE DIES   03 HOURS

5.1. **Compound Piercing and Blanking Die**
   5.1.1. Construction
   5.1.2. Parts and their function
   5.1.3. Advantages and Disadvantages

5.2. **Progressive Blanking and Piercing Die**
   5.2.1. Construction
   5.2.2. Parts and their function
   5.2.3. Strip layout

6. DIE MATERIALS AND THEIR APPLICATION   03 HOURS

6.1. Materials for Dies Components

6.2. Materials for Casting Dies

7. PRESS MACHINES   04 HOURS

7.1. **Fundamental of Press Machine**
   7.1.1. Press Frame
   7.1.2. Bolster
   7.1.3. Slide Drive
   7.1.4. Gibs
   7.1.5. Draw Cushion

7.2. **Classification of Presses**
   7.2.1. On the basis of Source power
   7.2.2. On the basis of no. of slides
   7.2.3. On the basis of application

7.3. **Press Parameters**
   7.3.1. Capacity of a Press
   7.3.2. Stroke
   7.3.3. Shut Height
   7.3.4. Die Space

8. DESIGNING OF MAIN COMPONENTS OF DIES   06 HOURS

8.1. Basics of Die Design

8.2. Cutting Clearance

8.3. Design Die Blocks

8.4. Design Blanking Punches

8.5. Design Trimming Punches

8.6. Design Piercing Punches

8.7. Design Punch Retainers

8.8. Design Stripper Plates

8.9. Designing of Pilots

8.10. Design Stoppers

8.11. Design Gauges

9. BENDING PRINCIPLE   04 HOURS

9.1. Principles of Bending

9.2. Plastic Deformation due to Bending

9.3. Bend Elements

9.4. V-Bending Tools

9.5. U-Bending Tools

9.6. Calculation of Original Length of Strip required for Bend Components 9.7. Spring Back

DIE DESIGN-1

INSTRUCTIONAL OBJECTIVES

1. Knowledge about different press tools and their operation
   1.1. Blanking die and its operation
   1.2. Forming die and its operation
   1.3. Trimming die and its operation
   1.4. Piercing die and its operation
   1.5. Coining die and its operation
   1.6. Drawing die and its operation
   1.7. Bending die and its operation
   1.8. Deep Drawing and its operation
   1.9. Compound die and its operation
   1.10. Progressive die and its operation
2. Knowledge about different sheet materials and die materials
   2.1. Ferrous Metals
   2.2. Non-Ferrous Metals
   2.3. Codes and Standards used for sheet
   2.4. Die Material used for different dies components
   2.5. Die Materials used for casting dies
3. Knowledge about types of Presses and their functionality
   3.1. Fundamental of Press Machines
   3.2. Classification of Press machines
   3.3. Press parameters
4. Knowledge about how to design dies components and important factors for designing.
   4.1. Dies and Punches,
   4.2. Strippers, Gauges, Stoppers
   4.3. Die Set
5. Knowledge about basic bending operation and its parameters.

RECOMMENDED BOOKS:

Tool & Die Maker (Press Tools, Jigs & Fixtures) - 2nd Year
Tool & Die Maker (Press Tools, Jigs & Fixtures) - 3rd Year

DIE DESIGN-I

PRACTICAL **192 Hrs**

To design and develop a sheet metal die of any part on any CAD software:-

- To perform 3D drawing

- Analyze the design in CAM software

- Machine the Die parts

- Assemble the Die

- Check the production/ output of die

  Development practical features:-

  - Cutting dies

  - Blanking dies

  - Piercing dies

  - Progressive dies and

  - Compound Tools etc.

APPLIED MECHANICS

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

AIMS.

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

Detail of Contents:

1. Measurements   **2 Hours**

1.1 Review: Dimensional formula of Equations of Motion
1.2 Review: Systems of measurement, S.I. Units, conversion
1.3 Significant Figures
1.4 Degree of accuracy

2. Equilibrium of con-current forces   **3 Hours**

2.1 Concurrent forces
2.2 Addition and Resolution of Vectors
2.3 Toggle Joint, Hanging Chains
2.4 Roof Trusses, Cranes.
2.5 Framed structures

3. Moments and couples: **2 Hours**

3.1 Principle of Moments - Review
3.2 Levers
3.3 Safety valve
3.4 Steel yard
3.5 Parallel forces, couple
3.6 Torque

4. Equilibrium of non concurrent forces: **3 Hours**

4.1 Non-concurrent forces
4.2 Free body diagram
4.3 Varignon's theorem
4.4 Conditions of total Equilibibrium.
4.5 Ladders

5. Moment of inertia: **3 Hours**

5.1 Review: Rotational Inertia

5.2 Moment of Inertia, Theorems

5.3 Moment of Inertia of symmetrical bodies

5.4 M.I. of Fly wheel with applications

    5.5   Energy stored by Fly wheel

6. Friction: **2 Hours**

6.1 Review: Laws of friction

6.2 Motion of body along an inclined plane (up & down)

6.3 Rolling friction & Ball Bearings

6.4 Fluid Friction, Stokes' Law

7. Work, energy and power   **3 Hours**

7.1 Work-Energy relationship

7.2 Work done by variable force.

7.3 Power

7.4 I.H.P, B.H.P and Efficiency

7.5 Dynamometer.

8. Transmission of power: **3 Hours**

8.1 Belts, Ropes.

8.2 Chains.

8.3 Gears.

8.4 Clutches, functions and types with application

9. Machines: **3 Hours**

9.1 Efficiency of machines

9.2 Inclined plane - Review

9.3 Reversibility of machines

9.4 Single purchase crab

9.5 Double purchase crab.

9.6 Worm and worm wheel.

9.7 Differential Screw Jack.

    9.8   Differential Pulley, Wheel and Axle

10. Vibratory motion: **2 Hours**

10.1   S.H.M. - Review

10.2   Pendulums

10.3   Speed Governors.

10.4   Helical spring.

10.5   Cams

10.6   Quick return motion

11. Elasticity: **3 Hours**

11.1   Three Moduli of Elasticity
11.2   Loaded Beams, Types of Beam & Loads
11.3   Bending Stress
11.4   S.F & B.M diagram
11.5   Torsion and Torsional Stresses

12. Simple mechanism: **1 Hour**
12.1   Introduction
12.2   Kinematic link or Element
12.3   Kinematic pair and types.
12.4   Kinematic chains and types.

13. Velocity in mechanism: **2 Hours**
13.1   Introduction.
13.2   Instantaneous centre.
13.3   Instantaneous velocity.
13.4   Velocity of a link by instantaneous centre method.
13.5   Relative velocity of two bodies in the straight line
13.6   Velocity of a link by relative velocity method.

Recommended Textbooks:

1.   Applied Physics by Mr. Khalid Mehmood, Asif Ali, Zafar Tarar, Vol-I, Published by National Book Foundation

PHY-212   APPLIED MECHANICS

Instructional Objectives:

1. **Use the concepts of measurement in practical situations/problems**
   1.1 Explain Dimensional formula
   1.2 Explain systems of measurement
   1.3 Use concept of significant figures and degree of accuracy to solve problems

2. **Use the concept of addition and resolution of vectors to problems on equilibrium involving concurrent forces**
   2.1   Describe concurrent forces
   2.2 Explain resolution of vectors
   2.3 Use the analytical method of addition of vectors for solving problems.
   2.4 Use the graphical method of addition of vectors for solving problems.
   2.5   Solve problems on forces with emphasis on roof trusses, cranes simple frames and framed structures.

3. **Use the principle of moments and concept of couple to solve problems.**
   3.1   Describe the principle of moments.
   3.2   Use the principle of moments to solve problems on compound levers, safety valve, steel-yard.
   3.3 Describe couple and torque.
   3.4 Use the concept to solve problems on torque.

4. **Use the laws of total equilibrium of forces to solve problems involving forces in equilibrium.**
   4.1   Distinguish between concurrent and non-concurrent forces.
   4.2 Prepare a free body diagram of an object or a structure.
   4.3 Explain Varignon's theorem.
   4.4 Explain the second condition of equilibrium.
   4.5   Use laws of total equilibrium to solve problems on forces involving framed structure and ladders.

5. **Use concepts of moment of inertia to practical situations and problems.**
   5.1   Explain moment of inertia.
   5.2 Explain the theorems of Parallel and perpendicular Axis.
   5.3 Describe the M.I. of regular bodies
   5.4 Explain M.I. of Fly wheel
   5.5 Explain Energy stored by Fly Wheel
   5.6   Use these concepts to solve simple problems.

6. **Understand the concepts and laws of solid and fluid friction.**
   6.1   Define Coefficient of friction between a body placed on an inclined plane and the surface.
   6.2 Explain motion of a body placed on an inclined plane

6.3 Calculate the force needed to move a body up and down an inclined plane.

6.4 Explain rolling friction and use of ball bearings.

6.5 Describe fluid friction and Stoke's law.

7. Understand work, energy and power.

7.1 Derive work-energy relationship

7.2 Use formulae for work done by a variable force to solve problems.

7.3 Explain Power, I.H.P, B.H.P and efficiency.

7.4 Describe dynamometers.

7.5 Use the concepts to solve problems on power and work-energy

8. Understand transmission of power through ropes and belts.

8.1 Describe the need for transmission of power.

8.2 Describe methods of transmission of power.

8.3 Describe transmission of power through ropes and belts.

8.4 Write formula for power transmitted through ropes and belts.

8.5 Describe transmission of power through friction gears and write formula.

8.6 Describe transmission of power through chains and toothed wheels/gears.

8.7 Use the formulae to solve/problems on transmission of power.

    8.8   Describe types and function of clutches with applications

9. Use the concepts of machines to practical situations.

    9.1   Explain theoretical, actual mechanical advantage and efficiency of simple machines.

9.2 Use the concept to calculate efficiency of an inclined plane.

9.3 Describe reversibility of machines.

9.4 Calculate the efficiency of:

    i.   Single purchase crab.

    ii.   Double purchase crab.

    iii.   Worm and worm wheel.

    iv.   Differential screw jack, Diff. Pulley, Wheel and Axle.

    9.5   Use the formulae to solve the problems involving efficiency, M.A of the above machines.

10. Use the concepts of vibratory motion to practical situations.

    10.1   Define vibratory motion giving examples.

10.2   Describe circular motion and its projection on diameter of the circular path.

10.3   Relate rotatory motion to simple vibratory motion.

    10.4   State examples of conversion of rotatory motion to vibratory motion and vice versa.

10.5   Describe speed governors, cams quick return motion.

    10.6   Derive formulae for position, velocity and acceleration of a body executing S.H.M.

10.7   Use the concept of S.H.M to helical springs.

10.8   Use the concept S.H.M to solve problems on pendulum.

11. Understand bending moments and shearing forces.

11.1   Define three types of stresses and modulii of elasticity.

11.2   Describe types of beams and loads.
11.3   Explain shearing force and bending moment.
    11.4   Use these concepts to calculate S.F and B.M in a given practical situation for point loads, uniformly distributed loads.
11.5   Prepare S.F and B.M diagram for loaded cantilever and simply supported beams.
    11.6   Describe torsion and tensional stresses giving formula

12. Understand simple mechanisms.
    12.1   Define simple mechanisms.
12.2   Define kinematics.
12.3   Explain kinematic link or element.
12.4   Explain kinematic chains.
12.5   Distinguish between types of kinematic chains.

13. Understand the method of finding velocity in mechanisms.
    13.1   Explains relative velocity.
13.2   Explain instantaneous center.
13.3   Explain instantaneous velocity.
13.4   Explain the method of finding velocity of a link by:
    i.   Relative velocity method.
    ii.   Instantaneous center method.

PHY-212 APPLIED MECHANICS

List of Practicals:

1. Find the weight of the given body using Law of Polygon of forces.
2. Find unknown forces in a given set of concurrent forces in equilibrium using Grave-sands apparatus
3. Set a jib crane and analyses forces in its members
4. Set a Derrick Crane and analyses forces in its members
5. Study forces shared by each member of a Toggle Joint
6. Set a Roof Truss and find forces in its members
7. Verify Principle of Moments in a compound lever
8. Calibrate a steelyard
9. Find the Reactions at the ends of a loaded beam
10. Use Reaction of Beams apparatus to study resultant of Parallel forces
11. Find the Moment of Inertia of a Flywheel
12. Find the angle of reaction for a wooden block placed on an inclined plane
13. Find the B.H.P. of a motor
14. Study the transmission of Power through friction gears
15. Study the transmission of power through belts
16. Study the transmission of Power through toothed wheels
17. Study the function of clutches
18. Find M.A. and Efficiency of worm and worm wheel
19. Find M.A. and efficiency of differential wheel and axle
20. Find the efficiency of a screw
21. Find the efficiency of a differential pulley
22. Study conversion of rotatory motion to S.H.M. using S.H.M. Model/Apparatus
23. Study conversation of rotatory motion to vibratory motion of the piston in a cylinder
24. Study the reciprocating motion
25. Study the working of cams
26. Study the quick return motion
27. Compare the Elastic constants of the given wires
28. Verify Hooke's Law using Helical Spring
29. Find the coefficient of Rigidity of a wire using Maxewell's needle
30. Find the coefficient of Rigidity of a round bar using torsion apparatus
31. Find the coefficient of Rigidity of a rectangular bar using Deflection of Beam Apparatus
32. Determine S.F. and B.M. in a loaded canti-lever (Point Loads)
33. Determine S.F. and B.M. in a simply supported Beam (Point Loads)
34. Determine S.F. and B.M. in a simply supported Beam (Point loads and uniformly distributed load)
35. Determine S.F. and B.M. in a simply supported Beam (Point loads and uniformly distributed)
36. Study working and function of link mechanism of different types .

DMT-242

MATERIAL SCIENCES AND HEAT TREATMENT

T	P	C
1	3	2

Total Contact Hours:	
Theory:	32
Practical:	96

Pre-requisite: Applied Chemistry

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

COURSE CONTENTS

1. INTRODUCTION TO METALLURGY.   01 Hour
   1.1.   Definition & Classification
   1.2.   Scope of Metallurgy

2. MANUFACTURE OF WROUGHT IRON   03 Hours
   2.1.   Classification of puddling furnace
   2.2.   Charge of puddling furnace 2.3. Simple operation of puddling furnace
   2.4. Uses of wrought iron.

3. TYPES OF STEELS.   03 Hours
   3.1.   Carbon steels.
   3.2.   Alloy steels.
   3.3.   Alloying elements of steel and their effects
   3.4.   Application of carbon and alloy steels.
   3.5.   Eutectoid steel.
   3.6.   Low Medium and high carbon steels.
   3.7.   Intermetallic compound.

4. MECHANICAL PROPERTIES OF MATERIALS   03 Hours

    4.1.   Hardness

    4.2.   Toughness

    4.3.   Ductility

    4.4.   Brittleness

    4.5.   Elasticity

    4.6.   Plasticity

5. DESTRUCTIVE TEST   03 Hours

    5.1.   Hardness tests

        5.1.1. Brinell hardness test

        5.1.2. Rockwell hardness test

    5.2.   Izod impact test

    5.3.   Tensile test

    5.4.   Bending test

    5.5.   Shear test

    5.6.   Torsion test

    5.7.   Fatigue test

6. STEEL MANUFACTURING PROCESS   04 Hours

    6.1.   Chemistry steel refining.

    6.2.   Construction and working of open hearth furnace.

        6.2.1. Acid process.

        6.2.2. Basic Process.

    6.3.   Bessemer convertor

        6.3.1. Construction of convertor

        6.3.2. Charge of the convertor.

        6.3.3. Operation of Bessemer convertor.

    6.4.   Electric Arc furnace.

        6.4.1. Construction of direct arc furnace.

        6.4.2. Construction of indirect arc furnace

        6.4.3. Operation of an electric arc furnace. 6.4.4. Charging of an electric arc furnace

        6.4.5. Oxidation period.

        6.4.6. Addition of alloying elements and tapping.

        6.4.7. Duplex operation.

7. NON FERROUS METALS   03 Hours

    7.1.   Properties & use of non ferrous metals

    7.2.   Ores of non ferrous metals

    7.3.   Extraction of non ferrous metals

8. INDUSTRIAL SHAPING OF METALS.   04 Hours

8.1. Hot working processes.
    8.1.1. Rolling.
    8.1.2. Forging.
    8.1.3. Drop forging.
    8.1.4. Heading.
    8.1.5. Hot pressing.
    8.1.6. Extrusion 8.2. Cold working process.
    8.2.1. Rolling.
    8.2.2. Drawing.
    8.2.3. Pressing.
    8.2.4. Deep drawing
    8.2.5. Coining.
    8.2.6. Spanning.
8.3. Production of pipes
    8.3.1. List methods of pipe manufacturing
    8.3.2. Explain casting & forming methods

9. HEAT TREATMENT PROCESSES   02 Hours
9.1. Annealing & Normalizing
9.2. Hardening by quenching
9.3. Tempering
9.4. Hardenability

10. CASE HARDENING PROCESSES   02 Hours
10.1. Carburizing (pack,gas,liquid)
10.2. Nitriding
10.3. Cyaniding
10.4. Flame & induction hardening

11. DIE-CASTING   02 Hours
11.1. Die casting & its uses 11.2. Materials of dies
11.3. Die casting methods

12. POWDER METALLURGY   02 Hours
12.1. Introduction to powder Metallurgy
12.2. Powder manufacturing methods
12.3. Properties of Powder
12.4. Fabricating procedure & Secondary operations
12.5. Powder Metallurgy applications

RECOMMENDED BOOKS:
    1.   Engineers Metallurgy {Part I, II by Raymond A. Higgins
2. Physical & Chemical Metallurgy by JE GARSIDE
3. Physical metallurgy by ANVER

DMT-242

MATERIAL SCIENCES AND HEAT TREATMENT

INSTRUCTIONAL OBJECTIVES

1. INTRODUCTION

1.1. Know definition and classification

    1.1.1. Define Metallurgy

    1.1.2. State relationship of metallurgy with chemistry

    1.1.3. State classification of metallurgy

1.2. Know scope of metallurgy

    1.2.1. Describe importance of metallurgy in engineering all metals

    1.2.2. State importance of metallurgy for a mechanical technician

    1.2.3. Describe specific importance w.r.t. steel industry

2. WROUGHT IRON

2.1. Understand wrought iron

    2.1.1. Define wrought iron

    2.1.2. Describe properties

    2.1.3. Explain uses

2.2. Understand wrought iron production

    2.2.1. Describe raw material med for wrought iron

    2.2.2. Explain construction of puddling furnace

    2.2.3. Explain operation in puddling furnace

    2.2.4. Describe the capacity of puddling furnace

    2.2.5. Enlist the types of puddling furnaces

3. STEEL

3.1. Know the difference between steel and iron

    3.1.1. Define steel

    3.1.2. Define iron

    3.1.3. List difference between steel and iron

3.2. Understand Types of steel

    3.2.1. List the types of steel w.r.t. percentage of carbon

    3.2.2. Define each type

    3.2.3. Describe the properties of each

    3.2.4. Explain the uses of each

3.3. Understand alloy steel

    3.3.1. Describe alloy steel

    3.3.2. List alloying elements

    3.3.3. Describe the uses of different alloy steels

    3.3.4. Define stainless steel

    3.3.5. Explain the properties of stainless steel

4. **STEEL MANUFACTURING**
   4.1. Know basic chemistry.
      4.1.1. List the raw material used for steel manufacturing.
      4.1.2. Describe the constituents of each raw material.
      4.1.3. Describe chemical reaction taking place in steel manufacturing furnace.
   4.2. Understand open hearth process.
      4.2.1. Describe parts of open Hearth Furnace (O H F)
      4.2.2. Describe operation inside O.H.F.
      4.2.3. Describe charging/discharging of O.H.F.
      4.2.4. Describe fuel supply/heating of O.H.F.
      4.2.5. Describe refractory lining of O.H.F.
      4.2.6. Appreciate quality of steel obtained through O.H.F.
      4.2.7. Estimate the quantity of steel produced by O.H.F. in Pakistan and the world
   4.3. Understand steel converter.
      4.3.1. Describe parts of steel converter.
      4.3.2. Describe charging of converter.
      4.3.3. Describe oxygenation process in convertor
      4.3.4. Explain alloying of steel in the converter.
      4.3.5. Describe discharging of the convertor.
      4.3.6. Describe the converter used in Pakistan Steel L.D. converter.
      4.3.7. Explain the difference between L.D. convertor and Bessemer convertor.

5. **INDUSTRIAL SHAPING OF METALS.**
   5.1. Know hot working processes.
      5.1.1. Define hot working.
      5.1.2. Describe hot rolling.
      5.1.3. Describe hot forging.
      5.1.4. Describe drop forging.
      5.1.5. Describe extrusion.
      5.1.6. Describe heading.
      5.1.7. Describe hot pressing.

6. **HEAT TREATMENT PROCESSES**
   6.1. Understand Annealing
      6.1.1. Define purpose of annealing
      6.1.2. Enlist steps taken in annealing
      6.1.3. Explain each step
   6.2. Understand Hardening
      6.2.1. Describe purpose of hardening
      6.2.2. Enlist steps taken for hardening
      6.2.3. Explain each process
   6.3. Understand Tempering
      6.3.1. Define purpose of tempering
      6.3.2. Enlist step taken for tempering
      6.3.3. Explain each process

6.4. Understand Quenching
- 6.4.1. Define purpose of quenching
- 6.4.2. Define different media, used for quenching 6.4.3. Explain the effect of quenching in each media

6.5. Know cold working processes.
- 6.5.1. Define cold working.
- 6.5.2. Describe cold rolling.
- 6.5.3. Describe cold pressing.
- 6.5.4. Describe cold drawing.
- 6.5.5. Describe cold forging.

7. DIE CASTING

7.1. Understand Die-casting
- 7.1.1. State Die-casting
- 7.1.2. Explain uses of Die-casting
- 7.1.3. Name the materials of Dies
- 7.1.4. State Die-casting methods
- 7.1.5. Explain Die-casting process step by step

8. POWDER METALLURGY

8.1. Understand Powder metallurgy
- 8.1.1. Describe powder metallurgy and uses
- 8.1.2. Explain methods of making powders & their properties
- 8.1.3. Explain fabricating procedures (compacting, sintering)
- 8.1.4. Explain secondary operations
- 8.1.5. Differentiate powder metallurgy methods from other production methods

RECOMMENDED BOOKS:

1- Frier elementary metallurgy 2-
Metallurgy of iron & steel by bradely 3-
Metallurgy past 1 & 11 by higgings.
4- Elements of heat treatment by enos &fontaine.
5- Engineering materials (the testing of materials) by aw judge.
6- Testing & inspection of engg materials by davis, troxell and wirkocil.

DMT-242

MATERIAL SCIENCES AND HEAT TREATMENT

LIST OF PRACTICALS   96 Hours

1. **MATERIAL SCIENCES.**
    1.1. Practice for Brinell hardness test.
        1.1.1. Practice for Rockwell hardness test for B-scale hardness.
        1.1.2. Practice for Rockwell hardness test for C-scale hardness.
    1.2. Practice for Izod and Charpy test on cast-iron, Aluminum and mild steel standard test specimens.
    1.3. Practice for Tensile test on universal testing machine on standard specimen and observe necking & yield point, calculate % elongation, % reduction in area.
    1.4. Compression Test on timber or cast iron.
    1.5. Practice for Bending and Shear test on universal testing machine.
    1.6. Practice for Torsion test on torsion testing machine.
    1.7. Practice for Fatigue test on fatigue testing machine.

2. **HEAT TREATMENT**
    2.1. Sketch Metallurgical Microscope indicating its various parts.
    2.2. Practice for working of Metallurgical microscope.
    2.3. Practice for Etching of specimen.
    2.4. Study grain size micro-structure of mild steel specimen.
    2.5. Practice for Flame hardening &quenching and study of grain structure.
    2.6. Practice for Annealing and study grain structure.
    2.7. Practice for Normalizing and study grain structure.
    2.8. Practice for Pack carburizing and study grain structure.
    2.9. Practice for heat treatment of Non-ferrous metals & cast iron and study grain structure.

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MOULD DESIGN-I

	T	P	C
	2	6	4

Total Contact Hours:	
Theory:	64
Practical:	192

AIMS This subject deals with the concepts of Plastic Injection Mould Design, after completing this course student will be able to design and develop plastic injection mold of a simple part.

1. INTRODUCTION   08 Hours

1.1.   Importance of Tool Design
1.2.   Basic Plastic Materials and their Properties
1.3.   Injection Moulding Machine
1.4.   Plastic Injection Mould Cavity and Punch
1.5.   Draft angle and shrinkages
1.6.   Plastic Injection Mould Arrangement of Cavities
1.7.   Injection Molding Process
1.8.   Plastic Injection Mould Main Parts of a Mould
1.9.   Plastic Injection Mould Guiding system and Cavities Disposition
1.10. Layout in Respect of Balance
1.11. Mold Polishing and its importance
1.12. Mold bases

2. DIFFERENT TYPES OF INJECTION MOULD   08 Hours

2.1.   Plastic Injection Mould -3 Plates Mould
2.2.   Three Plate Split Mould
2.3.   Double Color Mould
2.4.   Multi cavity Mould
2.5.   Family Mould
2.6.   Plate Mould Locking Unit
2.7.   Plate - Set (Die Set) With Guide Pillars and Bushes

3. INJECTION SYSTEM   08 Hours

3.1.   Plastic Injection Mould Sprue Bush
3.2.   Plastic Injection Mould Insulated Runner
3.3.   Plastic Injection Mould Hot Runner
3.4.   Plastic Injection Mould Cold Runners
3.5.   Arrangement & Sections

3.6.   Plastic Injection Mould Gates

3.7.   Plastic Injection Mould Sprue Gate

3.8.   Plastic Injection Mould Edge Gate

3.9.   Plastic Injection Mould Diaphragm Gate

3.10. Plastic Injection Mould Ring Gate

3.11. Plastic Injection Mould Flash Gate

3.12. Plastic Injection Mould Submarine Gate

3.13. Submarine Gate Dimension Cord

3.14. Submarine Gate Height and Section

3.15. Pin Point Gate

3.16. Plastic Injection Mould Parting Lines

3.17. Parting Line Exercise

3.18. Sprue Hooks

4. EJECTION SYSTEM   08 Hours

4.1.   Plastic Injection Mould Ejector System Machine Side

4.2.   Plastic Injection Mould Ejection System

4.3.   Mech. Ejector System

4.4.   Hydraulic Ejector System

4.5.   Plastic Injection Mould Types of Ejector

4.6.   Plastic Injection Mould Pin Ejector

4.7.   Plastic Injection Mould Blade Ejector

4.8.   Plastic Injection Mould Sleeve Ejector

4.9.   Plastic Injection Mould Stripper Plate

4.10. Plastic Injection Mould Disc Ejector

4.11. Plastic Injection Mould Ejector Return Springs

4.12. Plastic Injection Mould Ejector Return Cams

4.13. Manual Ejection

4.14. Unscrewing With Rack and Pinion

5. UNDERCUTS   08 Hours

5.1.   Definition and Types of undercuts

5.2.   Sliders Guiding System (Design Example)

5.3.   Slider (Diff. mechanisms)

5.4.   Delayed Action Finger Cams (Slider moving Side)

5.5.   Sliders (Inclined Pillar Operated), Effect of Angular Difference

5.6.   Cam Sliders (Spring Operated)

5.7.   Sliders(Hydraulic cylinder)

5.8.   Follow Split Mould

5.9.   Lifters and their mechanisms

5.10. Advantage of Lifter over Sliders

5.11. Molding of Internal Threaded Components

6. MOULD COOLING 08 Hours

    6.1.   Plastic Injection Mould Cooling Systems
    6.2.   Plastic Injection Mould Cooling - Simple - No Inserts
    6.3.   Plastic Injection Mould Cooling by Insert Sealing
    6.4.   Plastic Injection Mould Cooling – Simple Cooling Lines
    6.5.   Plastic Injection Mould Cooling –Baffles

7. TROUBLE SHOOTING OF PLASTIC INJECTION MOULD PARTS 08 Hours

    7.1.   Air traps
    7.2.   Sink marks
    7.3.   Weld lines
    7.4.   War page
    7.5.   Short molding
    7.6.   Trouble shooting with Molds

8. Metal Casting & Forging 08 Hours

    8.1.   Sand casting
    8.2.   Sand and its types
    8.3.   Casting materials
    8.4.   Construction of Patterns
    8.5.   Importance of risers and runners
    8.6.   Shell moulds
    8.7.   Plaster moulds
    8.8.   Centrifugal casting
    8.9.   Forging and its processes
    8.10. Hot and Cold Forging
    8.11. Forge ability
    8.12. Forging machines
    8.13. Forging die material and design
    8.14. Problems and trouble shooting

MOULD DESIGN-I   DMT-254

INSTRUCTIONAL OBJECTIVES

1. KNOWING ABOUT BASIC PARTS AND COMPONENTS OF A PLASTIC INJECTION MOULD
   1.1.   Describe Importance of Tool Design
   1.2.   Describe basic plastic Materials and their Properties
   1.3.   Explain Cavity and Punch
   1.4.   How to give Draft angle and shrinkages
   1.5.   How to arrange Cavities
   1.6.   Describe Injection Molding Process
   1.7.   Describe Guiding system and Cavities Disposition

2. UNDERSTANDING DIFFERENT TYPES OF AUTOMATIC MOULD
   2.1.   Describe construction of 3 Plates Mould
   2.2.   Describe construction and working of Double Color Mould
   2.3.   Describe construction and working of Multi cavity Mould
   2.4.   Describe construction and working of Family Mould

3. KNOW ABOUT INJECTION SYSTEM AND ITS FEATURES.
   3.1.   Describe different types of runner
   3.2.   Describe different types of gates and how to design them
   3.3.   Describe what is Parting Lines

4. KNOWING ABOUT EJECTION SYSTEM OF PLASTIC MOULD
   4.1.   How to design ejector System Machine Side 4.2. Understand different types of
          Ejection System
   4.3. Describe different Types of Ejectors.
   4.4. Describe how to Mould Internal Threaded Components
   4.5. Describe ejection with Rack and Pinion

5. KNOWING HOW TO DESIGN MOULD FOR THE PARTS WITH UNDERCUTS
   5.1.   What are under cuts?
   5.2.   Describe Sliders Guiding System
   5.3.   Describe slider mechanisms and its types
   5.4.   Describe Lifter Guiding System

6. UNDERSTANDING MOULD COOLING
   6.1.   Describe Cooling – Simple for No Inserts
   6.2.   Describe Cooling by Insert Sealing 6.3. Describe Cooling of Core & Cavity
   6.4. Baffles and hoses.

7. TROUBLE SHOOTING OF MOULDS
   7.1.   Common defects of parts, air traps, sink marks, weld lines, war page, flashing
          problem

8.   UNDERSTAND THE METAL CASTING & FORGING PROCESSES

8.1.   Types of casting

8.2.   Importance and application of sand casting

8.3.   Casting materials

8.4.   Importance of sand mould design

8.5.   Knowledge of Shell moulds

8.6.   Knowledge of Plaster moulds

8.7.   Knowledge of Centrifugal casting

8.8.   For Importance and application of Forging and its processes

8.9.   Importance and application of Hot and Cold Forging

8.10. Knowledge of die material and design

8.11. Problems and trouble shooting

DMT-254

MOULD DESIGN-I

PRACTICAL   **192 Hrs**

To design and develop a plastic injection mould of any part on CAD software:-

- Manufacturing Individual moulds, i.e.

    o Machining & Heat Treatment all parts of moulds

    o Grading systems, runner type

    o Ejector system

    o Sprue bush

    o Locating ring

- Guiding system

    o Guide pillar & guide bush.

    o Ejector back mechanism.

  - Types of cavity, spacers

  - Balancing of Multi-cavity mould

  - Polishing of mould

  - Machining of bearing faces etc.

DMT-263

MACHINE SHOP practice

A. MACHINE SHOP
B. ADVANCE WELDING

T	P	C
2	3	3

Total Contact Hours:	
Theory:	64
Practical:	96

Pre-requisite: Workshop Practice-I

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

COURSE CONTENTS

1.	**LATHE CONSTRUCTION**	02 Hours
1.1.	List the parts	
1.2.	Explain function of each part	
2.	**LATHE CUTTING TOOLS**	03 Hours
2.1.	kinds of lathe and cutting tools	
2.2.	Understand lathe tool angles	
2.3.	Name each angle for different lathe cutting tools	
3.	**CUTTING SPEED FEED AND MECHANISM**	03 Hours
3.1.	Cutting speed	
3.2.	R.P.M	
3.3.	machine time	
3.4.	cutting fluid and lubrication	
4.	**TYPES OF LATHE**	03 Hours
4.1.	Center Lathe	
4.2.	Vertical lathe	
4.3.	Turret lathe	
4.4.	Bench lathe	
5.	**LATHE ACCESSORIES**	02 Hours
5.1.	Chucks	
5.2.	Collates	
5.3.	Centers	

5.4.   Steady rest

6.   LATHE OPERATION   05 Hours
6.1.   Turning operation
6.2.   Facing operation
6.3.   Boring
6.4.   Tapper turning
6.5.   Threading
6.6.   Chamfering
6.7.   Centering
6.8.   Parting
6.9.   Drilling
6.10.   Reaming
6.11.   Knurling

7.   TOOL MATERIALS   02 Hours
7.1.   Classification Of Tools Materials

8.   DRILL CONSTRUCTION   02 Hours
8.1.   Types of drill press
8.2.   Parts and function of drill press

9.   DRILLING OPERATIONS   02 Hours
9.1.   Drill operations
9.2.   Drill parts and function
9.3.   Grinding/sharpening a drill
9.4.   Tool holding devices
9.5.   Work holding devices
9.6.   Speed and feeds
9.7.   Coolants and cutting lubricants

10.   GRINDING   02 Hours
10.1.   Surface Grinding
10.2.   Cylindrical Grinding
10.3.   Tool Grinding

11.   SHAPER WORK   08 Hours
   Shaper Machine Construction
11.1.   List parts of a shaper
11.2.   part of a shaper
11.3.   clamping device
   Types Of Shaper Machine
11.4.   Hydraulic
11.5.   Crank
11.6.   Geared
   Shaper operation
11.7.   Explain each type of shaper tools
11.8.   Explain adjustment of shaper speed and feed
   11.9   Explain calculation of time in shaper work

12   PLANNER   02 Hours

  12.1   Understand planner

  12.2   List parts of a planner

  12.3   Explain each parts of a planner

  12.4   Explain lubrication of planner

  12.5   Describe tool and work holding devices in planner

13   PLANNER OPERATION   02 Hours

  13.1   Describe tool used in planner

  13.2   Describe adjustment of speed and feed

  13.3   Explain planning operation

  13.4   Explain the attachment of planner

14   MILLING CONSTRUCTION   02 Hours

  14.1   Parts Of Milling Machine

  14.2   Explain Function Of Each Part

15   MILLING TYPES   03 Hours

  15.1   Milling Machine

  15.2   Universal Milling Machine

  15.3   Horizontal Milling Machine

  15.4   Vertical Milling Machine

  15.5   Copy Milling Machine

  15.6   Gear Hobbing

  15.7   Engraving

16   MILLING ACCESSORIES   03 Hours

  16.1   Vertical Spindle Head

  16.2   Cutter Arbors

  16.3   Collets

  16.4   Tables

  16.5   Chucks

  16.6   Dividing Head

  16.7   Work Holding Devices

17   MILLING CUTTERS   02 Hours

  17.1   Types Of Milling Cutters

  17.2   Profile Cutters

  17.3   End Mills Cutters

  17.4   T-Slot Cutters

18   MILLING OPERATION   04 Hours

  18.1   Conventional Milling

  18.2   Climb Milling

  18.3   Slotting Milling

19   ADVANCE WELDING   12 Hours

  Gas Welding

  19.1   Understand Gas Welding Equipment

MACHINE SHOP

INSTRUCTIONAL OBJECTIVES

A)   MACHINE SHOP

1. LATHE CONSTRUCTION
   1.1. Understand function of lathe and its parts
      1.1.1. List the parts
      1.1.2. Explain function of each part
      1.1.3. Explain the inter-relation of each part
      1.1.4. Explain the working of lathe in brief
   1.2. Know types of Lathe
      1.2.1. List the types of lathe
      1.2.2. Describe each type
      1.2.3. Describe advantages and limitation of each type
   1.3. Understand Lathe accessories, attachment work holding devices with uses
      1.3.1. Name the lathe accessories
      1.3.2. Explain each
      1.3.3. Name the lathe attachments
      1.3.4. Explain each
      1.3.5. List the work holding devices
      1.3.6. Explain each

2. LATHE CUTTING TOOLS
   2.1. Understands kinds of lathe cutting tools
      2.1.1. List the types of lathe cutting tools
      2.1.2. Explain each
   2.2. Understand lathe tool angles
      2.2.1. Name each angle for different lathe cutting tools
      2.2.2. Describe each
      2.2.3. Explain the functions and application of each angle

3. CUTTING SPEED AND FEED
   3.1. Understand speed and feed
      3.1.1. Define speed
      3.1.2. Define feed
      3.1.3. Describe method of speed calculation
      3.1.4. Describe method of feed calculation
      3.1.5. Describe relationship between speed and feed
   3.2. Understand depth of cut
      3.2.1. Describe depth of cut
      3.2.2. List the factor influence the depth of cut

3.2.3. Explain the relation between different factor affecting the depth of cut
3.3. Understand machining time
    3.3.1. Describe machining time
    3.3.2. Explain machine time calculation method
3.4. Understand coolants and lubrication
    3.4.1. List the coolants and lubrications used

4. LATHE OPERATION

4.1. Understand centering
    4.1.1. List different methods of centering the job
    4.1.2. Describe each method of centering
    4.1.3. Explain the importance of centering job
4.2. Understand simple turning
    4.2.1. Describe turning
    4.2.2. Describe principle of turning
    4.2.3. Describe turning classification
    4.2.4. Explain the method of measuring/checking
    4.2.5. Explain internal turning
    4.2.6. Explain off set or eccentric turning
4.3. Understand Taper Turning
    4.3.1. Describe taper turning
    4.3.2. Describe principle of taper turning
    4.3.3. Explain the use of formula for taper turning
    4.3.4. List the methods of taper turning
    4.3.5. Explain each method of taper turning
4.4. Understand Knurling
    4.4.1. Define knurling
    4.4.2. Describe purpose of knurling
    4.4.3. Describe principle of knurling
    4.4.4. List methods of knurling
    4.4.5. Explain each method of knurling 4.4.6. Explain tools used in knurling
4.5. Understand thread and thread cutting
    4.5.1. Define thread
    4.5.2. Describe different form of thread
    4.5.3. Describe the thread cutting procedure
    4.5.4. Explain thread cutting calculation
    4.5.5. Explain thread cutting operations
4.6. Understand Facing
    4.6.1. Define facing
    4.6.2. Explain the facing operation
    4.6.3. Explain the facing operation on job held in chuck
4.7. Understand drilling by lathe
    4.7.1. List different method of drilling on lathe machine
    4.7.2. Describe each method of drilling on lathe machine
    4.7.3. Explain the adjustment of speed and feed for different drilling methods
4.8. Understand Lathe boring

        4.8.1. Define boring its function and uses

        4.8.2. Explain boring principle and procedure

        4.8.3. Explain boring a taper hole

        4.8.4. Explain adjustment of speed and feed for boring

        4.8.5. Explain boring tools

    4.9. Understand Reaming by Lathe

        4.9.1. Define reaming its function and uses

        4.9.2. List types of reamers

        4.9.3. Explain each types of reamers

        4.9.4. Explain adjustment of speed and feed of reamer

5. DRILLING

    5.1. Understand drill machine

        5.1.1. List types of drill machines

        5.1.2. List parts of a drill machine

        5.1.3. Explain function of each parts of a drill machine

    5.2. Understand drilling operation

        5.2.1. List parts of a drill

        5.2.2. Explain each parts a drill machine

        5.2.3. Explain types of drills

        5.2.4. List different angles of drill

        5.2.5. Explain different angles of a drill machine

        5.2.6. Explain drilling operation

        5.2.7. Explain speed and feed

        5.2.8. Explain coolant and lubrication

        5.2.9. Explain grinding of drill-tools

        5.2.10. Describe safety procedures

6. TOOL GRINDER

    6.1. Understand grinder

        6.1.1. List parts of grinder

        6.1.2. Describe each type of grinder

        6.1.3. Explain speed of grinder

        6.1.4. List the types of grinding wheels

        6.1.5. Explain each type of grinding wheel

        6.1.6. Explain grinding operation

B.   ADVANCE WELDING

1. GAS WELDING

    1.1.Understand gas welding equipment

        1.1.1. List part of oxygen cylinder

        1.1.2. Describe function of each part

        1.1.3. Describe function of regulator in detail

        1.1.4. List part of acetylene cylinder

1.1.5. Describe function of each part

1.2.Understand gases use in welding

    1.2.1. List all the gases used

    1.2.2. Describe the function of oxygen in gas welding.

    1.2.3. Describe the function properties of other combustible gasses used.

    1.2.4. Describe the comparison between different combustible gasses used.

1.3. Understand Blow Pipes/Torches and Nozzles.

    1.3.1. List the types of blow pipes, torches nozzles.

    1.3.2. Explain distinct features of each and their uses

1.4. Understand welding Techniques and Procedure for steel welding.

    1.4.1. Explain Job preparation.

    1.4.2. Explain the formation of flame.

1.5. Know welding techniques for other metals.

    1.5.1. List different methods of welding materials other than steel.

    1.5.2. List different methods of preheating.

1.6. Understand Gas Cutting.

    1.6.1. Define gas cutting.

    1.6.2. Describe uses of gas cutting.

    1.6.3. Describe adjustment of a flame for gas cutting.

    1.6.4. Describe gas cutting apparatus.

    1.6.5. Explain gas cutting apparatus.

    1.6.6. Describe safety precautions in gas welding and cutting

2. **ELECTRIC ARC WELDING.**

    2.1. Understand welding transformers.

        2.1.1. Describe construction of a transformer.

        2.1.2. Describe principles of working of transformers.

        2.1.3. Describe current setting.

        2.1.4. Describe AC transformer.

        2.1.5. Describe uses of AC transformer.

    2.2. Understand Generators.

        2.2.1. Describe construction of a generator.

        2.2.2. Describe current setting.

        2.2.3. Describe safety procedures in ARC welding

    2.3. Understand Electrode.

        2.3.1. Explain the sizes of electrode.

        2.3.2. Explain each type.

        2.3.3. Describe the use of electrode.

        2.3.4. List advantages and disadvantages of long and short arc.

        2.3.5. Describe specific application of electrodes.

        2.3.6. Relate base metal material and electrode.

        2.3.7. Understand special Welding Processes.

            2.3.7.1. Explain resistance welding.

            2.3.7.2. Explain spot welding.

            2.3.7.3. Explain seam welding.

MACHINE SHOP

LIST OF PRACTICALS   **96 Hours**

1. Practice for centering the job by dial test indicator method
2. Turning and Facing Practice
3. Practice of counter-sinking
4. Practice of drilling on lathe
5. Practice of step turning
6. Knurling practice
7. Tool grinding practice
8. Practice of boring straight hole
9. Practice for boring taper hole
10. Reaming practice
11. Practice of taper turning
12. Practice for thread in metric system
13. Taping Practice
14. Practice for centering the job on milling machine
15. Slotting work practice on milling machine
16. Making flat surfaces on milling machine
17. Making core on milling machine
18. Making cavity on milling machine
19. Practice of Electric Arc Welding.
20. Practice of butt joint
21. Practice of lap joint
22. Practice of tee joint
23. Surface grinding

اسلامیات/مطالعہ پاکستان

		سی	ٹی	پی	GEN 311	نصاب سال سوئم
		1	0	1		حصہ اول اسلامیات

کل وقت 20 گھنٹے | حصہ دوئم مطالعہ پاکستان

موضوعات:

1۔ قرآن مجید:

سورۃ الفاتحہ، آیت الکرسی، سورۃ البقرہ کی آخری آیات از امن الرسولﷺ تا آخر اور سورۃ اخلاق مع ترجمہ وتشریح

2۔ دس منتخب احادیث کا ترجمہ (تشریح)

( ) بنی الا سلام علی خمس شہادت انا الا الہ الا لمراقلم الصلوتہ و ایتا الزکوۃ و حج البیت و صوم رمضان

( ) الدین النصیحتہ

( ) المنشاء موتمن

( ) للمومن علی المومن سنت خصال یعود ماذا مرض و تژھدہ اذا مات و یحیبہ اذا دعا

( ) لیسلم علیہ اذا لقیہ و لیثمتہ اذا عطس و فصیحلہ اذا غاب او شھد

( ) لا تخن من خانک

( ) لا یدخل الجنتہ قاتع

( ) ان اللہ حرم علیکم عقوق المھات و اضاعتہ المال

( ) لیسر اولا تعسر اولا تنفر

( ) ذاق طعم الایمان من مرضی باللہ و با الا سلام دینا بمحمدنبیا

( ) افضل الذکر لا الہ الا اللہ

3۔ حقوق وفرائض:

حصول تعلیم بطور فرض، والدین اور اولاد کے حقوق وفرائض، ہمسایہ کے حقوق، بچوں کے حقوق، عورتوں کے حقوق، بزرگ شہریوں کے حقوق، مخنث افراد کے حقوق۔

4۔ اسلام کی اخلاقی اقدار:

صبر واستقلال، عفوو درگزر، ایفائے عہد، اخوت، ایثار وقربانی۔

حصہ اول اسلامیات

تدریس مقاصد

قرآن حکیم:

عمومی مقاصد: منتخب سورتوں اور آیات کی روشنی میں اسلام کے بنیادی مقاصد اور عبادات جان سکے

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

سورۃ الفاتحہ، آیت الکرسی، سورۃ بقرہ کی آخری آیات از من الرسول سے اور سورۃ اخلاق کا ترجمہ و تشریح کر سکے

طالب علم درج ذیل کا مفہوم بیان کر سکے

( ) رب العالمین صرف اللہ تعالیٰ ہے

( ) اللہ رحم کرنے والا ہے

( ) قیامت کے دن بادشاہی اللہ کی ہوگی

( ) عبادات اور استعانت کا حقدار صرف اللہ ہے

( ) طالب علم درج ذیل کا مفہوم بیان کر سکے

( ) اللہ پاک ہر عیب سے پاک ہے

( ) اللہ کے اسمائے حسنہ حق اور قیوم ہیں

( ) تمام انبیاء پر ایمان لانا ضروری ہے

( ) رسول، ملائکہ، کتب، سماویہ، پر ایمان لانا فرض ہے

( ) اطاعت حقیقی صرف اللہ کے لیے ہے

( ) اسلامی احکامات پر عمل کرنا مسانی بساط میں ہے

( ) کفر کو اللہ کی مدد کے بغیر شکست نہیں دی جا سکتی

( ) اللہ ایک ہے

( ) اللہ کسی کا محتاج نہیں نہ اس کا کوئی شریک ہے

منتخب احادیث:

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

خصوصی مقاصد:

() احادیث کا ترجمہ بیان کر سکے

() احادیث کی تشریح کر سکے

() معاشرتی اور انفرادی زندگی میں احادیث سے رہنمائی حاصل کر سکے

حقوق و فرائض:

عمومی مقاصد:

() اسلامی معاشرے کا ایک اچھا فرد بن سکے

خصوصی مقاصد:

() والدین کے حقوق و فرائض بیان کر سکے

() ہمسایوں کے حقوق بیان کر سکے

() بچوں کے حقوق بیان کر سکے

() عورتوں کے حقوق کی پاسداری کر سکے

() بزرگ شہریوں کے حقوق کا خیال رکھ سکے

() مخنث حضرات کے حقوق جان سکے اور ان کے حقوق کی پاسداری کر کے انہیں معاشرے کا ایک مفید فرد بنایا جا سکے

() اسلام میں حقوق و فرائض کی آگاہی کی صورت میں اپنے اندر خدمت خلق کا جذبہ پیدا کر سکے

اسلامی اقدار:

عمومی مقاصد:

() طالب علم جان سکے گا کہ تعلیم کا مقصد حسن اخلاق سے متصف ہونا ہے

خصوصی مقاصد:

() اخلاق کے معنی و مفہوم کو بیان کر سکے

() اسلام میں حسن و اخلاق کی اہمیت بیان کر سکے

() قرآن و سنت کی روشنی میں صبر و استقلال کی اہمیت بیان کر سکے

() ایفائے عہد کی اہمیت بیان کر سکے

() اخوت کے معنی و مفہوم بیان کر سکے

() اخوت اسلامی کی اہمیت بیان کر سکے

( )	اسلام کی اعلیٰ اقدار کو اپنا کر مثالی معاشرہ پیدا کر سکے

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مطالعہ پاکستان

حصہ دوئم

کل وقت 12 گھنٹے

موضوعات:

( )   قیام پاکستان

( )   باؤنڈری کمیشن

( )   ریڈکلف ایوارڈ

( )   تقسیم بنگال

( )   تقسیم پنجاب

( )   مسئلہ مہاجرین

( )   ریاست کا الحاق

( )   ریاست جموں کشمیر

( )   نہری پانی کا تنازعہ

( )   قرارداد پاکستان

( )   علماء کے بائیس نکات

( )   1956ـ1962 اور 1973 کے دساتیر کی اسلامی و انسانی حقوق کی دفعات (8 تا 28)۔

( )   اقلیتوں کے حقوق۔ دیگر محروم طبقات کے حقوق

( )   پاکستان کا محل وقوع اور اسکی جغرافیائی اہمیت ـ +GSP کا تعارف اور عملی طریقہ کار

( )   قدرتی وسائل (تیل، گیس، کوئلہ)

مطالعہ پاکستان (حصہ دوئم)

قیام پاکستان

تدریس مقاصد:

عمومی مقاصد:

( )   قیام پاکستان کے بعد درپیش مسائل سے آگاہی حاصل کرے اور بیان کرے

خصوصی مقاصد:

( )   باؤنڈری کمیشن تشکیل اور اس کے فرائض بیان کر سکے

( )   ریڈ کلف اور اس کے ایوارڈ کے بارے بیان کر سکے

( )   بنگال اور کلکتہ کی تقسیم کی وجوہات بیان کر سکے

( )   پنجاب کی تقسیم کی تفصیل بیان کر سکے

( )   مہاجرین کی آمد سے جو مسائل پیدا ہوئے انہیں بیان کر سکے

( )   ریاستوں کے الحاق کے بارے میں تفصیل بیان کر سکے

( )   ریاست جموں کشمیر کے بارے میں بیان کر سکے

( )   نہری پانی کے تنازعہ کو بیان کر سکے

( )   قرارداد مقاصد کی تفصیلات بیان کر سکے

( )   22 علماء کے متفقہ اسلامی نکات بیان کر سکے

( )   1973 کے آئین میں انسانی حقوق کی دفعات (28-8)۔ اقلیتوں کے حقوق اور دیگر محروم طبقات کے حقوق کے بارے میں جان سکے

( )   قیام پاکستان کے بعد نفاذ اسلام کی کوششوں کو بیان کر سکے

( )   پاکستان کے محل وقوع اور اس کی جغرافیائی اہمیت بیان کر سکے اور GSP+ کے تعارف اور عملی طریقہ کار بیان کر سکے

( )   پاکستان میں قدرتی وسائل (تیل، گیس، کوئلہ) کے بارے میں بیان کر سکے

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نصاب اخلاقیات   GEN311

سال سوئم   1   0   1

کل وقت 20 گھنٹے

موضوعات:

( )   احساس ذمہ داری

( )   مثبت ذہن

( )   عدل وانصاف

( )   قومی خدمت کا جذبہ

( )   ذکر ونظر کی پاکیزگی

( )   احترام آدمیت

( )   شائستگی

( )   عفوو درگذر

( )   بردباری

( )   خودانحصاری

( )   اثرونفوذ

( )   جامعیت

( )   اپنی ذات کی معرفت (بذریعہ ہم عمر طلباء، اساتذہ، اہم شخصیات)

( )   بچوں کے حقوق

( )   عورتوں کے حقوق

( )   بزرگ شہریوں کے حقوق

( )   مخنث حضرات کے حقوق

غیر مسلم طلباء کے لیے

نصاب اخلاقیات (سال سوئم)

تدریس مقاصد:

عمومی مقاصد:

(۱) ملکی ترقی کے لیے اعلیٰ اوصاف کے ساتھ بہتر طور پر ملک وملت کی خدمت کر سکے

خصوصی مقاصد: طالب علم اس قابل ہو سکے کہ

(۱) موضوعات کا مطلب بیان کر سکے

(۲) عملی زندگی سے مثالوں کی نشاندہی کر سکے

(۳) موضوعات کی اہمیت بیان کر سکے

(۴) اپنی شخصیت اور معاشرے پر موضوعات کے مطابق اثرات پیدا کرنے کے طریقے بیان کر سکے

(۵) مثبت ذہن کے ساتھ کام کر سکے

(۶) عدل وانصاف سے ادارہ میں، دفتر میں بہتر ماحول پیدا کر سکے

(۷) ماحول کو اخلاقی طور پر پاکیزہ بنائے

(۸) کارکنوں کی بہتر طور پر دل جوئی کر سکے

(۹) کارکردگی میں اضافہ کر سکے

(۱۰) باہمی احترام کی برکات سے استفادہ کر سکے

(۱۱) بچوں کے حقوق بیان کر سکے

(۱۲) عورتوں کے حقوق کی پاسداری کر سکے

(۱۳) بزرگ شہریوں کے حقوق کا خیال رکھ سکے

(۱۴) مخنث حضرات کے حقوق جان سکے اور ان کے حقوق کی پاسداری کرکے انہیں معاشرے کا ایک مفید فرد بنایا جا سکے

COURSE OUTLINE YEAR – 3

INDUSTRIAL MANAGEMENT AND HUMAN RELATIONS

	T	**P**	**C**
	1	0	1

Total Contact Hours:	
Theory:	32
Practical:	0

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

COURSE CONTENTS

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

2.   LEADERSHIP   **1 Hour**
   2.1   Definition and types.
   2.3 Qualities of a good leader.

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

4.   MORALE   **1 Hour**
   4.1   Importance.
   4.2   Development.

   4.3   Measurement.

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

6.   INDUSTRIAL FATIGUE AND BOREDOM.   **2 Hours**
   6.1   Definition and distinction.
   6.2   Psychological causes.

6.3   Objective causes.

6.4   Prevention

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

8.   INDUSTRIAL PREJUDICE   **2 Hours**
   8.1   Causes
   8.2   Remedies

9.   PUBLIC RELATIONS.   **2 Hours**
   9.1   Importance
   9.2   Functions

10. GUIDANCE AND COUNSELLING   **2 Hours**
   10.1 Importance
   10.2 Choice of job.
   10.3 During service.

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

12. INDUSTRIAL MANAGEMENT   **2 Hours**
   12.1 Introduction
   12.2 Functions of management.
   12.3 Subdivisions of management
   12.4 Objectives of industrial management.

13. PERSONNEL SELECTION.   **2 Hours**
   13.1 Recruitment of employees.
   13.2 Training.
   13.3 Effects of training on production and product cost.

14. WORKING CONDITIONS.   **2 Hours**
   14.1 Importance and consideration.
   14.2 Effects on efficiency and per unit cost.

15. TIME AND MOTION STUDY.   **3 Hours**
   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 operations time.

16. QUALITY CONTROL.   **2 Hours**
16.1 Concept and advantages

16.2 Methods.

17. ROLE OF FOREMAN IN MANAGEMENT.   **2 Hours**
17.1 Foreman's abilities.

17.2 Duties and functions.

BOOKS RECOMMENDED:

1. C.S. Meyers, Industrial Psychology, Oxford University Press, London.
2. Smith Wakley, Psychology of Industrial Behaviors, Mc-Graw Hill, New York. 3. Ghulam Hussain, Nizamat-e-Sanaat Aur Insani Rawabat, Ilmi Kitab Khana, Urdu Bazar, Lahore.
4. Andrew R. Megill, The Process of Management William M New Man.
5. Richard N Omen, Management of Industrial Enterprises.

INDUSTRIAL MANAGEMENT AND HUMAN RELATIONS

INSTRUCTIONAL OBJECTIVES

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

KNOW INDUSTRIAL PSYCHOLOGY.

1.1 Describe brief history if 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 psychological 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 functions 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 service.

11. UNDERSTAND JOB EVALUATION.
11.1 Explain importance of job evaluation.
11.2 Explain methods 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 EFFECT OF WORKING CONDITION ON EFFICIENCY.
15.1 Explain importance of working condition.
15.2 Describe air-conditioning, ventilation, lighting and noise.
15.3 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 operations time.

16. UNDERSTAND THE METHODS OF QUALITY CONTROL.
16.1 Define quality control
16.2 State the advantages of quality control.
16.2 Explain methods of quality control.

17. UNDERSTAND THE ROLE OF FOREMAN IN AN INDUSTRIAL UNDERTAKING.
17.1 Explain ability of the foreman.
17.2 Enlist duties of foreman.
17.3 Describe functions of foreman as middle management.

DIE DESIGN-II

	T	P	C
	2	6	4

Total Contact Hours:	
Theory:	64
Practical:	192

Pre-requisite CAD and Engineering Drawing -1

AIMS At the end of the course, student should be able to:
1. Know the importance of deep draw and fine blanking tool making
2. Principles of designing deep draw and fine blanking tool.
3. Design Deep draw dies and punches.

COURSE CONTENTS

1. SHEET METAL FORMING OPERATIONS

1.1. Definitions of Various Forming Operations   04 HOURS
    1.1.Deep Drawing
    1.2.Form Drawing
    1.3.Embossing
    1.4.Coining
    1.5.Curling
    1.6.Flanging or Collar Drawing

2. DEEP DRAWING   04 HOURS
  2.1. Deep Draw Tool
  2.2. Explanation of Deep Drawing Operation
  2.3. Deep Draw Tool
      2.3.1. Components of Deep Draw Tool
        2.3.1.1. Top Plate
        2.3.1.2. Bottom Plate
        2.3.1.3. Deep Drawing Die
        2.3.1.4. Deep Drawing Punch
        2.3.1.5. Blank holder
        2.3.1.6. Blank
        2.3.1.7. Guide plates/Wear Plate
        2.3.1.8. Stripper
  2.4. Factors Influencing Deep Drawing Operations

3. BASIC DESIGNS OF DEEP DRAWING TOOL   10 HOURS

3.1. Push Through Tool
3.2. Return Tool
3.3. Inverted Drawing Tool
3.4. Redrawing Tool
3.5. Double Drawing Tool
3.6. Blanking/Drawing Tool
3.7. Multi station Drawing Tool
    3.7.1. Progressive Tool-Shearing Method
    3.7.2. Progressive Tools-Oeillet(Eye-let) Method
    3.7.3. Transfer Method
    3.7.4. Ironing Tools-Without Blank holder

4. DRAW PARAMETERS AND THEIR CALCULATION   08 HOURS

4.1. Draw Parameters
    4.1.1. Draw Edge
    4.1.2. Drawing Speed
    4.1.3. Draw Ratio
    4.1.4. Draw Clearance
    4.1.5. Drawing Force
    4.1.6. Blank holder Pressure
    4.1.7. Tool Ventilation
    4.1.8. Drawing Beads
4.2. Calculation of Draw Parameters
    4.2.1. Determining the Blank size
    4.2.2. Draw Ratio
    4.2.3. Drawing force
    4.2.4. Blank holder force
    4.2.5. Drawing clearance
    4.2.6. Trouble shooting Form Drawing Operation

5. DESIGNING OF COMPONENTS OF A DRAWING TOOL   08 HOURS

5.1. Base Plate
5.2. Drawing Dies
5.3. Drawing punches
5.4. Blank holder
5.5. Strippers
5.6. Drawing beads
5.7. Determining the Flat Blank
    5.7.1. Blank for circular draw pieces
    5.7.2. Blank calculation and construction for rectangular pieces

5.7.3. Blanks for irregular shapes

6. FINE BLANKING   06 HOURS

6.1. Fine Blanking
6.2. Advantages of Fine Blanking
6.3. Main application of fine blanked components
6.4. Working Principle of Fine Blanking Tool
6.5. Design Parameters of Fine Blanking Tool

7. FINE BLANKING MATERIALS, FORCES, QUALITY CHARACTERISTICS   06 HOURS
AND PART VARIETY

7.1. Material Selection
7.2. Material Stress and Properties
7.3. Part Configuration
7.4. Properties of the cut surface
7.5. Dimensional and form tolerances
7.6. Application examples

8. TYPES OF FINE BLANKING TOOLS   06 HOURS

8.1. Tool Types
8.2. Die system
8.3. Die Design
8.4. Calculation of Press forces
8.5. Die Lubrication

9. FINE BLANKING PRESSES AND LINES   04 HOURS

9.1. Requirement
9.2. Machine layout and drive system
9.3. Examples of production lines

10. DIE REPAIRING   04 HOURS
10.1. Defects and their countermeasures
10.2. Types of welding electrodes used

11. CALCULATION OF DIES WEIGHT AND COSTING OF DIES   04 HOURS
11.1. How to calculate Blank Size
11.2. How to calculate approximate die size
11.3. How to calculate die weight
11.4. How to calculate press tonnage required
11.5. How to make Die designing planning sheet
11.6. How to calculate Press Dies cost

DMT-314

DIE DESIGN-II

INSTRUCTIONAL OBJECTIVES

1. UNDERSTAND SHEET METAL FORMING OPERATIONS
1.1. Deep drawing
1.2. Form drawing
1.3. Coining, Embossing
1.4. Flanging or Collar drawing

2. KNOW ABOUT MAIN COMPONENTS OF DEEP DRAW TOOL AND ITS OPERATIONS & DESGINING FACTORES
2.1. Deep drawing Die
2.2. Deep drawing Punch
2.3. Blank Holder
2.4. Blank
2.5. Stripper
2.6. Deep drawing operations
2.7. Factor influencing deep drawing operations

3. KNOW BASIC DESIGNS OF DEEP DRAWING TOOL
3.1. Push through tool
3.2. Return tools
3.3. Inverted drawing tools
3.4. Redrawing tools
3.5. Double drawing tools
3.6. Blanking tools/Drawing tool
3.7. Multi station Drawing Tool

4. KNOW ABOUT DESIGN PARAMTERS AND ITS CALCULATION
4.1. Draw Clearance and its calculation
4.2. Draw Force and its calculation
4.3. Blank holder Pressure and its calculation
4.4. Drawing Beads and its calculation
4.5. Draw ratio and its calculation
4.6. Draw Edge and its calculation

5. KNOW ABOUT DESIGNING OF MAIN COMPONENTS OF A DRAWING TOOL
5.1. Design of base plate
5.2. Design drawing dies
5.3. Design drawing punches
5.4. Design blank holder
5.5. Design stripper
5.6. Design drawing beads

6. KNOW ABOUT FINE BLANKING TOOLAND ITS APPLICATION
6.1. Fine blanking tool and its application

6.2. Advantages of Fine blanking tool

6.3. Design Parameters of Fine Blanking Tool

7. KNOW ABOUT TYPES OF FINE BLANKING TOOLS AND THEIR PRESSES

7.1. Tool Types

7.2. Die System

7.3. Die Design

7.4. Fine Blanking Presses and Lines

8. KNOW ABOUT DIE REPAIRING AND COSTING OF DIES

8.1. Defects and their countermeasures

8.2. Types of welding electrodes used

8.3. Calculate Press Dies Cost

RECOMMENDED BOOKS:

Tool & Die Maker (Press Tools, Jigs & Fixtures) - 2nd Year

Tool & Die Maker (Press Tools, Jigs & Fixtures) - 3rd Year

DIE DESIGN - II

To design and develop a sheet metal die of any part on CAD software:-

- Forming as Non-Cutting Operations such as :

    o Deep drawing

    o Embossing

    o Coining etc.

- Performing Sheet Metal Press working Operations

- Analyzing the design in CAM software

- Machine the die parts

- Assemble the die

- Check the production/ output of die

CNC MACHINES & CAM

T	P	C
2	3	3

Total Contact Hours:	
Theory:	64
Practical:	96

Pre-requisite CAD and Engineering Drawing -1

AIMS: At the end of the course, student should be able to:
1. Set work piece, select the tooling and operate CNC machine.
2. Simulate actual 3d machining of a profile.
3. Specify different machining parameters as per the requirement of machining

COURSE CONTENTS

1.   INTRODUCTION OF CNC MACHINE   08 Hours

1.1   Types of CNC Machines

1.2   Basic components of CNC Machine

1.3   CNC Machine Controller

1.4   Setting Up Job on CNC

1.5   Job Alignment

1.6   Reference setting

1.7   Different types of tools and their uses

1.8   CNC Tool Assembly

2.   CNC PROGRAMMING   12 Hours

2.1   Manual programming

2.2   G AND M Codes and its functions

2.3   Sub Programming

3.   CNC MACHINE MAINTENANCE   12 Hours

3.1   CNC Lathe maintenance

3.2   Common problems and trouble shooting

3.3   CNC Milling

3.4   Common problems and trouble shooting

3.5   CNC EDM &Wire cut maintenance

3.6   Preventive maintenance

4.   COMMON MANUFACTURING FUNCTIONS   08 Hours

4.1   Overview of the Common Manufacturing Functions
4.2   The Operation Navigator
4.3   Manufacturing Objects
4.4   Manufacturing Operations and Sequences
4.5   Post processing

5.   SURFACE CONTOURING   24 Hours

5.1   Overview of the Surface Contouring
5.2   Area Milling
5.3   Flow Cutting
5.4   Surface Area Cutting
5.5   Contour Profiling
5.6   Planar And Cavity Milling
5.7   Overview of the Planar and Cavity Milling
5.8   Planar Milling
5.9   Introduction and Profiling
5.10   Cavity Milling, Z-Level Milling
5.11   Planar and Cavity Milling Project

RECOMMENDED BOOKS
1. CAD/CAM Principles, Practice & Manufacturing Management by Chris Mcmon 2nd Edition Pearson Education
2. Computer Numerical Control by Peter J. Amic, 1st Edition, Prentice hall Publishers
3. Automation Production Systems, & Computer-Integrated Manufacturing by Mikell P. Groover Prentice Hall 2nd edition 2000.

CNC MACHINES & CAM

LIST OF PRACTICALS: 96 Hours

1. Setup machine references
2. Setup job reference with the help of dial indicator in CNC Milling
3. Making a program in Jog mode in CNC Milling
4. Making a CNC program in manual mode in CNC Milling
5. Making and run a program in direct Automatic mood in CNC Milling
6. Setup job reference with the help of dial indicator in CNC Lathe
7. Making a program in Jog mode in CNC Lathe
8. Making a CNC program in manual mode in CNC Lathe
9. Setting up an electrode on CNC EDM as per drawing
10. Running a CNC wire cut program
11. Creating machining environment on software
12. Create and simulate a simple milling operation sequence
13. Create and simulate Surface Contouring for the given part
14. Create and simulate Area milling operation for the given part
15. Create and simulate Contour profiling for the given part
16. Create and simulate planar milling for the given part
17. Create and simulate cavity milling for the given part
18. Create and simulate Z level milling for the given part

INDUSTRIAL QUALITY CONTROL

	T	P	C
	2	0	2

Total Contact Hours:	
Theory:	64
Practical:	0

AIMS: At the end of this course the students will be able to understand:-
1. The fundamentals of Quality Control.
2. The Quality Management Practices, Tools and Standards.
3. The Statistical Process Control.

COURSE CONTENTS

1. IMPORTANCE OF QUALITY MANAGEMENT   6 Hours
   1.1. Introduction to Quality Control
   1.2. Introduction to Quality Management System

2. FUNDAMENTS OF PROBABILITY & STSTISTICS   16Hours
   2.1. Introduction to Probability & Statistics
   2.2. Definition of probability
   2.3. Probability laws
   2.4. Deterministic & probabilistic data
   2.5. Grouping of data

3. Measures of central tendency & dispersion   12Hours

   3.1. Calculation of mean
   3.2. Mode
   3.3. Median
   3.4. Standard deviation & range
   3.5. Random variable
   3.6. Discrete & continuous random variable

4. CONTROL CHARTS   20 Hours
   4.1. Statistical Process Control
   4.2. Causes of Variation
   4.3. Control Charts for Variables & Attributes
   4.4. Assignable causes
   4.5. Control charts for mean & range

4.6. Control charts for mean & standard deviation

4.7. Control charts for proportion defective & defects per assembly

5. PROCESS CAPABILITY   6 Hours

5.1. Introduction

5.2. Specification Limits and Control Limits

5.3. Process Capability Analysis

5.4. Process Capability Indices

6. TOTAL QUALITY MANAGEMENT 4 Hours

6.1. Introduction to TQM

6.2. Aspects of TQM

REFERENCE BOOKS:

1. Fundamentals of Quality Control and Improvements by Amitava Mitra - 3rd Edition
2. Statistical Quality Control by Douglas C. Montgomery

INDUSTRIAL QUALITY CONTROL

INSTRUCTIONAL OBJECTIVES

7. IMPORTANCE OF QUALITY MANAGEMENT
7.1. Understand the importance of Quality Control
7.2. Understand the importance of Quality Management System

8. FUNDAMENTS OF PROBABILITY & STSTISTICS
8.1. Definition of Probability
8.2. Definition of Statistics
8.3. Application of Probability & Statistics
8.4. Data and its types

9. Measures of central tendency & dispersion
9.1. Definition and importance of Mean, Median and Mode
9.2. Definition and importance of Standard deviation & range
9.3. Definition Random variable
9.4. Definition Discrete & continuous random variable
9.5. Application and inferences of central tendency

10. CONTROL CHARTS
10.1. Importance of statistical process control
10.2. Variation and its causes
10.3. Control charts and their types
10.4. Types of causes
10.5. Understand and develop the control charts for mean & range
10.6. Understand and develop the control charts for mean & standard deviation
10.7. Understand and develop the control charts for proportion defective & defects per assembly

11. PROCESS CAPABILITY
11.1. Definition of process capability
11.2. Difference between Specification Limits and Control Limits
11.3. Analysis of process capability
11.4. Process Capability Indices

12. TOTAL QUALITY MANAGEMENT
12.1. Philosophy of TQM
12.2. Advantages of TQM

MOULD DESIGN-II

T	P	C
2	6	4

Total Contact Hours:	
Theory:	64
Practical:	192

Pre-requisite CAD and Engineering Drawing -1

AIMS: At the end of the course, student should be able to:
1. Know the importance of pressure die casting mould
2. Principles of designing a pressure die casting mould
3. Understand manufacturing operation of pressure die casting mould

COURSE CONTENTS

1. **INTRODUCTION**   04 Hours
   1.1. Types of casting
   1.2. Casting Metals
   1.3. Casting Machines
   1.4. Manual Drive Arrangement

2. **PRESSURE DIE CASTING**   05 Hours
   2.1. Pressure Die Casting Metals
   2.2. Application
   2.3. Limitation
   2.4. Pressure Die Casting Machine
   2.5. Hot Chamber Machine
   2.6. Cold Chamber Machine

3. **DIE DESIGN**   15 Hours
   3.1. Materials for Die Casting Dies
   3.2. Split Cavities
   3.3. Drive of Cores and Splits
   3.4. Shrinkage Allowance and Draft
   3.5. Split
   3.6. Pressure Die Casting Cavity Layout
   3.7. Pressure Die Casting Parting Line and its selection
   3.8. Disposition of Cavities
   3.9. Die Components(mold bases and inserts)
   3.10. Pressure Die Casting (Sleeve and distributers)

3.11. Pressure Die Casting Runner

3.12. Pressure Die Casting Gates

3.13. Pressure Die Casting Vents

3.14. Pressure Die Casting Overflows

3.15. Pressure Die Casting Mould Cooling

4. EJECTION ARRANGEMENT **1**5 Hours

4.1. Pressure Die Casting Ejectors

4.2. Pressure Die Casting Ejection (Machine Side)

4.3. Ejector Location

4.4. Pin Ejector

4.5. Ejector (Stripper Plate, Ring, Sleeve)

4.6. Ejector Returns

4.7. Sliders (Angular pins and hydraulic cylinders)

4.8. Cores

5. MACHINE PARAMETERS 10 Hours

5.1. Operating cycles

5.2. Die Lubricants

5.3. Hints for Trial Production

5.4. Surface Finish and Quality of Castings

5.5. General Casting Problems

5.6. Heat treatment

6. GRAVITY CASTING 15 Hours

6.1. Gravity Casting Mould Design

6.2. Risers and Gates

6.3. Top Gating

6.4. Side Gating

6.5. Bottom Gating

6.6. Undercuts

6.7. Ejection

6.8. Mould Material

REFERENCE BOOKS

1. Moulds Design & Processing Handbook by Eiri consultants &Engr, 1st edition r
published by Sudhir Gupta

MOULD DESIGN-II

INSTRUCTIONAL OBJECTIVES

1. **INTRODUCE DIFFERENT TYPES OF ALUMINIUM DIE CASTING OPERATIONS**
   1.1. Know about different types of casting operations.
   1.2. Know about different types of casting materials.
   1.3. Know about different casting machines , their setup and operation

2. **KNOW THE OPERATION OF PRESSURE DIE CASTING**
   2.1. Describe which elements can be casted and what are the limitations
   2.2. Know Pressure Die Casting Machine
   2.3. Know Hot Chamber Machine and its application
   2.4. Know Cold Chamber Machine and its operation

3. **ABLE TO DESCRIBE DIE MAIN PARTS**
   3.1. Able to design Cavity Layout, Parting Line, Gating System, Disposition of Cavities, Parting Lines, Runner, Gates, Vents, Overflows etc
   3.2. Able to design Sliders and Cores
   3.3. Know Split Cavities, Drive of Cores and Splits
   3.4. Knows about Shrinkage Allowance and Draft
   3.5. Understand Die Cooling

4. **ABLE TO UNDERSTAND EJECTION ARRANGEMENT**
   4.1. Know Ejectors, Ejector Location
   4.2. Know Different types of ejectors , Pin Ejector, Blade Ejector, Ejector (Stripper Plate, Ring, Sleeve), Ejector Returns

5. **ABLE TO UNDER STAND DIFFERENT MACHINING PARAMETERS**
   5.1. Know the Materials for Die Casting Dies
   5.2. Know how to do die Lubrication and maintenance
   5.3. Able to trouble shoot l Casting Problems

6. **GRAVITY DIE CASTING**
   6.1. Know how to design a gravity casting mould with risers, gates, ejection, undercuts.

MOULD DESIGN - II

LIST OF PRACTICALS **192 Hrs**

To design and develop a Pressure Die Casting Mould of any part on CAD software:-

- Manufacturing of Individual mould:

    o Machining

    o Heat Treatment of various parts of die casting moulds including gating systems.

    o Runner Type, Ejector system

    o Guiding systems, i.e guide pillar & guide bush

    o Ejector type of cavity,

    o Spacers as well as balancing of Die casting mould

    o Polishing of mould etc.

DMT- 353

JIGS & FIXTURE DESIGN

T	P	C
2	3	3

Total Contact Hours:	
Theory:	64
Practical:	96

Pre-requisite CAD and Engineering Drawing -1

AIMS: At the end of the course, student should be able to:
1. Know the importance of jigs and fixture design
2. Principles of designing a jig or fixture

1. INTRODUCTION TO JIGS & FIXTURES   04 HOURS
   1.1. Definitions of Jigs and Fixtures
   1.2. Advantages of Jigs and Fixtures
   1.3. Distinguish between Jigs and Fixtures
   1.4. Types of Jigs
   1.5. Types of Fixtures

2. UNDERSTAND DIFFERENT PARTS OF JIGS AND FIXTURES   08 HOURS
   2.1. Description of parts of JIGS
   2.2. Explain function of each part
   2.3. Description parts of Fixtures
   2.4. Explain function of each part.

3. UNDERSTAND DIFFERENT MATERIALS USED IN JIGS AND FIXTURES   04 HOURS
   3.1. Enlist different materials
   3.2. Description of the properties of each with respect to Jigs and Fixtures 3.3.
      Selection of best material

4. UNDERSTAND DESIGN PROCEDURE   12 HOURS
   4.1. Outline the design detail
   4.2. Convert the outline into concrete form

5. UNDERSTAND JIG SUPPORT LOCKING PIN, SUPPORT JIG FEET, NUTS, SPRING AND WASHERS.
                12 HOURS
   5.1. Enlist different types of jig supports
   5.2. Explain each with the help of sketch
   5.3. Enlist different types of locking pins
   5.4. Explain each with the help of sketch 5.5. Enlist different types of Jig feet
   5.6. Explain each with the help of sketch

5.7. Enlist different types of nuts and spring washers

5.8. Explain

6. CHECKING FIXUTRES   24 HOURS

6.1. Introduction

6.2. **Checking Fixture Planning**
- 6.2.1.   Check Process Chart
- 6.2.2.   Panel Drawing
- 6.2.3.   Welding Jig Planning Sheet
- 6.2.4.   Decision on Use of CF
- 6.2.5.   Check Welding Jig
- 6.2.6.   Meeting with Parts Inspection Department
- 6.2.7.   Making CF Planning Sheet
- 6.2.8.   Checking CF Planning Sheet
- 6.2.9.   Return Planning Sheet to CF Maker

6.3. **Study Part Drawing**
- 6.3.1.   Check the fitment of the part
- 6.3.2.   Check the Matching surface of the part
- 6.3.3.   Check the Datum/MTG. Holes of part
- 6.3.4.   Part Clamping Position on Welding Jigs
- 6.3.5.   Resting Areas/Stoppers on Welding Jigs
- 6.3.6.   Attaching Parts Behavior in Assembly
- 6.3.7.   Drain Holes and Non Functional Holes

6.4. **Fixture Design Details**
- 6.4.1.   Datum Holes
- 6.4.2.   Mtg. Holes
- 6.4.3.   Holes for Nuts
- 6.4.4.   Drain Holes/Non Functional Holes
- 6.4.5.   Resting Point/Clamping Position
- 6.4.6.   Template for Checking of Bolt Position
- 6.4.7.   Template for Checking of Part Profile
- 6.4.8.   Marking for Outer Profile/Trim Profile
- 6.4.9.   Color Codes to Differentiate Fixture Surfaces
- 6.4.10. Tolerances Basic Hole Systems
- 6.4.11. Fixture Accuracy Standard
- 6.4.12. Selection of Fixture Material and Matching

6.5. **Procedure of Inspection Jig Manufacturing**
- 6.5.1.   Manufacturing of main negative (cavity) model from Styrofoam. (Styrofoam based Pattern)
- 6.5.2.   Construction of pipe structure
- 6.5.3.   Construction of main panel checker body

6.5.4.   Construction of foundation(Base)

6.5.5.   Machining of Surface

6.5.6.   Manufacturing of swing gauge

6.5.7.   Manufacturing of section gauge

6.5.8.   Manufacturing of other parts and their mounting 6.5.9.   Paint and final finishing is done

6.5.10.

RECOMMENDED BOOKS:

Tool & Die Maker (Press Tools, Jigs & Fixtures) - 3rd year
Tool Making & Design-MT-353

JIGS & FIXTURE DESIGN

INSTRUCTIONAL OBJECTIVES

1. **KNOW WHAT ARE JIGS AND FIXTURE WHERE THEY USED**
   1.1. Basic Concept of Jigs and Fixtures
   1.2. Applications of Jigs and Fixtures
   1.3. Difference between Jigs and Fixtures
   1.4. Types of Jigs and Fixtures

2. **KNOWLEDGE ABOUT BASIC COMPONENTS OF JIGS AND FIXTURES**
   2.1. Description of Jigs and Fixtures components
   2.2. Functions of components

3. **KNOWLEDGE ABOUT MATERIALS USED FOR JIGS AND FIXTURES**
   3.1. To know about different materials used in Jigs and Fixtures
   3.2. To study properties of different materials and Selection of best material.

4. **KNOWLEDGE ABOUT DESIGN PROCEDURE**
   4.1. How to design Jigs and Fixtures
   4.2. How to convert design into concrete form

5. **KNOWLEDGE ABOUT CHECKING FIXTURES AND THEIR DESIGNING & MANUFACTURING**
   5.1. Basic concept of Checking Fixtures
   5.2. Design Features of Checking Fixtures
   5.3. Procedure to manufacture Checking Fixture

JIGS & FIXTURE DESIGN

LIST OF PRACTICALS **96 Hrs**

1. Sketching of angle jig
2. Sketching of milling fixture.
3. Sketching of turning fixture.
4. Sketching of different standard parts of jig & fixture.
5. Application of unilateral tolerance for different sizes of shafts and holes
6. Application of bilateral tolerance for different sizes of shafts and holes
7. Sketch of different types of cams
8. Sketch of different types of followers
9. Cam profile design
10. Designing of Checking Fixtures

MT-332   **INDUSTRIAL ENGINEERING**

Total Contact Hours

			T	P	C
Theory	32				
Practical	96		1	3	2

AIMS: At the end of this course the students will be able to:
  (a)   Understand the fundamentals of planning of the industrial concern.
  (b)   Understand and appreciate the methods generally employed in various categories of manufacturing operations for economic production.

COURSE CONTENTS

1.   INDUSTRIAL PLANNING   **2 Hours**
        1.1   Need of industrial planning
        1.2   Financial planning, product planning, process planning

2.   SITE SELECTION OF INDUSTRY   **2 Hours**
        2.1   Elements of site selection (labor availability, transportation, electricity,
               Availability of raw materials, consumption products.)

3.   PLANT LAY-OUT   **2 Hours**
        3.1   Nature
        3.2   Purpose
        3.3   Types of plant layout and elements.

4.   FACTORS INFLUENCING PLANT LAY-OUT   **4 Hours**
        4.1   Raw materials, machinery, tools and equipment
        4.2   Man power
        4.3   Movement
        4.4   Service
        4.5   Building, plant modification, zoning
        4.6   Process requirements
        4.7   Safety
               a)   Man
               b)   Material/machines

5.   PLANNING FOR MAINTENANCE ACTIVITIES   **2 Hours**
        5.1   Maintenance plan
        5.2   Forms for schedule of activities

6.   CLASSIFICATION OF MECHANICAL PRODUCTS   **2 Hours**
        6.1   Classification and types of Mechanical products

7.   COST   **3 Hours**
        7.1   Item Cost
        7.2   Total Cost
        7.3   Cost comparison

8.   PRODUCTION METHOD   **2 Hours**
        8.1   Production
        8.2   Types of production

9.   JOB ANALYSIS   **3 Hours**
       9.1   Motion Study
       9.2   Time study

10.   TOTAL LABOUR TIME   **3 Hours**
       10.1   Labor
       10.2   Calculation of total labor time
       10.3   Flow process chart
       10.4   Waste time study

11.   PRODUCTION CONTROL   **3 Hours**
       11.1   Routing
       11.2   Scheduling
       11.3   Dispatching

12.   PRODUCTION TOOL   **2 Hours**
       12.1   Jig
       12.2   Fixture

13.   STORE OPERATION AND MAINTENANCE   **2 Hours**
       13.1   Receipt of stores
               a)   Raw material
               b)   Finished material issue of stores Indents, store cards
       13.2   Issue of stores
       13.3   Indents, store cards

REFERENCE BOOKS:

i)   Motion and time study by Ralph M. Barnes
ii)   Plant Layout and design by Moore

MT-332   INDUSTRIAL ENGINEERING

INSTRUCTIONAL OBJECTIVES

1.   KNOW THE BASIC PRINCIPLES OF INDUSTRIAL PLANNING
1.1   Define planning
1.2   Describe need of planning in industries
1.3   Describe financial planning steps and aspects in a general way
1.4   Describe product planning and product comparison
1.5   Describe process planning and selection of plan and equipment

2.   KNOW THE SALIENT FEATURES OF THE SELECTION OF SITE TO A FACTORY
2.1   Define site
2.2   Describe elements for selection of site for specific production emphasis on elements like (location of site, labor availability, electricity, transportation, rebate in taxes, availability of raw material, consumption of product etc.)

3.   UNDERSTAND THE PURPOSE OF PLANT LAYOUT
3.1   Describe the need and importance of plant layout
3.2   Describe the types of layout
3.3   Explain Elements of layout
3.4   Explain influence of nature of product as layout

4.   FACTORS INVOLVING IN PLANT LAYOUT
4.1   Know the factors involving in plant layout
    4.1.1   Describe Movement and supply of raw material to workshop
    4.1.2   Describe space requirement for machinery, tools and equipment
    4.1.3   Describe Process requirements
    4.1.4   State zoning - building - change required for future expansion
    4.1.5   State Safety requirements for
        i)   Man
        ii)   Men
4.2   Know the planning for layout
    4.2.1   State method of gathering the facts about industry.
    4.2.2   Describe the flow chart of process
    4.2.3   Compare alternate layouts and recognize correct layout

5.   PLANNING FOR MAINTENANCE ACTIVITIES
5.1   Know the planning for maintenance activities
    5.1.1   Observe schedule for maintenance on daily, weekly, monthly, quarterly and yearly bases
5.2   Know the maintenance plan
    5.2.1   Describe plan for emergency maintenance

6.   UNDERSTAND THE CLASSIFICATION AND TYPES OF MECHANICAL PRODUCT
6.1   Define mechanical products
6.2   Explain role of mechanical products in planning

7.   ROLE OF COST OF PRODUCT ON PLANNING
7.1   Understand total cost
    7.1.1   Define total cost
    7.1.2   Explain role of total cost on planning
7.2   Know item cost
    7.2.1   Define item cost
    7.2.2   Outline role of item cost on planning prime cost, overhead cost or finish cost

7.3   Know the cost comparison

7.3.1   Define cost comparison with respect to planning
7.3.2   Outline the cost control with respect of proper planning

8.   UNDERSTAND PRODUCTION AND PRODUCTION METHOD
8.1   Define production
8.2   Explain types of production like mass production, batch production and special order production

9.   UNDERSTAND DIFFERENT STUDIES INVOLVING JOB ANALYSIS
9.1   Define motion study
9.2   Describe the history of Gilberth
9.3   Instrument used in motion study like - stop watch - motion picture camera, etc.
9.4   Explain different symbols of micro-motion A.S.M.E. symbols and Therbliges.
9.5   Describe time study
9.6   State history of Taylor movement
9.7   Describe the use of time study
9.8   Describe time study equipment
9.9   State the points for time study
9.10   Explain time study with observation board.

10.   UNDERSTAND THE TOTAL LABOUR
10.1   List the time calculated towards total time
10.2   Define operation, transportation inspection and maintenance time.
10.3   Estimate standard time for a job
10.4   Explain flow process chart.
10.5   Explain waste time study.

11.   UNDERSTAND PRODUCTION CONTROL.
11.1   Describe routing, scheduling and dispatching.
11.2   Explain method of receipt and issue of material.
11.3   Describe standard forms used in stores.

12.   KNOW PRODUCTION TOOL.
12.1   Define jig
12.2   Describe and explain fixture
12.3   Differentiate between jig & fixture
12.4   State uses of jig & fixture in production industry

13.   KNOW STORE OPERATION AND MAINTENANCE
13.1   Describe issue receipt of raw product
13.2   Describe issue receipt of finished products
13.3   Describe indent and indenting
13.4   Describe store costs

REFERENCE BOOKS:

i)   Motion and Time study by RALPH M BARNES
ii)   Plant layout and Design by MOORE

MT-332   INDUSTRIAL ENGINEERING

LIST OF PRACTICAL   **96 Hours**
1.   Sketch layout of shops of Technology
2.   Planning of shop layout
3.   Draw and discuss administrative chart
4.   Study of Institutes stores
5.   Visit of cement factory/sugar mill/ghee/fertilizer Factory.
6.   Preparation of process chart/flow chart
7.   Preparation the chart of symbols:
        a)   ASME (American society of mechanical engineering)
        b)   Therebligs
8.   Preparation of activity chart
9.   Problems on time study
10.   Preparation of process charts
11.   Preparation of man land machine chart
12.   Preparation of operation chart
13.   Visit to production factory, paper and board mills, cycle, fan, pump, and sewing machine Factory, etc.
14.   Writing report critically analyzing the production process of the factory visited
15.   Preparations of a chart for calculating the actual time spent on the job.
16.   Preparation of an observation chart
17.   Preparation of a job analysis sheet

DMT- 361

COMPRESSION & RUBBER MOULDS

T	P	C
1	0	1

Total Contact Hours:	
Theory:	32
Practical:	0

AIMS: To be able to understand the basic knowledge of compression and rubber moulds.

COURSE CONTENTS

1. INTRODUCTION   02 Hours
   1.1. Compression mould
   1.2. Rubber mould
   1.3. Thermosetting plastics

2. COMPRESSION MOULD   03 Hours
   2.1. Difference b\w injection, blow & compression moulds
   2.2. Mould base
   2.3. Thermosetting plastic and applications
   2.4. Plastic identifications
   2.5. Mould materials

3. MAIN PARTS   03 Hours
   3.1. Compression mould cavity
   3.2. Compression mould core
   3.3. Compression mould Ejector
   3.4. Compression mould Injection
   3.5. Compression mould Parting line
   3.6. Compressing unit
   3.7. Heating unit

4. TYPES OF COMPRESSION MOULDS   08 Hours
   4.1. Compression mould Hand mould
   4.2. Flash mould
   4.3. Positive mould
   4.4. Landed plunger mould
   4.5. Semi positive mould

4.6. Inverted mould

5. RUBBER MOULDING   6 Hours
    5.1. Rubber forming
    5.2. Rubber injection
    5.3. Preheating of rubber
    5.4. Rubber moulding process

6. MAIN PARTS   04 Hours
    6.1. Rubber cavity
    6.2. Rubber core
    6.3. Rubber Ejector
    6.4. Rubber Parting line
    6.5. Heaters

7. TYPES OF RUBBER MOULDS   03 Hours
    7.1. Hand mould
    7.2. Semi auto mould
    7.3. Automatic mould

8. Rubber Mould Manufacturing   03 Hours
    8.1. Rubber products
    8.2. Applications
    8.3. Process time
    8.4. Rubber moulding machines
    8.5. Shrinkage
    8.6. Mould cooling
    8.7. Mould life

REFEERENCE BOOKS:

1. Moulds Design & Processing Handbook by Eiri consultants &Engr, 1st edition published by Sudhir Gupta

DMT- 361

COMPRESSION & RUBBER MOULDS

INSTRUCTIONAL OBJECTIVE

1. KNOW ABOUT COMPRESSION AND RUBBER MOULDS

2. KNOW THE DETAIL DESIGN OF COMPRESSION MOULD
2.1. Have knowledge to Difference b\w injection, blow & compression moulds
2.2. Know about molding material & Mould base
2.3. Know about Thermosetting plastic and applications

3. HAVE DETAIL KNOWLEDGE OF MAIN PARTS
3.1. Know the design detail of cavity, core, Ejector, Injection and parting line
3.2. Know about Compressing and heating unit
3.3. Knowledge about different types of compression moulds
3.4. Know about Hand mould, Flash mould, Positive mould, Landed plunger mould, Semi positive mould and inverted mould

4. KNOWLEDGE ABOUT RUBBER MOULDING
4.1. Know about the design of Rubber forming
4.2. Know Rubber injection
4.3. Know about the rubber moulding process

5. DESCRIBE MAIN PARTS OF A RUBBER MOULD INCLUDING

6. KNOW ABOUT DIFFERENT TYPES OF RUBBER MOULDS
6.1. Have knowledge of Rubber products and applications
6.2. Know different parameters of working of rubber mould

DIE AND MOULD MAINTENANCE

T	P	C
2	3	3

Total Contact Hours:	
Theory:	64
Practical:	96

AIMS At the end of this course the students will be able to:-
1. Understand the fundamentals of maintenance of dies and moulds
2. Understand and appreciate the methods generally employed in various categories of preventive and corrective maintenance.

COURSE CONTENTS

INTRODUCTION   04 Hours

1.1. Difference b\w corrective and preventive maintenance.
1.2. Mould maintenance
1.3. Die maintenance

2. PREVENTIVE MAINTENANCE   30 Hours

2.1. Die and mould life.
2.2. Inventory of standard part.
2.3. Over hauling
2.4. Re Nitriding
2.5. Replacement of core pins 2.6. Re matching of bearing faces
2.7. Re polishing.
2.8. Replacement of inserts
2.9. Preventive maintenance plan
2.10. Inventory of non-standard parts
2.11. Oiling and greasing

3. CORRECTIVE MAINTENANCE   30 Hours

3.1. Die and mould handling
3.2. Welding
3.3. Re sinking of electrodes
3.4. Grinding of broken cutting edges
3.5. General problems and remedies.

DIE AND MOULD MAINTENANCE

INSTRUCTION OBJECTIVES

1. KNOW WHY MAINTENANCE OF DIES AND MOULDS IS IMPORTANT
    1.1. Know the difference b\w corrective and preventive maintenance.
    1.2. Know how to do Mould maintenance
    1.3. Know how to do Die maintenance

2. KNOW BASICS OF PREVENTIVE MAINTENANCE
    2.1. Have knowledge of Die and mould life.
    2.2. Have the knowledge of Inventory of standard part.
    2.3. Know over hauling of dies and moulds
    2.4. Know how to do re nit riding, replacement of cores and re matching
    2.5. Know how to do Re polishing.
    2.6. Know how to Replace inserts
    2.7. Have detail knowledge of Preventive maintenance plan

3. HAVE KNOWLEDGE OF CORRECTIVE MAINTENANCE
    3.1. Know how to handle Dies and moulds
    3.2. Know about repairs with Welding
    3.3. Know the Re sinking of electrodes
    3.4. Know the Grinding of broken cutting edges

AND MOULDS MAINTENANCE

LIST OF PRACTICALS   **96 HOURS**

1. To disassemble a Mould.

2. To remove the inserts from Mould base and Die set.

3. To trouble shoot all Pins.

    3.1.1. Check bending in Pins.

    3.1.2. Check breakage / damage in pins.

4. To over haul Dies and Moulds.

    4.1.1. Removal of excess aluminum.

    4.1.2. Polishing of inserts, Core and Cavity.

    4.1.3. Renitriding of Moulds and Dies.

5. To re matching of bearing faces of Dies and Moulds.

    5.1.1. Check flashing on bearing faces.

    5.1.2. Welding of bearing faces.

    5.1.3. Machining of welded surface.

    5.1.4. Rematching of welded surface.

    5.1.5. Stress relieving.