Revised Curriculum of

D.A.E IN MECHANICAL TECHNOLOGY WITH

SPECIALIZATION IN DIES AND MOULDS (3-Year)

Year 2024

D.A.E IN MECHANICAL TECHNOLOGY WITH SPECIALIZATION IN DIES AND MOULDS (3-Year)

(Scheme of Studies)   **Year 2024**

FIRST YEAR

S.No	Code No	Course Title	T	P	C
1	GEN 111	Islamiyat /Pakistan Studies	1	0	1
2	TTQ 111	Tarjama-tul-Quran/Civics	1	0	1
3	ENG 112	English	2	0	2
4	CH 112	Applied Chemistry	1	3	2
5	MATH 113	Applied Mathematics-I	3	0	3
6	PHY 122	Applied Physics	1	3	2
7	DMT 113	Technical Drawing & CAD	1	6	3
8	DMT 131	Introduction to Dies & Moulds	1	0	1
9	DMT 142	Applied Electricity & Electronics	1	3	2
10	WT 156 Rev.	Workshop Technology – I	2	12	6
		Total	**14**	**27**	**23**

SECOND YEAR

S. No	Code No	Course Title	T	P	C
1	GEN 201	Islamiyat /Pakistan Studies	1	0	1
2	TTQ 211	Tarjama-tul-Quran/ Civics	1	0	1
3	MGM 201	Communication Skills and Report Writing	1	0	1
4	MATH 212	Applied Mathematics –II	2	0	2
5	PHY 212	Applied Mechanics	1	3	2
6	MECH 272	Metrology	1	3	2
7	DMT 232	Die Design – I	1	3	2
8	DMT 243	Material Science, Heat Treatment & Testing	2	3	3
9	DMT 252	Mould Design – I	1	3	2
10	WT 227	Workshop Technology II	2	15	7
		Total	**13**	**30**	**23**

THIRD YEAR

S. No	Code No	Course Title	T	P	C
1	GEN 301	Islamiyat /Pakistan Studies	1	0	1
2	MECH 321	Industrial Planning & Production Methods	1	0	1
3	MECH 333	Machine Design & Analysis	2	3	3
4	DMT 313	Die Design – II	2	3	3
5	DMT 334	CNC Machines & CAD/CAM	2	6	4
6	DMT 343	Mould Design – II	2	3	3
7	DMT 353	Jigs & Fixture Design	2	3	3
8	DMT 361	Compression & Rubber Mould	1	0	1
9	DMT 362	Die & Mould Maintenance	1	3	2
10	DMT 382	Project	0	6	2
		Total	**14**	**27**	**23**

COURSE OUTLINE YEAR – 1

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سال اول

اسلامیات

سی	پی	ٹی	
۱	۰۰	۱	گھنٹے
۵۰	۰۰	۵۰	نشانات

موضوعات

کتاب و سنت

الف: قرآن مجید

(۱) تعارف قرآن مجید (۲) نزول قرآن (۳) مکی و مدنی 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 اہلها

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 عند اللہ اتقاکم

۹۔ وما اتاکم الرسول فخذوہ وما نھکم عنہ فانتھوا

۱۰۔ واوفوا بعہد اللہ

۱۱۔ وعاشروھن بالمعروف

۱۲۔ یحق اللہ الربو و یربی الصدقات

۱۳۔ واصبر علی ما اصابک

۱۴۔ وقولوا قولا سدیدا

۱۵۔ ان الدین عند اللہ الاسلام

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سبق: سنت

١۔ سنت کی اہمیت

٢۔ دس منتخب احادیث معہ ترجمہ و تشریح

۱۔ انما الاعمال بالنیات

٢۔ انما بعثت لاتمم مکارم الاخلاق

٣۔ لا یؤمن احدکم حتی یحب لاخیہ ما یحب لنفسہ

٤۔ المسلم من سلم المسلمون من لسانہ و یدہ

٥۔ قل امنت باللہ ثم استقم

٦۔ خیرکم خیرکم لاھلہ

٧۔ سباب المسلم فسوق و قتالہ کفر

٨۔ المومن اخو المومن

٩۔ کل المسلم علی المسلم حرام دمہ و مالہ و عرضہ

١٠۔ آیۃ المنافق ثلاث اذا حدث کذب و اذا اوتمن خان و اذا وعد اخلف

٣۔ دین اسلام

٣۔١ اسلام کے بنیادی عقائد کی وضاحت اور انسان کی انفرادی و اجتماعی زندگی پر ان کے اثرات

۱۔ توحید   ٢۔ رسالت   ٣۔ آخرت   ٤۔ ملائکہ   ٥۔ آسمانی کتاب

٣۔٢ عبادات

۱۔ نماز   ٢۔ روزہ   ٣۔ حج   ٤۔ زکوۃ

مندرجہ بالا عبادات کی اہمیت و فضیلت، حکمتیں اور انسان کی انفرادی و معاشرتی زندگی پر ان کے اثرات

٤۔ 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 و اجتماعی زندگی پر پڑنے والے اثرات بیان کر سکے

۔ عبادات کے لفظی و اصطلاحی 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

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

_ قرآن مجید کی تعریف کر سکے گا

_ قرآن مجید کے نزول کی صورت بیان کر سکے گا

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

_ 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

_ قرآنی آیات کا ترجمہ و تشریح کر سکے گا

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

ب۔ سنت

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

خصوصی مقاصد

_ سنت کی تعریف بیان کر سکے گا

_ سنت کی اہمیت و ضرورت کی وضاحت کر سکے گا

_ سنت کی روشنی میں اسوۂ حسنہ پر عمل کر سکے گا

ج۔ منتخب احادیث نبوی

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

خصوصی مقاصد

_ احادیث کا ترجمہ و تشریح کر سکے گا

_ رسول اللہ ﷺ کے اسوۂ حسنہ کی پیروی کا جذبہ پیدا ہوگا

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

سال اول

مطالعہ پاکستان

سی	پی	ٹی	
١	٠٠	١	گھنٹے
۵٠	٠٠	۵٠	نشانات

حصہ دوم

موضوعات

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

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

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

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

- مجدد الف ثانی اور شاہ ولی اللہ کی تعلیمی خدمات

- سید احمد شہید کی تحریک مجاہدین

- تعلیمی تحریکیں

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

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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 :
- پیدا کیا اسے بیان کر سکے
- آزادی ہند کے سلسلہ میں تحریک مجاہدین کی خدمات بیان کر سکے

TTQ 111   TARJAMA TUL QURAN

	T	P	C
	1	0	1

Total Contact Hours:	
Theory:	32
Practical:	0

SYLLABI AND COURSES OF READING

نصاب تعلیمات اسلامی (لازمی)

50 نمبر

باب اول: بنیادی عقائد، توحید، رسالت، ملائکہ، آسمانی کتابیں، آخرت۔

باب دوم: اسلامی تشخص، ارکان اسلام، اللہ تعالیٰ اور رسول اللہ (خاتم النبیین صلی اللہ علیہ وعلی آلہ واصحابہ وسلم) کی محبت اور اطاعت۔
حقوق العباد، معاشرتی ذمہ داریاں۔

باب سوم: اسوہ رسول اکرم (خاتم النبیین صلی اللہ علیہ وعلی آلہ واصحابہ وسلم) ، رحمۃ للعالمین۔
اخوت، مساوات، صبر وا ستقلال، عفو و درگزر، ایثار۔

باب چہارم: تعارف قرآن و حدیث
تعارف قرآن، تعارف حدیث، منتخب آیات، منتخب احادیث۔

منتخب آیات

۱۔ یایھاالذین امنوا اتقوا اللہ و قولوا قولا سدیدا۔ یصلح لکم اعمالکم
و یغفرلکم ذنوبکم ومن یطع اللہ ورسولہ فقد فاز فوزاً عظیما

۲۔ لقد کان لکم فی رسول اللہ اسوۃ حسنۃ۔

۳۔ واعتصموا بحبل اللہ جمیعا ولا تفرقوا۔

۴۔ ان اکرمکم عنداللہ اتقاکم۔

۵۔ ان فی خلق السموت والارض واختلاف اللیل والنھار لایات لاولی الالباب۔

۲۔ لن تنالو البر حتی تنفقوا مما تحبون۔

۷۔ وما اتاکم الرسول فخذوہ وما نھاکم عنہ فانتھوا۔

۸۔ ان الصلوۃ تنھی عن الفحشاء والمنکر۔

۹۔ ولا تکسب کل نفس الا علیھا ولا تزر وازرۃ وزراخری

۱۰- ان الله يامركم بالعدل والاحسان.

۱۱- انانحن نزلنا الذكر واناله لحافظون

۱۲- يايها الذين أمنوا كتب عليكم الصيام.

احاديث

۱- انما الاعمال بالنيات وانما لكل امرئ مانوىٰ

۲- انما بعثت لاتمم مكارم الاخلاق.

۳- لايومن احدكم حتّى اكون احب اليه من والده وولده والناس اجمعين.

۳- لا يومن احدكم حتّى يحب لاخيه مايحب لنفسه

۵- المسلم من سلم المسلمون من لسانه ويده.

۲- لايرحمه الله من لا يرحم الناس.

۷- كل المسلم على المسلم حرام دمه وماله وعرضه.

۸- ماعال من اقتصد.

۹- من سلك طريقا يطلب فيه علما سلك الله به طريقا من طرق الجنة.

۱۰- المومن اخوالمومن كجسد واحد ان اشتكىٰ شيئامنه وجد الم ذلك فى سائر جسده.

۱۱- الجنته تحت اقدام الامهات.

۱۲- الصدق ينجى والكذب يهلك.

CIVICS (Compulsory)

(For non Muslim Students only in lieu of Islamiat Compulsory)
(There will be one paper of 50 Marks)
(Outlines of tests)

Marks : 50

The outline of the courses contains the following major themes and their contents:-

CHAPTER – I MAN AND SOCIETY

1. Sociability of man
2. Survival and development
3. Impact of social environment of man
4. Processes of socialization
5. Nature of Associations, their kinds (Voluntary / compulsory) and functions
6. Concepts of Family, Nation, Millat and state
7. Independence of the Individual and society

CHAPTER – II INDIVIDUAL AND STATE

1. Meaning of State and its elements (Population, Territory, Government and Sovereignty)
2. Islamic Concept of State
3. Functions of State (Defence, Law and Order welfare etc.)
4. Organs of Government Legislature. Executive and judiciary
5. Forms of Government
6. Law, Liberty and Equality

CHAPTER – III INDIVIDUAL AND THE WORLD

1. Rationale of International Cooperation, Fields of Cooperation (Political, Economic, Social, Cultural, Educational, Scientific, Technology etc)

2. UN Aims and Object, main organs and specialized agencies (UNE, UNESCO, UNICEF, WHO)

CHAPTER – IV CITIZENSHIP

1. Meaning of Citizenship
2. Modes of acquiring and losing citizenship
3. Status of aliens
4. Qualities of good citizenship
5. Rights and Duties of Citizen in a State
6. Fundamental Human Rights

CHAPTER–V RIGHTS AND DUTIES OF A CITIZEN IN PAKISTAN

1. Rights and Duties of Citizen in Islamic State with special reference to Khutba-e-Hujjat-ul-Wida
2. Constitutional provisions regarding rights and duties of citizen.
3. Rights and Duties of Non-Muslim in Pakistan under the Constitution.

SYLLABI AND COURSES OF READING

اخلاقیات لازمی (ETHICS)

(غیر مسلموں کیلئے متبادل اسلامیات لازمی)

باب اوّل: مذاہب کا تعارف

مذہب کی سماجی، فلسفیانہ اور نفسیاتی تفہیم، مذہب پر معاشرے کے اثرات
وحدت ادیان کا تصور، مذہب اور سائنس

باب دوم: پاکستان میں مختلف مذاہب

اسلام، مسیحیت، ہندو دھرم، زرتشتیت، سکھ مذہب

باب سوم: اخلاقی اقدار

اجتماعی عدل اور مساوات، معاشرتی ادارے
کام کی جگہ پر وقت اور پابندی وقت کی اہمیت

باب چہارم: آداب

کام کی جگہ کے آداب، انتظامیہ، ماتحت عملہ، خدمت گار، ملاقاتی

باب پنجم: مشاہیر

نیلسن منڈیلا، عبدالستار ایدھی، مدر ٹریسا، ڈاکٹر محمد یونس
نجیب محفوظ، جمشید نسر وان جی مہتا۔

مصنفین:- ۱۔ ڈاکٹر عبداللہ شاہ ہاشمی ۲۔ ڈاکٹر محمد شفیع مرزا

	T	P	C
	1	0	1

Total Contact Hours:	
Theory:	32
Practical:	0

درسی کتب کا نام: تَرْجَمَۃُ الْقُرْآنِ الْمَجِیْد

Eng-112 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

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

    3.6   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

- Technical English developed by Mr. Zia Sarwar , National Book Foundation

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.

Ch-112   APPLIED CHEMISTRY

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

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, 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.

MATH-113 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   3 Hrs.
3.1   nth term
3.2   sum of the first n terms
3.3   Means
3.4   Infinite Geometric progression
3.5   Problems

4   BINOMIAL THEOREM   6 Hrs.
4.1   Factorials
4.2   Binomial Expression
4.3   Binomial Co-efficient
4.4   Statement
4.5   The General Term
4.6   The Binomial Series.

REFERENCE BOOKS
- Applied Mathematics Math-113, Developed by Nasir -ud-Din Mahmood, 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.
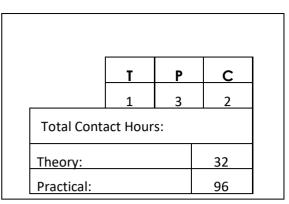
10.8   Solve problems of these solids.

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

PHY – 122 APPLIED PHYSICS

	T	P	C
	1	3	2

Total Contact Hours:	
Theory:	32
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/technical courses and understand concepts to learn advance physics/technical courses,

COURSE CONTENTS

1   MEASUREMENTS.   **2 Hrs**

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

2.   SCALARS AND VECTORS.   **4 Hrs**

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

3.   MOTION   **4 Hours**

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

4.   TORQUE, EQUILIBRIUM AND ROTATIONAL INERTIA   **2 Hours**

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

5.   WAVE MOTION   **5 Hrs**

   5.1 Motion under an elastic restoring force.
   5.2 Characteristics of simple harmonic motion
   5.3 S.H.M. and circular motion
   5.4 Simple pendulum

5.5 Wave form of S.H.M.

5.6 Resonance

5.7 Transverse vibration of a stretched string

6.   SOUND   5 Hrs

6.1 Longitudinal waves

6.2 Intensity, loudness, pitch and quality of sound

6.3 Units of Intensity of level and frequency response of ear

6.4 Interference of sound waves silence zones, beats

6.5 Acoustics

6.6 Doppler effect

7.   LIGHT   5 Hrs

7.1 Review laws of reflection and refraction

7.2 Image formation by mirrors and lenses

7.3 Optical instruments

7.4 Wave theory of light

7.5 Interference, diffraction, polarization of light waves

7.6 Applications of polarization in sunglasses, optical activity and stress analysis

8 .   OPTICAL FIBER   2 Hrs

8.1 Optical communication and problems

8.2 Review total internal reflection and critical angle

8.3 Structure of optical fiber

8.4 Fiber material and manufacture

8.5 Optical fiber - uses.

9 .   LASERS   3 Hrs

9.1 Corpuscular theory of light

9.2 Emission and absorption of light

9.3 Stimulated absorption and emission of light

9.4 Laser principle

9.5 Structure and working of lasers

9.6 Types of lasers with brief description. Applications (basic concepts)

9.7 Material processing

9.8 Laser welding

9.9 Laser assisted machining

9.10 Micro machining

9.11 Drilling scribing and marking

9.12 Printing

9.13 Lasers in medicine

RECOMMENDED BOOKS

1.   A Text Book of Physics, Phy-122 of TEVTA published by National Book Foundation(NBF)

Phy-122   **APPLIED PHYSICS**

INSTRUCTIONAL OBJECTIVES

1   USE CONCEPTS OF MEASUREMENT TO PRACTICAL SITUATIONS AND TECHNOLOGICAL PROBLEMS

l. 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 SCALARSA ND 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 rectangular components

2.4   Differentiate between dot product and cross product of vectors

2.5   Use the concepts in solving problems involving addition resolution and multiplication of vectors

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

3.1   Use law of conservation' of momentum to practical/technological problems

3.2   Explain relation between linear and angular motion

3.3   Use concepts and equations of angular motion to solve relevant technological problems

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

4.1   Explain Torque

4.2   Distinguish between Centre of gravity and centre of mass

4.3   Explain rotational Equilibrium, and its conditions

4.4   Explain. Rotational Inertia giving examples

4.5   Use the above concepts in solving technological problems.

5   **USE CONCEPTS OR WAVE MOTION IN SOLVING RELEVANT PROBLEMS**

5.1   Explain Hooke's Law of Elasticity

5.2   Derive formula for Motion under an elastic restoring force

5.3   Derive formulae for simple harmonic motion and simple pendulum

5.4   Explain wave form with reference to S.H.M. and circular motion

5.5   Explain Resonance

5.6   Explain Transverse vibration of a stretched 'string

5.7   Use the above concepts and formulae of S.H.M. to solve relevant problems.

6   **UNDERSTAND CONCEPTS OF SOUND**

6.1   Describe longitudinal wave and its propagation

6.2	Explain the concepts: Intensity, loudness, pitch and quality of sound
6.3	Explain units of Intensity of level and frequency response of ear
6.4	Explain phenomena of silence zones, beats
6.4	Explain Acoustics of buildings.
6.5	Explain Doppler Effect giving mathematical expressions.

7	**USE THE CONCEPTS OF GEOMETRICAL OPTICS TO MIRRORS AND LENSES**
7.1	Explain laws of reflection and refraction
7.2	Use the concepts of image formation by mirrors and lenses to describe working of optical instruments, e.g. Microscopes, telescopes, camera and sextant
7.3	Understand wave theory of light
7.4	Explain wave theory of light
7.5	Describe uses of polarization given in sunglasses, optical activity and stress analysis
7.6	Apply mirror formula to solve problems
8	**UNDERSTAND THE STRUCTURE, WORKING AND USES OF OPTICAL FIBER**
8.1	Describe the Optical communication and problems
8.2	Describe Review total internal reflection and critical angle
8.3	Explain Structure of optical fiber
8.4	Enlist and describe different type of optical Fiber material and its manufacturing
8.5	State different uses of Optical fiber
9	**UNDERSTAND THE WORKING of LASERS**
9.1	Describe the Corpuscular theory of light
9.2	Describe Emission and absorption of light
9.3	Describe Stimulated absorption and emission of light
9.4	Describe LASER principle
9.5	Describe Structure and working of LASERS
9.6	Describe Types of LASERS with brief description. Applications (basic concepts)
9.7	Describe effects of LASER in Material processing
9.8	Describe LASER welding
9.9	Describe LASER assisted machining
9.10	Describe Micro machining
9.11	Describe Drilling scribing and marking
9.12	Define LASER Printing
9.13	Describe the uses of LASERS in medicine

Phy-122   APPLIED PHYSICS

LIST OF PRACTICALS

l.   Draw graphs representing the functions:

   a)   y=mx for rn=O, 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 ofthe 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 La mi's theorem

7.   Determine the weight of a given body using

   a)   Law of parallelogram of forces

   b)   Law of triangle of forces

   c)   Lam i'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 Hooke's Law using helical spring.

15.   Study of frequency of stretched string with length.

16.   Study of variation of frequency of stretched string with tension.

17.   Study resonance of air 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 effect of rotation of plane mirror on reflection.

22.   Compare the refractive indices of given glass slabs.

23.   Find focal length of concave mirror by locating centre of curvature.

24.   Find focal length of concave mirror by object and image method

25.   Find focal length of concave mirror with converging lens.

26.   Find refractive index of glass by apparent depth.

27.   Find refractive index of glass by spectrometer.

28.   Find focal length of converging lens by plane mirror.

29.   Find focal length of converging lens by displacement method.

30.   Find focal length of diverging lens using converging lens.

31. Find focal length of diverging lens using concave mirror.

32. Find angular magnification of an astronomical telescope.

33. Find angular magnification of a simple microscope (Magnifying Glass)

34. Find angular magnification of a compound microscope.

35. Study working and structure of camera.

36. Study working and structure of sextant.

37. Compare the different scales of temperature and verify the conversion formula.

38. Determine the specific heat of lead shots.

39. Find the coefficient of linear expansion of a metallic rod.

40. Find the heat of fusion of ice.

41. Find the heat of vaporization.

42. Determine relative humidity using hygrometer

DMT-113 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:

- Understand fundamental of technical drawing (drawing views, dimensions, symbols, sections)
- Prepare drawings of various parts on drawing sheet
- Develop sketches, solid models, surfaces and assemblies on CAD software

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

17. ASSEMBLY MODELING   **1 Hour**

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

RECOMMENDED BOOKS

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

DMT-113 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)

DMT-113 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

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 understand the fundamentals of Dies and Mould technology. They will be able to understand basic concept of dies and mould manufacturing. They will also learn the safety practices, safety equipment's, safety Codes and Rules etc. to be desired in Industries.

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 AND PREVENTIONS IN MECHANICAL INDUSTRY.** 3 Hours
    6.1. Accidents and preventions in Material handling and transportation.
    6.2. Accidents and preventions due to hand tools.
    6.3. Accidents and preventions in machines shop.
    6.4. Accidents and preventions in Metal work shop.
    6.5. Accidents and preventions in wood working shop.
    6.6. Accidents and preventions in Foundry welding & forging shop.
    6.7. Safety in CNC machines operation

7. **PERSONNEL PROTECTIVE EQUIPMENTS.** 3 Hours
    7.1 Useful protective device
    7.2 Personal protective device and its importance
    7.3 Protection from chemicals and gases

8. **ANALYZING CAUSES OF ACCIDENTS.** 3 Hours
    8.1 Accident prevention fundamental strategies
    8.2 Plant inspections and accidents investigation
    8.3 Safety inventory, auditing, records and annual reports

9. **FIRST AID.** 2 Hours
    9.1. State the importance of first-aid
    9.2. Explain the methods of providing first aid
    9.3. Describe the step-by-step procedure of providing medical services

10. **SAFETY REGULATIONS & ADHERENCE TO INTERNATIONAL SAFETY STANDARDS** 2 Hours
    10.1 Safety Regulations & adherence to International Safety Standards
    10.2 Pakistan Factory Act (laws concerning to safety)
    10.3 Workman compensation act
    10.4 Industrial insurance and social security
    10.5 Legal aspects of safety

DMT-131 INTRODUCION TO DIES & MOULDS

INSTRUCTIONAL OBJECTIVES

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

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

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

4. **KNOW ABOUT THE PRODUCTION MACHINES USED FOR PLASTICS, ALUMINUM AND SHEET METAL**
   4.1. Describe the construction and working of Injection moulding machine
   4.2. Describe the construction and working of Pressure die casting machine
   4.3. Describe the construction and 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 CAUSES AND PREVENTION OF ACCIDENTS IN MECHANICAL INDUSTRY**
   6.1 List of accidents in material handling and transportation in industry
   6.1.1 Describe the methods of prevention of accident due to material and machine handling in manufacturing Industry
   6.2 Enlist accidents due to hand tools and explain proper use of hand tools to prevent accident
   6.3 Describe accidents in machines shop and their preventions
   6.4 Describe accidents in Metal workshop and their preventions

6.5 Describe accidents in wood working shop and their preventions

6.6 Describe accidents in foundry, welding and forging shop

6.7 Describe Safety in CNC machines operation

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

7.1 State useful protective devices

7.2 List personal protective devices and describe their importance

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

    7.2.2   Describe protection

    7.2.3   Describe personal safety equipments

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

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

8. **ANALYZING THE CAUSES OF ACCIDENTS**

8.1 Understand the procedure of analyzing the causes of accidents

    8.1.1 Identify the general causes of accident

    8.1.2 Explain step by step procedure to analyze the accidents

8.2 Know the use of data for investigation and resident reports for analyzing the causes of accident

    8.2.1   Record safety inventory, accident report and investigation reports, annual reports

    8.2.2   Collect the data of accident for analyzing the root of accidents

8.3 Identify safety rules procedures in the light of annual accidents report for safe guard

9. KNOW THE METHOD OF PROVIDING FIRST AID

9.1 Define First Aid and state it's importance

9.2 Explain the methods of providing first aid and their training may be arranged to train the students in first aid procedure (a video/ Rescue 1122)

9.3 Identify the step-by-step procedure of providing medical services

9.3.1 Describe protection of respiration system and methods of artificial respiration

10. UNDERSTAND LAWS REGARDING SAFETY

10.2 Explain safety Regulations & adherence to International Safety Standards

10.2 Describe clauses of Pakistan Factory Act related to safety

10.3 Describe Workman compensation Act

10.4 Identify the procedure for industrial insurance and social security

10.5 Describe legal procedure in case of serious accidents

Reference Books

1.
2. ENVIRONMENTAL SAFETY AND HEALTH ENGINEERING BY GAYLE WOODSLDE, DIANNA K O CUREK
3. SAFETY ENGINEERING PRINCIPLES AND PRACTICES BY FRANK R. SPELLMAN
4. SAFETY ENGINEERING BY JAMES COVAN

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DMT-142 APPLIED ELECTRICITY AND ELECTRONICS

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

DMT-142   APPLIED ELECTRICITY AND ELECTRONICS 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 Semiconductor 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

DMT-142 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

WT-156 WORKSHOP TECHNOLOGY-I

	T	P	C
	2	**12**	**6**

Total contact Hours
Theory   **64 Hours**
Practical   **384 Hours**

AIMS: At the end of this course, the student will have good working knowledge of the different kinds of hand tools, measuring tools, instruments used in mechanical workshop and bench work.

COURSE CONTENTS

1. Holding devices
2. Files and saws
3. Hand tools
4. Impact/striking tools
5. Marking tools
6. Assembly tools
7. Holding and clamping tools
8. Instruments for checking surfaces
9. Measuring instruments
10. Metal cutting
11. Drilling

DETAIL OF COURSE CONTENTS

1.	**Holding devices**	**4 Hours**

1.1   Leg vice
1.2   Pipe vice

1.3   Parallel Jaw vice

1.4   Soft jaws

1.5   Machine vice

1.6   Hand vice

1.7   Pin vice

2.	**Files and saws**	**10Hours**

2.1.   File and its parts
2.2.   Convexity of the file
2.3.   Cross section of files
2.4.   Cuts of files
2.5.   Coarseness of files
2.6.   Forms of file teeth
2.7.   Machine files

2.8.	Rotary file	
2.9.	Hacksaw	
2.10.	Types of Hacksaw Blade	
2.11.	Fitting of the blade	
2.12.	Coping saw	
2.13.	Fret saw	
3.	**Hand tools**	**4 Hours**
3.1.	Chisel and its types	
3.2.	Scrapers and its types	
3.3.	Hand shear	
3.4.	Wire Cutter	

4.	**Impact/Striking Tools**	**3 Hours**
4.1.	Hammer and its Parts.	
4.2.	Ball peen, cross peen, straight peen, sledge hammer	
4.3.	Soft hammers types and uses.	

5.	**Marking Tools**	**3 Hours**
5.1.	Scriber	
5.2.	Spring divider	
5.3.	Center punch	
5.4.	Prick punch	
5.5.	Letter and number punches	

6.	**Assembly tools**	**4 Hours**
6.1.	Use of Screw drivers	
6.2.	Standard screw driver	
6.3.	Offset screw driver	
6.4.	Watch maker screw driver	
6.5.	Philips head screw driver	
6.6.	Wrench and spanners	
6.7.	Open end wrenches	
6.8.	Ring spanners	
6.9.	Adjustable wrenches	
6.10.	Lock wrenches	
6.11.	Allen keys	

7.	**Holding and clamping tools**	3 **Hours**
7.1.	Pliers	
7.2.	Snapping Pliers	
7.3.	Tweezers	
7.4.	Tool maker clamp	
7.5.	C – Clamp	

8.	**Instruments for checking surfaces**	**4 Hours**
8.1.	Surface plate	
8.2.	Straight edge	
8.3.	Back or Foot square and tri square	

8.4. Beveled edge square

8.5. Adjustable square

8.6. Auxiliary marking tools

8.7. Spirit levels

9.   Measuring instruments   12 Hours

9.1. Rule and Scale

9.2. Vernier calipers

9.3. Use of Vernier calipers

9.4. Vernier height gauge

9.5. Protractor

9.6. Vernier bevel protractor

9.7. Construction of Outside micrometer

9.8. Types of a Micrometer
- Micrometer depth gauge
- Micrometer head
- Thread micrometer
- Tube Micrometer
- Bench micrometer
- Inside Micrometer

9.9. Tools for transferring measurements
- Dividers
- Calipers(Outside, Inside, Odd leg)

10.   Metal cutting   6 Hours

10.1. Geometry of Single point cutting Tool

10.2. Cutting tool Materials.
- High speed steel
- Carbides
- Ceramics
- Cermets
- Diamond

10.3. Cutting speed, feed, and depth of cut

10.4. Machining time Calculations

11.   Drilling   10 Hours

11.1. Types of Drilling and Boring machines
- Portable drilling machine
- Table or pedestal drilling machine
- Pillar type drilling machine
- Multi spindle drilling machine
- Radial drilling machine
- Jig boring machine
- Horizontal boring machine

11.2. Drilling and Boring operations
- Drilling
- Reaming
- Boring

- Counter boring
- Counter sinking
- Spot facing
- Tapping

11.3. Types of drills
- Straight shank drill
- Taper shank drill

11.4. Twist drill geometry

11.5. Drilling speeds and feeds

11.6. Types of Reamers
- Hand reamers
- Machine reamers
- Expansion reamers
- Adjustable reamers
- Taper reamer

11.7. Types of Taps
- Hand taps
- Machine taps

11.8. Types of Threading Dies and Die Stock/Holder
- Split die
- Solid die
- Loose die

11.9. Cutting speed for Taps and Dies

WT-156 WORKSHOP TECHNOLOGY-I

INSTRUCTIONAL OBJECTIVES

Instructors/Teachers must ensure to

1.   DEVELOP KNOWLEDGE OF HOLDING DEVICES   4 HOURS

1.1.   Introduction to Leg vice
1.2.   Introduction to Pipe vice
1.3.   Introduction to Parallel Jaws vice
1.4.   Introduction to Soft jaws
1.5.   Introduction to Machine vice
1.6.   Introduction to Hand vice
1.7.   Introduction to Pin vice

2.   DEVELOP KNOWLEDGE OF FILES AND SAWS   10 HOURS

2.1.   Define file
2.2.   Describe the convexity of the file
2.3.   Describe cross section of files
2.4.   Describe the cuts of files
2.5.   Describe coarseness of files
2.6.   Describe forms of file teeth
2.7.   Define Machine files
2.8.   Define Rotary file

2.9.   Define hacksaw
2.10.   Define types of hacksaw blade
2.11.   Describe fitting of blade
2.12.   Describe Cooping saw
2.13.   Describe fret saw

3.   DEVELOP KNOWLEDGE OF HAND TOOLS   4 HOURS

3.1.   Define Chisel and its types
3.2.   Define Scrapers and its types
3.3.   Define Hand shear
3.4.   Define wire Cutter

4. DEVELOP KNOWLEDGE OF IMPACT/STRIKING TOOLS   3 HOURS

4.1.   Describe Hammer and its Parts.
4.2.   Describe Ball peen, cross peen, straight peen, sledge hammer
4.3.   Describe Types and uses of Soft hammers.

5. DEVELOP KNOWLEDGE OF Marking Tools   3 HOURS

5.1.   Define Scriber
5.2.   Define Spring divider
5.3.   Define Center punch
5.4.   Define Prick punch
5.5.   Define Letter and number punches

6. DEVELOP KNOWLEDGE OF ASSEMBLY TOOLS   4 HOURS

6.1.   Describe uses of Screw drivers
6.2.   Define Standard screw driver
6.3.   Define Offset screw driver
6.4.   Define Watch maker screw driver
6.5.   Define Philips head screw driver
6.6.   Define Wrenched and spanners
6.7.   Define Open end wrenches
6.8.   Define Ring spanners
6.9.   Define Adjustable wrenches
6.10. Define Lock wrenches
6.11. Define Allen keys

7. DEVELOP KNOWLEDGE OF HOLDING AND CLAMPING TOOLS   4 Hours

7.1. Define Pliers
7.2. Define Snapping Pliers
7.3. Define Tweezers
7.4. Define Tool maker clamp
7.5. Define C – Clamp

8.   DEVELOP KNOWLEDGE OF INSTRUMENTS FOR CHECKING SURFACES
4 Hours

8.1. Describe Surface plate

8.2. Describe Straight edge

8.3. Describe Squares

8.4. Describe Back or Foot square and tri square

8.5. Describe Beveled edge square

8.6. Describe Adjustable square

8.7. Describe Auxiliary marking tools

8.8. Describe Spirit levels

9. DEVELOP KNOWLEDGE OF MEASURING INSTRUMENTS   12 Hours

9.1. Describe Rules and scale

9.2. Describe the vernier caliper

9.3. Describe Functions of a vernier caliper

9.4. Describe Vernier height gauge

9.5. Describe Protractor

9.6. Describe Vernier bevel protractor

9.7. Describe the construction of a Outside micrometer

9.8. Describe Types of a Micrometer
   • Micrometer depth gauge
   • Micrometer head
   • Thread micrometer
   • Tube Micrometer
   • Bench micrometer
   • Inside Micrometer

9.9. Describe tools for transferring measurements
   • Dividers
   • Calipers (Outside, Inside, Odd leg)

10. DEVELOP KNOWLEDGE OF METAL CUTTING   6 HOURS

10.1. Describe geometry of single point cutting Tool

10.2. Describe the cutting tool Materials
   • High speed steel
   • Carbides
   • Ceramics
   • Cermets
   • Diamond

10.3. Define Cutting speed, feed, and depth of cut

10.4. Describe Machining time calculations.

11. DEVELOP KNOWLEDGE OF DRILLING   10 Hours

11.1. Describe types of Drilling and Boring machines
   • Portable drilling machine
   • Table or pedestal drilling machine
   • Pillar drilling machine
   • Multi spindle drilling
   • Radial drilling machine
   • Jig boring machine
   • Horizontal boring machine

11.2. Describe Drilling and Boring operations
   • Drilling

- Reaming
- Boring
- Counter boring
- Counter sinking
- Spot facing
- Tapping

11.3. Describe Twist drills
- Straight shank drill
- Taper shank drill

11.4. Describe geometry of Twist drill

11.5. Define Drilling speeds and feeds

11.6. Describe types of Reamers
- Define Hand reamers
- Define Machine reamers
- Define Expansion reamers
- Define Adjustable reamers
- Define Taper reamer

11.7. Describe types of Taps
- Define Hand taps
- Define Machine taps
- State procedure for Tapping with drilling machine

11.8. Describe threading Dies and Die Stock/Holders
- Define Split dies
- Define Solid die nut
- Define Loose die
- Define Die head

11.9. Define Cutting speed for taps and dies

Recommended Books

I.   Workshop Technology (Part – 1)   By W. A. J. Chapman
II.   Technology of Machine Tools   By Steve F. Krar, Albert F. Check
III.   Workshop Technology (Vol-1)   By Mr. Rudalph Brunner Published by PSTC,
PCSIR
IV.   Workshop Technology By Gupta
V.   Production Engineering By PC Sharma
VI.   Workshop Technology By W. A. A. Champman Part 1
VII.   Workshop Technology By W. A. A. Champman Part 2
VIII.   Workshop Technology By W. A. A. Champman Part 3

List of Practical   384 Hours

    Bench Fitting Exercises

1. Filing exercise on U-Channel Exercise
2. Step Filling Exercise
3. Sawing Exercise
4. Marking exercise
5. Marking with Height gauge
6. Centre Punching
7. Stamping Exercise
8. Chipping Exercise
9. Hammer Excercise
10. Counter Filling Exercise
11. Drilling Exercise
12. Deburring Exercise
13. Tapping Exercise
14. Internal Filling Exercise
15. Reaming Exercise
16. Counter Sinking Exercise
17. Counter boring Exercise
18. Internal/External Round Filling
19. Push Fit Exercise
20. Sheet Metal Fits Exercise
21. Doweling Exercise
22. Introduction to Lathe and Simple Step Turning

COURSE OUTLINE YEAR – 2

GEN201 ISLAMIAT / PAK STUDIES

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اسلامیات/مطالعہ پاکستان

GEN – 201

نصاب سال دوئم

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 و لا دین لا من لا اعھد لہ

( ) و یاکم و الظن 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 و نتائج)

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 و انصاف۔امر بالمعروف۔نہی عن المنکر۔انسانی حقوق کا معاشرتی اور معاشی ترقی میں کردار

جہاد۔کسب حلال۔مسجد(اہمیت و فضیلت)

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

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حقوق آگاہی ر معلومات 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

( )   منتخب آیات قرآنی   ( )   قرآن مجید

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: حضور ﷺ کی سیرت طیبہ کے بارے میں جان سکے

خصوصی مقاصد:

( )   حضور ﷺ کی ابتدائی زندگی اختصار کے ساتھ بیان کر سکے

( )   حضور ﷺ کی ہجرت کا واقع بیان کر سکے

( )   حضور ﷺ کی مدنی زندگی اختصار سے بیان کر سکے

( )   حضور ﷺ 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 ومقاصد بیان کر سکے

( ) اسلامی ریاست کے قیام کے لیے جدوجہد کر سکے

( ) حقوق آگاہی،رمعلومات 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

سال دوئم

س	پی	ٹی
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حصہ دوم

کل وقت 12 گھنٹے

موضوعات:

( ) دوقومی نظریہ

( ) تحریک پاکستان

( ) انڈین کانگریس

( ) مسلم لیگ

( ) تقسیم بنگال

( ) میثاق لکھنؤ

( ) تحریک خلافت

( ) سندھو تحریک

( ) تجاویز دہلی

( ) نہرو رپورٹ

( ) قائداعظم کے چودہ نکات

( ) خطبہ آلہ آباد

( ) انتخابات 1938 اور انتقال اقتدار

( ) قرارداد پاکستان

مطالعہ پاکستان

تدریس مقاصد:

تحریک پاکستان:

عمومی مقاصد:

( ) قیام پاکستان کے اسباب وتحریک کو بیان کر سکے

خصوصی مقاصد:

( ) قومیت کے مفہوم کو بیان کر سکے

( ) دو قومی نظریہ کی تعریف وتوضیح کر سکے

( ) دوقومی 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 بیام 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

نصاب اخلاقیات

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سال دوم

کل وقت 20 گھنٹے

موضوعات:

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

( ) حقوق وفرائض

( ) قوت برداشت

( ) قوت ارادی

( ) لگن وجذبہ

( ) وسیع النظری

( ) بے غرضی

( ) انسانی دوستی

( ) حفاظتی شعور

( ) پاس آزادی

( ) کامل آگاہی

( ) تغیرات کوقبول کرنا

( ) خودشناسی

( ) انسانی حقوق کا اعلامیہ،حقوق انسانی پالیسی 2018

( ) 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 وضرورت 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 ۔ بےغرض ۔ انسانی دوستی شعور ۔ پاس آزادی ۔ کامل آگاہی اور خودشناسی 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 پر معلومات تک رسائی کے قانون کو جان سکے

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

	T	P	C
	1	0	1

Total Contact Hours:	
Theory:	32
Practical:	0

5.12- جماعت بارھویں (موضوعات، حاصلاتِ تعلّم، مجوّزہ سرگرمیاں اور جائزہ)

مجوّزہ سرگرمیاں (Suggested Activities)	حاصلاتِ تعلّم (Learning Outcomes)	موضوعات (Themes)
• آدابِ تلاوت کا اعادہ • نصاب میں موجود قرآنی سورتوں کا تعارف • جماعت بارھویں کے نصاب میں مذکور قرآنی سورتوں کے بنیادی مضامین (ایمانیات، عبادات، معاملات، معاشرت اور اخلاق) پر خصوصی توجّہ • سُورۃُ الْاَحْزَاب کی آیت 49 کی روشنی میں عقیدہ ختم نبوت کے موضوع پر جامع مضمون تحریر کرنا • سُورۃُ الْمَائِدَة کی آیات 90 تا 92 میں مذکور معاشرے میں فساد کا سبب بننے والی برائیوں سے آگاہی • سُورۃُ الْاَحْزَاب کی آیت 06 کی روشنی میں ازواج مطہرات رضی اللہ تعالٰی عنہن کے مقام و مرتبہ اور فضائل سے آگہی • سُورۃُ الْاَحْزَاب کی آیت 33 کی روشنی میں اہل بیت اطہار رضی اللہ تعالٰی عنہم کے مناقب سے روشناس ہونا • سُورۃُ الْاَحْزَاب کی آیت 59 کی روشنی میں پردے کے احکام جاننا • قرآنی دعاؤں کی ترجمہ کے ساتھ تفہیم • قرآنی نصوص / متن سے متعلق سوال جواب (Brain Storming) • سابقہ اسباق کا اعادہ • کوئز پروگرام، آن لائن ایپ اور دستاویزی فلم سے استفادہ	طلبا و طالبات جماعت بارھویں کے لیے منتخب درسی مواد کی تکمیل کے بعد اس کے قابل ہوں گے کہ: 1. تلاوتِ قرآن مجید کے آداب پر عمل کر سکیں۔ 2. متعلقہ جماعت کے لیے مختص قرآنی سورتوں کے مکمل نام اور ان کے معانی جان سکیں۔ 3. مذکورہ سورتوں کا تعارف کروا سکیں۔ 4. مذکورہ سورتوں کے مرکزی مضامین اخذ کر سکیں۔ 5. مذکورہ قرآنی سورتوں کا بامحاورہ ترجمہ کر سکیں اور ان کا فہم حاصل کر سکیں۔ 6. منتخب قرآنی آیات کا بامحاورہ ترجمہ کر سکیں۔ 7. منتخب سورتوں کے قرآنی الفاظ کے معانی جان سکیں۔ (بارھویں جماعت کے لیے ذخیرۂ قرآنی الفاظ کی فہرست ملاحظہ فرمائیں۔) 8. نصاب میں موجود قرآنی سورتوں میں مذکورہ قرآنی دعاؤں کو ترجمہ کے ساتھ یاد کر سکیں۔	ترجمہ قرآن مجید 1. سُورۃُ النِّسَاء 2. سُورۃُ الْمَائِدَة 3. سُورۃُ النُّور 4. سُورۃُ الْاَحْزَاب 5. سُورۃُ مُحَمَّد سے سُورۃُ الْحُجُرَات 6. سُورۃُ الْحَدِيْد سے سُورۃُ التَّحْرِيْم
• متعلقہ جماعت کے لیے مقررہ حصہ قرآن کی تمام سورتوں کا تعارف اور مرکزی مضامین پر مشتمل تفصیلی، مختصر اور کثیر الاختیابی سوالات کے ذریعے سے امتحان لیں۔ • متعلقہ جماعت کے لیے مختص ذخیرۂ قرآنی الفاظ میں سے ہی ماڈل پیپرز کی طرز پر امتحان لیا جائے۔ • نمبروں کی تقسیم سے متعلق ہدایات کے لیے ماڈل پیپرز سے استفادہ کریں۔ • درج ذیل آیات مبارکہ کے بامحاورہ ترجمہ کا امتحان لیا جائے: 　i. سُورۃُ النِّسَاء، آیت 1 تا 2 　ii. سُورۃُ النِّسَاء، آیت 9 اور 10		جائزہ (Assessment)

iii.	سُوْرَةُ النِّسَاءِ، آيت 29 تا 32
iv.	سُوْرَةُ النِّسَاءِ، آيت 58 اور 59
v.	سُوْرَةُ الْمَائِدَةِ، آيت 08 تا 10
vi.	سُوْرَةُ الْمَائِدَةِ، آيت 38 تا 40
vii.	سُوْرَةُ الْمَائِدَةِ، آيت 48 اور 49
viii.	سُوْرَةُ الْمَائِدَةِ، آيت 83 تا 86
ix.	سُوْرَةُ النُّوْر، آيت 01 تا 03
x.	سُوْرَةُ النُّوْر، آيت 28 تا 31
xi.	سُوْرَةُ النُّوْر، آيت 55 اور 56
xii.	سُوْرَةُ الْأَحْزَاب، آيت 35 تا 36
xiii.	سُوْرَةُ الْأَحْزَاب، آيت 40 تا 48
xiv.	سُوْرَةُ الْأَحْزَاب، آيت 56 تا 59
xv.	سُوْرَةُ الْأَحْزَاب، آيت 70 تا 71
xvi.	سُوْرَةُ الْفَتْح، آيت 18
xvii.	سُوْرَةُ الْفَتْح، آيت 29
xviii.	سُوْرَةُ الْحُجُرَات، آيت 01 تا 05
xix.	سُوْرَةُ الْحُجُرَات، آيت 10 تا 13
xx.	سُوْرَةُ الْحَشْر، آيت 18 تا 24

SYLLABI AND COURSES OF READING
اخلاقیات لازمی (ETHICS)
(غیر مسلموں کیلئے متبادل اسلامیات لازمی)
As Provided by PBTE

MGM-201 COMMUNICATION SKILLS & REPORT WRITING

	T	P	C
	1	0	1

Total contact hours

Theory   32 Hrs.

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

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

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

COURSE CONTENTS

1. COMMUNICATION PROCESS & ORAL COMMUNICATION SKILLS   8 Hours
   - 1.1   Purposes of communication
   - 1.2   Communication process
   - 1.3   Distortions in communication
   - 1.4   Consolidation of communique
   - 1.5   Communication flow
   - 1.6   Communication for self-development
   - 1.7   Significance of speaking.
   - 1.8   Verbal and non-verbal messages.
   - 1.9   Strategic steps of speaking.
   - 1.10   Characteristics of effective oral messages.
   - 1.11   Communication Trafficking.
   - 1.12   Oral presentation.

2. QUESTIONING SKILLS. & INTERVIEWING SKILLS   7 Hours
   - 2.1   Nature of question.
   - 2.2   Types of questions.
   - 2.3   Characteristics of a good question.
   - 2.4   Questioning strategy
   - 2.5   Significance of interviews.
   - 2.3   Characteristics of interviews.
   - 2.4   Activities in an interviewing situation
   - 2.5   Types of interviews.
   - 2.6   Interviewing strategy.

3. LISTENING SKILLS & READING COMPREHENSION   6 Hours
   - 3.1   Principles of active listening.
   - 3.2   Skills of active listening.
   - 3.3   Barriers to listening.
   - 3.4   Reasons of poor listening.

3.5   Giving Feedback.

3.6   Reading problems.

3.7   Four Reading skills.

4.   **REPORT WRITING.**   **5 Hours**

     4.1   Goals of report writing

     4.2   Report format.

     4.3   Types of reports.

     4.4   Report writing strategy.

        4.4.1 Graphs/ Charts and their Analysis

     4.5   Technical Reports:

        4.5.1 Meaning & Classification.

        4.5.2 Main Parts of the report.

        4.5.3 Organizational & outline of the report.

        4.5.4 Sources of information

     4.6   Business & Market Reports:

        4.6.1 Definition.

        4.6.2 Scope.

        4.6.3 Importance.

        4.6.4 Contents.

        4.6.5 Market Terms

5.   **GROUP COMMUNICATION.**   **4 Hours**

     5.1   Purposes of conducting meetings.

     5.2   Planning a meeting.

     5.3   Types of meetings.

     5.4   Selection of a group for meeting.

     5.5   Group leadership skills.

     5.6   Running a successful meeting.

     5.7   Active participation techniques.

6.   **INTERPERSONAL & INTRAPERSONAL SKILLS**   **2 Hours**

     6.1   Interpersonal Skills

     6.2   intrapersonal Skills

RECOMMENDED BOOKS

     6.3   Sh. Ata-ur-Rehman   Effective Business Communication & Report Writing.

     6.4   Ulman J.N. Could JR. Technical Reporting.

MGM-201 COMMUNICATION SKILLS & REPORT WRITING.

INSTRUCTIONAL OBJECTIVES

1. **UNDERSTAND THE COMMUNICATION PROCESS THE PROCESS OF ORAL**
   1.1 State the benefits of two way communication.
   1.2 Describe a model of communication process.
   1.3 Explain the major communication methods used in organization.
   1.4 Identify the barriers to communication and methods of overcoming these barriers.
   1.5 Identify misconceptions about communication.
   1.6 Identify speaking situations with other peoples.
   1.7 Identify the strategy steps of speaking.
   1.8 Identify the characteristics of effective speaking.
   1.9 State the principles of one-way communication.
   1.10 State the principles of two-way communication.
   1.11 Identify the elements of oral presentation skills.
   1.12 Determine the impact of non-verbal communication on oral communication.

2. **DETERMINE THE USES OF QUESTIONING SKILLS TO GATHER AND CLARIFY INFORMATION IN THE ORAL COMMUNICATION PROCESS AND DETERMINE THE APPROPRIATE**
   INTERVIEW TYPE FOR THE SPECIFIC WORK-RELATED SITUATION AND CONDUCT A WORK-RELATED INTERVIEW.
   2.1 Identify different types of questions.
   2.2 Determine the purpose of each type of question and its application.
   2.3 Identify the hazards to be avoided when asking questions.
   2.4 Demonstrate questioning skills.
   2.5 State the significance of interviews.
   2.6 State the characteristics of interviews.
   2.7 Explain the activities in an interviewing situation.
   2.8 Describe the types of interviews.
   2.9 Explain the interviewing strategy.
   2.10 Prepare instrument for a structured interview.

3. **DEMONSTRATE THE USE OF ACTIVE LISTENING SKILL IN THE ORAL COMMUNICATION PROCESS and DEMONSTRATE READING COMPREHENSION**
   3.1 State the principles of active listening.
   3.2 Identify skills of active listening.
   3.3 Identify barriers to active listening.
   3.4 State the benefits of active listening.
   3.5 Demonstrate listening skills.
   3.6 Explain the importance of giving and receiving feedback.
   3.7 Identify major reading problems.
   3.8 Identify basic reading skills.
   3.9 State methods of previewing written material.

3.10 Identify methods of concentration when reading.

3.11 Demonstrate reading comprehension.

4. **Understand REPORT WRITING**

4.1 Interpret Goals of report writing

4.2 Explain Report format.

4.3 Enlist Types of reports.

4.4 Describe Report writing strategy.

4.4.1 Graphs/ Charts and their Analysis

4.5 Understanding Technical Reports:

4.5.lMeaning & Classification.

4.5.2Main Parts of the report.

4.5.3Organizational & outline of the report.

4.5.4 Sources of information

4.6 Understanding Business & Market Reports:

4.6.1Definition.

4.6.2Scope.

4.6.3Importance.

4.6.4Contents.

4.6.5Market Terms

5. **UNDERSTAND THE PRINCIPLES OF GROUP COMMUNICATIONS.**

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

5.2 Explain responsibilities of a meeting/committee.

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

5.4 Distinguish between content and process at meetings.

5.5 Explain the key characteristics of a good group facilitator.

6. **UNDERSTAND INTERPERSONAL & INTRAPERSONAL SKILLS**

6.1 Explain Interpersonal Skills

6.2 Describe intrapersonal Skills

MATH-212   Applied Mathematics-II

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

Total Contact Hours:
Theory: **64** Hours.

Aims & Objectives:

After completing the course, the students will be able to: Solve the problems of calculus and analytical Geometry.

COURSE CONTENTS:

1.   FUNCTIONS & LIMITS.   **4 Hours**
1.1 Constants and variables
1.2 Functions & their types
1.3 The concept of limit
1.4 Limit of a function
1.5 Fundamental theorems on limit
1.6 Some important limits
1.7 Problems

2.   DIFFERENTIATION.   **4 Hours**
2.1 Increments
2.2 Different Coefficient or Derivative
2.3 Differentiation ab-initio or by first principle
2.4 Geometrical Interpretation of Differential Coefficient
2.5 Differential Coefficient of Xa, (ax + b)a
2.6 Three important rules
2.7 Problems.

3.   DIFFERENTIATION OF ALGEBRIC FUNCTION.   **4Hours**
3.1 Explicit function
3.2 Implicit function
3.3 Parametric forms
3.4 Problems

4.   DIFFERENTATION OF TRIGNOMETRIC FUNCTION.   **4Hours**
4.1 Differential coefficient of sin x, cos x, tang x from first principle.
4.2 Differential coefficient of Cosec x, Sec x, Cot x.
4.3 Differentiation of inverse trigonometric function.
4.4 Problems.

5.   DIFFERENTIATION OF LOGARITHIMIC & EXPONENTIAL FUNCTION. 4 Hours
5.1 Differentiation of In x
5.2 Differentiation of log ax
5.3 Differentiation of ax
5.4 Differentiation of ex
5.5 Problems.

6.   RATE OF CHANGE OF VARIABLE.   **4 Hours**
6.1 Increasing and decreasing function
6.2 Maxima and Minima values

6.3 Criteria for maximum and minimum values.

6.4 Method of finding maxima and minima.

6.5 Problems.

7. INTEGRATION.   **8 Hours**

7.1 Concept

7.2 Fundamental Formulas

7.3 Important Rules

7.4 Problems.

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

8.1 Integration by substitution

8.2 Integration by parts

8.3 Problems.

9. DEFINITE INTEGRALS.   **6 Hours**

9.1 Properties

9.2 Application to Area

9.3 Problems

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

10.1   Coordinate System

10.2   Distance Formula

10.3   The Ratio Formulas

10.4   Inclination and slope of a line

10.5   The Slope Formula

10.6   Problems.

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

11.1   Some Important Forms

11.2   General form

11.3   Angle formula

11.4   Parallelism and perpendicularity

11.5   Problems

12. THE EQUATION OF THE CIRCLE.   **8 Hours**

12.1   Standard form of equation

12.2   Central form of equation

12.3   General form of equation

12.4   Radius & coordinate of the Centre

12.5   Problems

REFREFNCE BOOKS

1   Thomas finny –Calculus and analytic geometry

2   Ghulam Yasin Minhas –Technical mathematics Vol II, Ilmi Kitab Khana, Lahore.

3   Prof .Riaz Ali Khan –Poly technique mathematics series vol I & II, Majeed sons Faisal Abad.

4   Prof. SanaUllah Bhatti –Calculus and analytic geometry , Punjab Text Book Board Lahore.

MATH -212   APPLIED MATHEMATICS –II

INSTRUCTIONAL OBJECTIVES

1. USE THE CONCEPT OF FUNCTION AND THEIR LIMITS IN SOLVING SIMPLE PROBLEMS
- 1.1 Define a function
- 1.2 List all types of function
- 1.3 Explain the concept of limit and limit of a function
- 1.4 Explain fundamental theorem on limits
- 1.5 Derive some important limits
- 1.6 Solve simple problems on limits

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

3. USE RULES OF DIFFERENTIAL TO SOLVE PROBLEMS OF ALGEBRIC FUNCTIONS.
- 3.1 Differentiate ab-initio Xn and (ax+b)n
- 3.2 Derive product, quotient and chain rules.
- 3.3 Find derivative of implicit function & explicit function.
- 3.4 Differentiate parametric forms; function w.r.t another function and by Rationalization.
- 3.5 Solve problems using these formulas.

4. USE RULES OF DIFFERENTIATION TO SOLVE PROBLEMS OF ALGEBRIC FUNCTIONS.
- 4.1 Differentiate from first principle sin x ,cosx, tang x.
- 4.2 Derive formula for derivation of sec x,cosec x, cot x.
- 4.3 Find differential coefficient of inverse trigonometric functions.

5. USE RULES OF DIFFERENTIATION TO LOGARITHMIC AND EXPONENTIAL FUNCTIONS.
- 5.1 Derive formulas for differential coefficient of logarithmic and exponential functions.
- 5.2 Solve problems using these formulas.

6. UNDERSTAND RATE OF CHANGE OF ONE VARRIABLE WITH RESPECT TO ANOTHER.
- 6.1 Write expression for velocity, acceleration, and slope of a line.
- 6.2 Define an increasing and decreasing function, maxima and minima values, of inflection.
- 6.3 Explain criteria for maxima and minima values of a function.
- 6.4 Solve problems involving rate of change of variables.

7. APPLY CONCEPT OF INTEGRATION IN SOLVING TECHNOLOGICALPROBLEMS
- 7.1 Explain the concept of integration
- 7.2 Write basic theorem of integration
- 7.3 List some important rules of integration
- 7.4 Derive fundamental formulas of integration

7.5   Solve problems based on these formulas /rules.

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

9.   UNDERSTAND THE METHOD OF SOLVING DEFENITE INTEGRALS.
    9.1   Define definite integral
    9.2   List properties of definite integrals using definite integrals.
    9.3   Find areas under curves
    9.4   Solve problems of definite integrals.

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

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

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

PHY-212 APPLIED MECHANICS

	T	P	C
	1	3	2

Total Contact Hours:	
Theory:	32
Practical:	96

AIMS.
• Apply the concepts of Applied Physics to understand Mechanics
• Apply laws and principles of Mechanics in solving technological problems
• Use the knowledge of App. Mechanics in learning advance technical courses.
• 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**

Three Moduli of Elasticity

11.1   Loaded Beams, Types of Beam & Loads

11.2   Bending Stress

11.3   S.F & B.M diagram

11.4   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 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:

      1   Single purchase crab.

      2   Double purchase crab.

      3   Worm and worm wheel.

      4   Differential screw jack, Diff.

      Pulley,

      5   Wheel and Axle.

      6   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:

1   Relative velocity method.

2   Instantaneous center
method.

PHY-212 APPLIED MECHANICS

List of Practical:

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 .

Mech-272   **METROLOGY**

	T	P	C
	1	3	2

Total Contact Hours:	
Theory:	32
Practical:	96

Pre-requisites: WT-156 (Workshop Technology - I)

AIMS: The subject is connected with the methods of measurements based on agreed International Standards and units. The practice in the subject requires the use of apparatus and equipment which include measuring instruments, laying-out Tools, Supporting Tools, necessary to adjust at the degree of accuracy required.

Detail of Contents:

1. **INTRODUCTION TO MEASUREMENT AND QUALITY CONTROL** 4Hrs
   1.1 History of measurements
   1.1 Importance and purpose of measurements
   1.2 Quality control and its Importance in metrology
   1.3 S.I Units
   1.4 ISO Standards
   1.5 Fits, Tolerance & Allowance
   1.6 Geometric Tolerance

2. **LINEAR MEASUREMENTS SUPPORTING TOOLS**   **2 Hrs.**
   2.1 Cast iron surface plate
   2.2 Granite Surface plate
   2.3 Glass surface plate
   2.4 Straight edges
   2.5 Spirit levels
   2.6 Engineer's parallels
   2.7 Universal Surface Gauge

3. **GAUGES**   **2 Hrs.**
   3.1 Ring gauge
   3.2 Plug gauge
   3.3 Snap gauge
   3.4 Radius gauge
   3.5 Angle gauge
   3.6 Screw-pitch Gauge
   3.7 Standard wire gauge
   3.8 Feeler Gauge

4. **ADJUSTABLE MEASURING TOOLS**   **3 Hrs.**
   4.2 Vernier Caliper
   4.3 Micro meter
   4.4 Dial indicator

5. **ANGLE MEASURING TOOLS**   **3 Hrs.**
   5.1 Fixed angle measuring tool
   5.2 Angle gauges
   5.3 Adjustable angle measuring tools
       5.3.1 Without graduations
       5.3.2 With graduations

6. **PRECISION MEASURING INSTRUMENTS**   **3 Hrs.**
   6.1 Vernier height gauge

6.2 Vernier depth gauge

6.3 Inside Micrometer

6.4 Depth Micrometer

6.5 Thread Micrometer

6.6 Hot gauge Micrometer

6.7 Vernier Micrometer

7. ACCURACY IN MEASUREMENTS   **2 Hrs.**
7.1 Elements of Metrology

7.2 Classification of Errors

    7.2.1 Controllable errors

    7.2.2 Random errors

7.3 Calibration

7.4 Repeatability

8. DIAL INSTRUMENTS   **2 Hrs.**
8.1 Dial Caliper

8.2 Dial thickness gauge

8.3 Dial bore gauge

9. TAPER MEASUREMENTS   **1 Hr.**
9.1 Gauge Block

9.2 Sine Bar

10. OPTICAL MEASUREMENT
10.1 Tool Makers Micro Scope

10.2 Profile Projector/Shadow Graph (SOX)

10.3 Optical Flats

11. COMPARATORS   2 Hrs.
11.1 Mechanical Comparator

11.2 Electrical Comparator

11.3 Electronic Comparator

12. DIGITAL INSTRUMENTS   1 Hr.
12.1 Digital Micrometer

12.2 Digital Caliper

12.3 Digital Indicator

12.4 Digital Depth Gauge

12.5 Digital Height Gauge

12.6 Digital Read Out (DRO)

12.7 Digital Roughness Tester

13. COORDINATEM EASURING MACHINE   3Hrs
13.1 Working principle of CMM and its coordinates

13.2 Part and Accessories

13.3 Use of CMM

13.4 Digital 30 Scanner

14. GEAR MEASUREMENT   2 Hrs.
14.1 Gear Testing machine

14.2 Backlash Measurement

RECOMMENDED TEXTBOOKS:
1. Shop Theory by Anderson
2. Engineering Metrology by R.K Jane
3. Production Technology by R.B Gupta
4. Dimensional Metrology by Ted. Busch, Roger Horlow

Instructional Objectives:
1. **INTRODUCTION TO MEASUREMENTS**
   1.1   State history of measurements
   1.2   Describe importance and purpose of measurements
   1.3   Describe quality control and its importance in metrology
   1.4   Describe S.I units
   1.5   Describe ISO standard
   1.6   Describe fits, tolerance, allowances
   1.7   Describe geometric tolerance
2. **UNDERSTAND LINEAR MEASUREMENT SUPPORTING TOOL**
   2.1   Describe Cast-iron Surface plate
   2.2   Describe Granite Surface plate
   2.3   Describe Glass Surface plate
   2.4   Describe Straight edges
   2.5   Describe Spirit levels
   2.6   Describe Engineers parallels
   2.7   Explain Universal Surface Gauge
3. **KNOW ABOUT GAUGES**
   3.1   Describe the ring gauge and its uses
   3.2   Describe the plug gauge and its uses
   3.3   Describe the snap gauge and its uses
   3.4   Describe the radius gauge and its uses
   3.5   Describe the angle gauge and its uses
   3.6   Describe screw pitch gauge
   3.7   Describe the use of standard wire gauge
   3.8   Describe the use of feeler gauge
4. **UNDERSTAND ADJUSTABLE MEASURING TOOLS**
   4.1   Explain the construction and use of vernier Caliper
   4.2   Explain the construction and use of Micrometer
   4.3   Explain the construction and use of Dial Indicator
5. **UNDERSTAND ANGLE MEASURING TOOLS**
   5.1   Describe the use of following fixed angle Measuring Tools
         5.1.1 Centre Square
         5.1.2 Combination square
         5.1.3 Try Square
         5.1.4 Double Square
         5.1.5 Die maker Square
         5.1.6 Engineer Square
   5.2   Describe the use of following angle gauges
         5.2.1 Thread gauges
         5.2.2 Grinding gauges
         5.2.3 Tool angle Gauge
         5.2.4 Drill gauges
         5.2.5 Drill point Gauge
   5.3   Discuss adjustable angle measuring tools
         5.3.1 Without graduations
               5.3.1.1 Sine bar
               5.3.1.2 Universal bevel
               5.3.1.3 Combination bevel
         5.3.2 With Graduations
               5.3.2.1 Bevel protractor
               5.3.2.2 Vernier bevel protractor

Mech-272   **METROLOGY**

List of Practical:

1. PRACTICE OF FOLLOWING GRADUATED TOOLS   3Hrs
   - 1.1   Steel Rule
   - 1.2   Hook Rule
   - 1.3   Folding Rule
   - 1.4   Trammels
2. PRACTICE OF COMBINATION   SET   3Hrs
3. PRACTICE OF FOLLOWING SUPPORTING TOOLS   3Hrs
   - 3.1   Cast Iron, Granite, and Glass Surface Plates
   - 3.2   Straight Edge
   - 3.3   Spirit level
   - 3.4   Engineer's level
   - 3.5   Engineer's parallel
4. PRACTICE OF FOLLOWING GAUGES   6 Hrs.
   - 4.1   Fixed gauges
   - 4.2   Adjustable gauges
   - 4.3   Small hole gauges 4.4 Telescope gauges
5. PRACTICE AND USE OF FOLLOWING PRECISION INSTRUMENTS   12 Hrs.
   - 5.1   Outside Micrometer
   - 5.2   Inside Micrometer
   - 5.3   Depth Micrometer
   - 5.4   Thread Micrometer
   - 5.5   Vernier Micrometer
6. PRACTICE AND USE OF VERNIER TOOLS   9 Hrs
   - 6.1   Vernier caliper
   - 6.2   Vernier Height gauge
   - 6.3   Vernier depth gauge
7. PRACTICE AND USE OF FOLLOWING ANGLE MEASURING TOOLS   6 Hrs.
   - 7.1   Bevel protractor
   - 7.2   Vernier Bevel protractor
   - 7.3   Dial protractor
   - 7.4   Steel protractor
   - 7.5   Sine bar
8. CALCULATION RELATING TO TOLERANCE AND ALLOWANCE   3 Hrs.
9. PRACTICE AND USE OF FOLLOWING DIAL INSTRUMENTS   3 Hrs.
   - 9.1   Dial Caliper
   - 9.2   Dial Thickness gauge
   - 9.3   Dial Indicator
10. PRACTICE AND USE OF GAUGE BLOCKS   6 Hrs.
11. PRACTICE OF TOOL MAKERS MICROSCOPE   6 Hrs.
12. PRACTICE OF PROFILE PROJECTOR   3 Hrs

DMT-232 DIE DESIGN – I

T	P	C
1	3	2

Total Contact Hours:	
Theory:	32
Practical:	96

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. Aluminum

        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

RECOMMENDED BOOKS

1. Production Engineering by PC Sharma.
2. Tool Engineering and Design by G.Nagpal
3. Press tools by PSTC, PCSIR
4. Bending Tools by PSTC, PCSIR
5. Tool Design by Donalson Lecain Goold.
6. Guide to Press Tool Design by William Francis Walke
7. Fundamentals of Tool Design Sixth Edition by Chief Technical Reviewer and Managing Editor Dr. John G. Nee.
8. Fundamentals of Press Tool Design by William Francis Walker
9. Die Makers Handbook by JERRY ARNOLD
10. Press Tools Design and Construction by Joshi P.H. publisher S Chand and Co. Ltd

DMT-232 DIE DESIGN – I

INSTRUCTIONAL OBJECTIVES

1. INTRODUCTION TO DIE DESIGN   03 HOURS

1.1. Define Press Tool

1.2. Describe Press Tools Applications

1.3. Define and Classify the Press Tools/ Operation

   1.3.1. Define Shearing Process

   1.3.2. Define Blanking die

   1.3.3. Describe Piercing die

   1.3.4. Define Cutting off operation

   1.3.5. Define Parting off operation

   1.3.6. Define Perforating operation

   1.3.7. Describe Trimming operation

   1.3.8. Define Notching operation

   1.3.9. Describe Shaving operation

   1.3.10. Define Lancing operation

   1.3.11. Define Dinking operation

   1.3.12. Describe Broaching operation

   1.3.13. Define Planishing operation

   1.3.14. Define Embossing operation

   1.3.15. Define Coining operation

   1.3.16. Define Extrusion operation

   1.3.17. Define Bending Tool

   1.3.18. Define Forming Tool

   1.3.19. Define Drawing operation

   1.3.20. Define Curling operation

   1.3.21. Define Flaring or Lugging operation

   1.3.22. Describe Side cam Tool

   1.3.23. Describe Compound Tool

   1.3.24. Describe Progressive Tool

2. CLASSIFICATION OF SHEETS MATERIAL AND THEIR APPLICATION   03 HOURS

2.1. Sheet Material

2.2. Ferrous Metals

   2.2.1. Define Hot Rolled Sheet

   2.2.2. Define Cold Rolled Sheet

   2.2.3. Define Stainless Steel

   2.2.4. Define Silicon Steel

   2.2.5. Describe Spring Steel

2.3. Non-Ferrous Metals

   2.3.1. Define Copper Material

2.3.2. Define Brass Material

2.3.3. Define Bronze Material

2.3.4. Define Aluminum Material

2.3.5. Define Tin Material

2.3.6. Define Zinc Material

2.4. Non-Metallic Materials

2.4.1. Describe Plastic

2.4.2. Describe Rubber

2.4.3. Describe Wood

2.4.4. Describe Cloth

2.4.5. Describe Paper

2.5. Nomenclature of Sheet Material

2.5.1. Codes

2.5.2. Standards

3. DIE SET 02 HOURS

3.1. Describe the Die Set

3.2. Write down the Advantages of Die Set

3.3. Describe Types of Die Sets

3.3.1. Precision

3.3.2. Commercial

3.4. Describe Die Set Materials

3.5. Die Set Components

3.6. Classification of Die Sets according to Design

3.6.1. Elaborate the Standard Die Set

3.6.2. Describe Non-standard Die

4. COMPONENTS OF DIES AND THEIR FUNCTIONS 04 HOURS

4.1. Define Blanking Die

4.2. Describe Forming Die

4.3. Define Draw Die

4.4. Define Trimming Die

4.5. Define Piercing Die

4.6. Define Bending Die

5. COMPOUND AND PROGRESSIVE DIES 03 HOURS

5.1. **Compound Piercing and Blanking Die**

5.1.1. Describe the Construction features of compound Piercing and Blanking die

5.1.2. Enlist the Parts and function of Compound and Blanking die

5.1.3. Write down the Advantages and Disadvantages of compound and Blanking die

5.2. **Progressive Blanking and Piercing Die**

5.2.1. Define Construction features of Progressive blanking and piercing die

5.2.2. Enlist Parts and their function

5.2.3. Describe Strip layout of progressive blanking and piercing die

6. DIE MATERIALS AND THEIR APPLICATION 03 HOURS

6.1. Elaborate the Materials for Dies Components

6.2. Elaborate the Materials for Casting Dies

7. PRESS MACHINES   04 HOURS

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

7.2. **Classification of Presses**
    7.2.1. Classify the press on the basis of Source power
    7.2.2. Classify the press on the basis of No. of slides
    7.2.3. Classify the press on the basis of application

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

8. DESIGNING OF MAIN COMPONENTS OF DIES   06 HOURS

8.1. Write down the Basics of Die Design

8.2. Describe 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. Define the Principles of Bending

9.2. Define Plastic Deformation due to Bending

9.3. Define Bend Elements

9.4. Define V-Bending Tools

9.5. Define U-Bending Tools

9.6. Define Calculation of Original Length of Strip required for Bend Components

9.7. Spring Back

DMT-232 DIE DESIGN – I

PRACTICAL   **96 Hrs.**

To design and develop a Press working die of any part on 3D CAD software: -

Following are Mandatory steps while designing a Press tool

1. To design and develop a sheet metal die of any part on CAD software.
2. Make arrangements for industrial visit of students to explore basic knowledge of sheet metal dies (Blanking, piercing, notching, bending, lancing etc.)
3. Development of Plan based on Types of dies.
4. To learn the development of Punch holder for different types of sheet metal die
5. To learn the multiple commands or tools based on the type of die for the designing of followings.
    - Backing plate
    - Punch plate.
    - Stripper plate
    - Die plate.
    - Die holder.
    - Punch
6. To learn the development and Importance of Animation of sheet metal dies and exploded view.
7. To learn and practices different types of Illustration and Bill of Materials (BOM) in sheet metal Die modelling
8. To learn and practice types of Rotation or translation constraints for different types of sheet metal dies.
9. To learn and practices different types of Rams or slider for different types of sheet metal die
10. To learn and practices different types of Post bushes for different types of sheet metal die
11. To learn the development and Importance Guidepost for different types of sheet metal die
12. To learn and practices different types of Bolster plate for different types of sheet metal die
13. To learn the development and Importance Bed or press for different types of sheet metal die.
14. To learn and practices different types of Ejector pin for different types of sheet metal die
15. To learn and practices different types Draw Cavity for different types of sheet metal die.

DMT-243   **MATERIAL SCIENCE, HEAT TREATMENT & TESTING**

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

Theory   64 Hours
Practical   96 Hours

AIMS:

At the end of this course the student will be able to understand about

- metallurgy of metallic material, their extraction and forming processes
- engineering materials and their properties
- inspection and testing of metallic materials
- heat treatment process and their uses in Dies and Mould

COURSE CONTENTS

1. METALLURGY OF IRON & STEEL   04 Hours

1.1. MANUFACTURING OF PIG IRON
     1.1.1. Raw Materials
         1.1.1.1. Iron Ore
         1.1.1.2. Types of Iron Ores and their quality
         1.1.1.3. Description of good quality ore
         1.1.1.4. Iron ore reserves in Pakistan and their quality
     1.1.2. Coke
         1.1.2.1. Production of Coke
         1.1.2.2. Quantity of Coke required in pig-iron manufacturing
     1.1.3. Fluxes
         1.1.3.1. Types of fluxes and their function in the process
         1.1.3.2. Quantity of flux required in pig-iron manufacturing
     1.1.4. Blast Furnace
         1.1.4.1. Layout of blast furnace
         1.1.4.2. The process in the blast furnace
         1.1.4.3. Products of blast furnace

2. MANUFACTURE OF STEEL   08 Hours

2.1. Converter process
     2.1.1. Structure of Converter
     2.1.2. Working of Converter
     2.1.3. Products of Converter
2.2. Siemens- Martin open hearth process
     2.2.1. Structure of open hearth furnace
     2.2.2. Working of open hearth furnace
     2.2.3. Products of open hearth furnace
2.3. Basic Oxygen furnace (L.D. Converter)
     2.3.1. Structure of basic oxygen furnace
     2.3.2. Working of basic oxygen furnace
     2.3.3. Products of basic oxygen furnace
2.4. Electric Furnaces
     2.4.1. Types of electric furnaces
     2.4.2. Structure of arc furnaces
     2.4.3. Operation of arc Furnaces

2.4.4. Advantages of electric furnace

3. **METALLIC MATERIAL AND THEIR CLASSIFICATION**   12 Hours
    3.1. Major Classifications of Metal Alloys
        3.1.1. Ferrous Alloys
            3.1.1.1. Steels and its classifications
            3.1.1.2. Cast Iron and its classifications
        3.1.2. Non-Ferrous Alloys
            3.1.2.1. Common Heavy Non-Ferrous Metal Alloys their Characteristics and Applications
                3.1.2.1.1. Coper Alloys,
                3.1.2.1.2. Zinc alloys
                3.1.2.1.3. Tin alloys
                3.1.2.1.4. Nickel alloys
            3.1.2.2. Common Light Non-Ferrous Metal Alloys
                3.1.2.2.1. Aluminum Alloys
                3.1.2.2.2. Magnesium Alloys
                3.1.2.2.3. Beryllium Alloys
        3.1.3. Miscellaneous N.F Alloys
        3.1.4. Refractory Metals
        3.1.5. Super Alloys
    3.2. Introduction to Dies and Mould Materials

4. **FABRICATION OF METALLIC MATERIALS**   12 Hours
    4.1. Introduction to Fabrication of metallic materials
        4.1.1. Metal fabrication techniques
            4.1.1.1. Forming operations
            4.1.1.2. Forging
            4.1.1.3. Rolling
            4.1.1.4. Extrusion
            4.1.1.5. Drawing
        4.1.2. Casting
            4.1.2.1. Sand Casting
            4.1.2.2. Die Casting
            4.1.2.3. Investment Casting
            4.1.2.4. Lost foam Casting
            4.1.2.5. Continuous casting
            4.1.2.6. Miscellaneous techniques
        4.1.3. Powder metallurgy
        4.1.4. Welding
    4.2. Die Making Process

5. **INTRODUCTION TO HEAT TREATMENT OF METALLIC MATERIAL** 12 Hours
    5.1. Heat Treatment of steels
        5.1.1. Phase diagrams
        5.1.2. Phase Transformation diagrams
        5.1.3. Effect of heating on steel
        5.1.4. Effect of cooling on steel
    5.2. Heat Treatment Processes
        5.2.1. Annealing
        5.2.2. Hardening
        5.2.3. Tempering
        5.2.4. Normalizing

5.3. Heat Treatment Equipment
  5.3.1. Heat Treatment Furnaces
  5.3.2. Pyrometers
  5.3.3. Metallurgical microscope
5.4. Case Hardening Processes
  5.4.1. Carburizing (pack, gas, liquid)
  5.4.2. Induction hardening
  5.4.3. Flame hardening
  5.4.4. Cyaniding
  5.4.5. Nitriding
5.5. Introduction to Heat treatment of Non - Ferrous Metals and Alloys
  5.5.1. Annealing and Precipitation hardening of Non-Ferrous Metals
5.6. Introduction to Heat Treatment of Die and Mould

6. **MECHANICAL PROPERTIES AND TESTING OF METALLIC MATERIALS** 02 Hours
  6.1. Mechanical Properties of Metals
    6.1.1. Hardness
    6.1.2. Toughness
    6.1.3. Ductility
    6.1.4. Malleability
    6.1.5. Elasticity
    6.1.6. Brittleness
    6.1.7. Plasticity
    6.1.8. Stiffness
  6.2. Testing of materials
    6.2.1. Destructive tests.
    6.2.2. Non Destructive Tests
  6.3. Mechanical Properties and Testing of Dies and Mould

7. **DESTRUCTIVE TESTS** 10 Hours
  7.1. Introduction to Hardness Test and Machines
    7.1.1. Brinell hardness test
    7.1.2. Rockwell hardness test
    7.1.3. Vickers hardness test
  7.2. Introduction to Impact Test and Machines
    7.2.1. Izod impact test
    7.2.2. Charpy Impact test
  7.3. Introduction to Universal Testing Machine (UTM)
    7.3.1. Tensile test
    7.3.2. Compression Test
    7.3.3. Bending test
    7.3.4. Shear Test
  7.4. Introduction to Torsion Test and Machine
  7.5. Introduction to Fatigue Test and Machine

8. **NON-DESTRUCTIVE TEST** 04 Hours
  8.1. Visual Inspection
  8.2. Dye Penetrant Test
  8.3. Ultrasonic Inspection
  8.4. Magnetic Particle Inspection
  8.5. Pressure Test
  8.6. Hammer Test (Sonic Inspection)
  8.7. Eddy Current inspection
  8.8. Radiographic Inspection

DMT 243   MATERIAL SCIENCE, HEAT TREATMENT & TESTING

1. METALLURGY OF IRON & STEEL   04 Hours
  1.1. Explain the manufacturing of pig iron
    1.1.1.   Describe Raw Materials for pig iron
      1.1.1.1.   Enlist different Types of Iron Ores
      1.1.1.2.   Description of good quality ore
      1.1.1.3.   Enlist Iron ore reserves in Pakistan and their qualities
    1.1.2.   Coke
      1.1.2.1.   Describe Production processes of Coke
      1.1.2.2.   Describe chemical reactions involve in coke production process
      1.1.2.3.   Describe the Quantity of Coke required in pig-iron manufacturing
    1.1.3.   Fluxes
      1.1.3.1.   Describe the type of fluxes
      1.1.3.2.   Explain the function of fluxes in the production of iron
      1.1.3.3.   Describe the quantity of fluxes required in the process
    1.1.4.   Understand Blast Furnace
      1.1.4.1.   Explain the Construction of a blast furnace
      1.1.4.2.   Explain the working operation of blast furnace
      1.1.4.3.   Describe the pre – heating of air
      1.1.4.4.   Describe different chemical reaction in the blast furnace
      1.1.4.5.   Explain the composition of crude pig iron
      1.1.4.6.   Explain the composition of gases from blast furnace
      1.1.4.7.   Describe the uses of carbon monoxide
      1.1.4.8.   Explain the quantity of slag produced
      1.1.4.9.   Briefly discuss the uses of slag
      1.1.4.10.   Enlist the composition of slag

2. MANUFACTURE OF STEEL   08 Hours
  2.1. Understand the reasons for the development of various furnaces
    2.1.1.   Describe the processes used in Bessemer converter
    2.1.2.   Describe the structure / construction of Bessemer converter
    2.1.3.   Describe the working of Bessemer converter
    2.1.4.   Explain the chemical reaction (oxidation process) in the Bessemer converter
    2.1.5.   Describe the products of Bessemer converter
  2.2. Understand the open – hearth process
    2.2.1.   Understand the Construction of open – hearth furnace
    2.2.2.   Understand the use of acidic / basic refractory living for the process
    2.2.3.   Describe the working of open – hearth furnace
    2.2.4.   Explain the products of open – hearth furnace
  2.3. Understand the basic oxygen furnace
    2.3.1.   Describe the structure of basic oxygen furnace
    2.3.2.   Describe the working of basic oxygen furnace
    2.3.3.   Briefly describe the modification in basic oxygen furnace (Kaldo furnace)
    2.3.4.   Briefly discuss the product of basic oxygen furnace Electric Furnaces
  2.4. Understand electric arc furnaces
    2.4.1.   Understand electric arc furnaces
    2.4.2.   Describe direct are furnace and indirect are furnace
    2.4.3.   Describe the structure of direct and indirect are furnace
    2.4.4.   Briefly discuss the advantages of electric arc furnace over the basic oxygen
    2.4.5.   Discuss the working of direct and indirect are furnace

2.4.6. Explain the charging of electric arc furnace

3. **METALLIC MATERIAL AND THEIR CLASSIFICATION**　　　12 Hours

3.1. Major Classifications of Metal Alloys

3.1.1. Ferrous Alloys

    i Describe Steels and its classifications
- Based on carbo content, alloying element
- Describe tool steel, High speed steel

    ii Describe the types of cast iron (gray, white, nodular cast iron)
- List compositions of different cast irons
- Describe applications of different cast iron

3.1.2. Non-Ferrous Alloys

3.1.2.1. Common Heavy Non-Ferrous Metal Alloys their Characteristics and Applications

3.1.2.1.1. Understand copper
- Understand copper-zinc alloys (brasses)
- Describe the types of copper-zinc alloys
- Describe the casting of brasses
- Describe the chemical contents of German silver
- Understand the brazing solders
- Describe the types of brazing solders
- Describe the uses of brazing solders
- Understand copper – tin alloys (bronzes)
- Know the UNS number for bronzes

3.1.2.1.2. Understand zinc alloys
- Describe zinc casting and wrought alloys
- Describe the uses of zinc casting and wrought alloys

3.1.2.1.3. Understand tin alloys
- Describe types of tin alloys
- Describe soldering tin alloys (tin-lead, tin-antimony-lead, tin-zinc, tin-silver soldering alloys)

3.1.2.1.4. Understand Nickel alloys
- Describe types of nickel alloys and their uses (Nickel-copper, Nickel-chromium, Nickel molybdenum, Nickel-iron, Invar, Alloy 42, Kovar, Platinum alloys)
- 6.7.1.1 Describe permanent magnet alloys (Alnico)
- Uses of permanent magnet alloys

3.1.2.2. Common Light Non-Ferrous Metal Alloys
- Understand the non-ferrous light metals
- List the properties of non-ferrous light metals
- Describe the properties and uses of non-ferrous light metals (aluminum, magnesium, beryllium)

3.1.2.2.1. Understand aluminum alloys
- Describe the effects of important alloying elements
- Describe the types of aluminum alloys
- Describe the heat-treatable and non-heat treatable cast alloys
- List the compositions of cast and wrought aluminum alloys
- Describe the international designation system for aluminum alloys

   3.1.2.2.2. Describe the properties and uses of non-ferrous light metals (magnesium, beryllium)

   3.1.2.2.3. Describe Miscellaneous N.F Alloys

   3.1.2.2.4. Describe Refractory Metals

   3.1.2.2.5. Describe Super Alloys

 3.2. Introduction to Dies and Mould Materials

  3.2.1. Describe H, D, M, and A series of steel

4. **FABRICATION OF METALLIC MATERIALS**   12 Hours

 4.1 Introduction to Fabrication of metallic materials

 4.2 Metal fabrication techniques

  4.2.1 Forming operations

   4.2.1.1 Describe Forging process

   4.2.1.2 Describe Rolling process (Two high, Three High and Four High Rolling Mills)

   4.2.1.3 Describe Extrusion process

   4.2.1.4 Describe Drawing process

  4.2.2 Casting

   4.2.2.1 Describe Sand Casting process

   4.2.2.2 Describe Die Casting process

   4.2.2.3 Describe Investment Casting process

   4.2.2.4 Describe Lost foam Casting process

   4.2.2.5 Describe Continuous casting process

  4.2.3 Miscellaneous techniques

   4.2.3.1 Describe Powder metallurgy process

   4.2.3.2 Describe Welding process

 4.3 Understand the Die Making Process

5. **INTRODUCTION TO HEAT TREATMENT OF METALLIC MATERIAL** 12 Hours
MECHANICAL TESITNG OF MATERIALS

 5.1 Understand Heat Treatment of Steel

  5.1.1 Describe heat treatment of steel

  5.1.2 Explain constituents of steel

  5.1.3 Describe allotropic phases of steel

  5.1.4 Explain change of structure on heating

  5.1.5 Explain role of heating rate/cooling rate

  5.1.6 Distinguish between micro and macro structure

  5.1.7 Sketch iron carbide diagram

  5.1.8 Describe significance of various areas in iron carbide diagram

  5.1.9 Explain role of iron carbide diagram in heat treatment of carbon steel

  5.1.10 Describe time temperature transformation diagram

 5.2 Understand Phase Diagram (Alloy steel)

  5.2.1 Define phase diagram

  5.2.2 Explain importance of phase diagram

  5.2.3 Name different phases

  5.2.4 Explain different phases

 5.3 Understand effect of heating on steels

  5.3.1 Describe heating curve of steels

  5.3.2 Describe its importance in heat treatment of steel

 5.4 Understand Effect of rate of Cooling on Steel

  5.4.1 Explain the change of micro structure on cooling

  5.4.2 Explain the importance of rate of cooling

    5.19.1 Describe Annealing and Precipitation hardening of Non-Ferrous Metals

 5.20 Introduction to Heat Treatment of Die and Mould

6. **MECHANICAL PROPERTIES AND TESTING OF METALLIC MATERIALS** 02 Hours

 6.1 Mechanical Properties of Metals

   6.1.1 Describe Hardness

   6.1.2 Describe Toughness

   6.1.3 Describe Ductility

   6.1.4 Describe Malleability

   6.1.5 Describe Elasticity

   6.1.6 Describe Brittleness

   6.1.7 Describe Plasticity

   6.1.8 Describe Stiffness

 6.2 Testing of Metallic Materials

   6.2.1 Describe and enlist Destructive tests.

   6.2.2 Describe and enlist Non Destructive Tests

 6.3 Mechanical Properties and Testing of Dies and Mould

7. **DESTRUCTIVE TEST**   10 Hours

 7.1 Understand Hardness Tests and selection of test for a material

 7.2 Knows types of hardness tests

 7.3 Explain Brinnel Hardness Test

   7.3.1 Enlist parts of brinell hardness testing machine

   7.3.2 Explain working of brinell hardness testing machines

   7.3.3 Explain preparation of specimen for brinell hardness testing machine

   7.3.4 Explain the measurement of impression by microscope for brinell test

   7.3.5 Describe relevant calculations

 7.4 Explain Rockwell hardness testing machine

   7.4.1 Explain construction and working of Rockwell hardness testing machine (minor load, major load, scales B, C)

   7.4.2 Explain preparation of specimen for Rockwell hardness testing machine

   7.4.3 Enlist difference between brinell and Rockwell hardness testing

 7.5 Explain Vicker hardness test

   7.5.1 Describe Vicker hardness testing machine

   7.5.2 Explain Vicker hardness testing method

 7.6 Explain the working Principles of Impact Testing Machine

   7.6.1 Enlist capacity and parts of Izod impact machine

   7.6.2 Explain function of each part

   7.6.3 Explain working principle

   7.6.4 Explain preparation of specimen (ASTM, JIS, ISO)

   7.6.5 State difference between Izod and Charpy impact test

 7.7 Explain the working Principle of Universal Testing Machine

   7.7.1 Describe tensile testing machine

   7.7.2 Enlist capacity and different parts of tensile testing machine and extensometer

   7.7.3 Describe different function of tensile testing machine

   7.7.4 Explain the preparation of standard tensile test specimen (ASTM, ISO)

   7.7.5 Explain the procedure of tensile test of mild steel

   7.7.6 Describe the stress strain curve obtained in a tensile test of mild steel

   7.7.7 Describe the %age elongation and %age reduction in area of specimen in tensile test

   7.7.8 State need of correct holding of specimen on machine

 7.8 Explain Compression test

   7.8.1 Describe compression test

   7.8.2 Describe procedure for the conduct of compression test

   7.8.3 Describe standard specimen for compression test

7.9   Understand Bending Test
        7.9.1   Describe bending
        7.9.2   Explain bending test and shape factor
        7.9.3   Describe deflection in specimen and bending equation.
7.10   Understand Shear Test
        7.10.1   Explain shear test procedure on universal testing machine
        7.10.2   Explain shear stress calculation of round bar and punched plate specimen
7.11   Understand Torsion Testing Machines and Torsion Test
        7.11.1   Describe torsion
        7.11.2   Explain shafts subjected to twisting moment
        7.11.3   Explain working of torsion testing machine
        7.11.4   Explain procedure of torsion test
7.12   Understand Fatigue Testing Machine and Fatigue Test
        7.12.1   Define fatigue
        7.12.2   Describe the Phenomenon of Stress Hysteresis
        7.12.3   Describe cyclic loading
        7.12.4   Explain effect of fatigue on metals and fatigue failure
        7.12.5   Explain working of fatigue testing machine
        7.12.6   Explain procedure for fatigue test

8. NON-DESTRUCTIVE TEST   04 Hours

    8.1   Describe Visual Inspection
    8.2   Explain Dye Penetrant Test
        8.2.1   Describe need and uses of Dye penetrant test
        8.2.2 Describe procedure of Dye penetrant test
    8.3   Understand Ultrasonic Test of metals
        8.3.1   Describe need and uses of Ultrasonic Test in the Inspection of Metals and Metallic Component
        8.3.2   Explain Ultrasonic Testing Equipment
        8.3.3   Describe procedure of Ultrasonic test
    8.4   Understand Magnetic particles inspection Methods
        8.4.1   Enlist advantages disadvantages
        8.4.2   Explain the equipment used
        8.4.3   Explain the basic principle
        8.4.4   Explain crack detection procedure
    8.5   Describe Pressure Test (pneumatic, hydraulic)
    8.6   Describe Hammer Test (Sonic inspection)
    8.7   Eddy Current inspection
    8.8   Understand Radiographic inspection
        8.8.1   X-Ray Method
            8.8.1.1 Enlist advantages and disadvantages of x-ray test.
            8.8.1.2 Explain the basic principle of x-ray test
            8.8.1.3 Explain the equipment used
            8.8.1.4 Enlist the safety measures adapted in x-ray method
            8.8.1.5 Explain the use of x-ray method in the inspection of castings and welded joints
        8.8.2   Gamma Ray Method
            8.8.2.1 Describe basic principle of Gamma Rays methods
        8.8.3   Enlist advantages and disadvantages of Gamma Rays methods with respect to X-ray method

DMT-243

MATERIAL SCIENCES AND HEAT TREATMENT

<u>**LIST OF PRACTICALS**</u>   96 Hours

1. **MATERIAL TESTING**
    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.

DMT-252 MOULD DESIGN – I

T	P	C
1	3	2

Total Contact Hours:	
Theory:	32
Practical:	96

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   04 Hours
    1.1. Importance of mould 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   04 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   04 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**   04 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**   04 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**   04 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**   04 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   04 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

Recommended Books

- Plastics Injection Molding: Scientific Molding, by José R. Lerma Valero
- Plastic Injection Molding Book Series SME series
- Plastic Part Design for Injection Molding: An Introduction by Robert A. Malloy
- Injection Moulds by PSTC, PCSIR
- Plastic Injection Molding: Mold Design and Construction Fundamentals by Douglas M Bryce
- Plastic Injection Molding: Manufacturing Process Fundamentals by Douglas M Bryce

DMT-252 MOULD DESIGN-I

INSTRUCTIONAL OBJECTIVES
1. **KNOWING ABOUT BASIC PARTS AND COMPONENTS OF A PLASTIC INJECTION MOULD**
   1.1. Describe Importance of mould 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
   6.3. 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. Define Shell moulds
   8.6. Describe of Plaster moulds
   8.7. Describe Centrifugal casting
   8.8. Define the Importance and application of Forging and its processes
   8.9. Importance and application of Hot and Cold Forging
   8.10. Define die material and design
   8.11. Describe the Problems and their trouble shooting

DMT-252 MOULD DESIGN-I

PRACTICAL   **96 Hrs.**

To design and develop a plastic injection mould of any part on 3D CAD software: -

Following are Mandatory steps while designing an injection Mould

1. Make arrangements for industrial visit of students to explore basic knowledge of injection Moulds (Locating ring, Sprue bush, Top Plate, Cavity Plate, Punch Plate, Cavity, Punch, Spacer, Gate and Runner system. Ejector Mechanism and Cooling system etc.)
2. Product Modelling

   2.1   Create from 3D Scanner or developed 3D drawing from actual 3D model or Import File from other Software

3. Make 2D Drawings from 3D Product Models
4. Understanding the importance of CAD software in injection molding
5. Evaluation of Die Design Criteria in CAD Software
6. To Modelling the basic design parameters of plastic injection molds
   - Mold flow,
   - nominal walls projection,
   - depressions,
   - Ejector systems,
   - Runners,
   - Gates,
   - Parting lines, and
   - General mold configurations.
7. To design and develop a plastic injection mould of any part on CAD software.
   7.1. Product Modelling
      7.1.1.   Create by yourself
      7.1.2.   Create from 3D Scanner
      7.1.3.   Import File from other Software
   7.2. 2-Make 2D Drawing from 3D Product Model
      7.2.1.   Different 2D, Section, and Detail views, Dimensions, Tolerances (Dimensional and Geometrical), etc.
      7.2.2.   Provide all the necessary information regarding Plastic Material, Drawing Scale, Created By, Checked By, Job No., Drawing No., Company Profile etc.
   7.3. 3- Gathered all the information for the Plastic Injection Mold to read the component physically or by Customer:
      7.3.1.   Types of Mold, No. of Cavity, Injection Type, Ejection Type, Mold Cooling, Decision of Parting Line, etc.
      7.3.2.   Make calculations: Clamping Force, Injection Capacity, Core Plate Thickness, Runner Size, etc.
      7.3.3.   After Finalization of the Injection Molding Machine: Confirm Tie bar Distance, Mold Max and Min Opening and Closing (Mold Shut Height), Locating Ring Diameter,
      7.3.4.   Prepared the Mold Layout in 2D, using the 2D Product Drawing: Adjust the heights of Guide and Support Pins

7.4. 4. Using the 3D Model, Create Core and Cavity for the Mold according to the design of the Injection mold set in a 2D mold Layout

7.5. 5- Create Mold Base, after completion of the 3D parts of the Molds, create an Assembly modeling

7.6. 6-Create a 2D Assembly Drawing from 3D Assembly Modeling:

    7.6.1.   Allot Numbers to all the standard and non-standard parts, create a Material List, and put all the necessary information in the Material List regarding Metal Materials, Quantities, Finished or Un-Finished Sizes of the Parts used in the Mold

    7.6.2.   Put overall Dimensions in the 2D Assembly drawing

7.7. 7-Create 2D Drawings of Non-Standard parts used in the Mold:

    7.7.1.   With complete 2D views, Section Views, Detail Views, etc. put all the necessary dimensions with tolerances and also give all other information regarding part material, Qty., H/T, etc.

WT-227 WORKSHOP TECHNOLOGY-II

	T	P	C
	2	15	7
Total Contact Hours			
Theory			64
Practical			480

AIMS:

     This subject deals with the types of lathes, drilling machines, tool grinders, shaper/planner, Milling, Indexing, Engraving, basic 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.

DETAIL OF COURSE CONTENTS

1. LATHE MACHINES 14 Hours
  1.1. **Types of Lathes**
- Centre lathe
- Bench lathe
- Engine lathe
- Turret lathe
- Capston Lathe
- Vertical lathe
- CNC Lathe and Turning Centre

  1.2. **Drives of lathes**
- Step or cone pulley drive
- Gear drive

  1.3. **Power feed motion**
- Standard change gear
- Quick change gear box

  1.4. **Parts of the lathe**
- Lathe bed
- Head stock
- Tail stock
- Carriage
- Cross slide
- Compound slide
- Tool post
- Feed shaft
- Lead screw

  1.5. **Accessories of lathe**
- Chucks
- Face plate
- Collets
- Centers
- Mandrel
- Steady rest
- Follower rest

1.6. **Special attachments**
- Quick change tool post
- Lever – operated carriage
- Lever – operated drilling tail stock
- Star – wheel – operated turret carriage
- Thread cutting attachment
- Milling attachment
- Grinding attachment
- Ball turning attachment

1.7. **Lathe tools**
- Left Hand Turning tool
- Right Hand Turning tool
- Threading tool
- Knurling tool
- Boring tool

1.8. **Turning operations**
- Longitudinal and transverse turning
- Speed and feed for turning
- Slotting and parting off
- Boring
- Taper turning with compound slide
- Taper turning with setting over tail stock
- Taper turning with attachment
- Eccentric turning
- Knurling
- Thread cutting
- Calculation of change gears for thread cutting
- Setting the thread cutting tool
- Lathe Setting for Threads cutting

2. <u>**SHAPER AND PLANER**</u>   **10 Hours**
2.1. **Type of machines**
- Planning machines
- Hydraulic shaping machine
- Vertical shaper or slotting machine

2.2. **The shaper drive**
    2.2.1.   The friction – wheel drive

2.3. **The parts of the shaper**

2.4. **Accessories**
- Concentric machine vice
- Slotting attachment
- Parallels

2.5. **Shaping Surfaces**
- Flat shaping
- Vertical shaping
- Angular shaping
- Profile Shaping

2.6. **Operation Instruction**
- Setting speed
- Adjusting length of stroke
- Setting the ram
- Setting cross feed or table feed

- Vertical adjustment of table
- Adjusting down feed
- Setting of tool lifter in operation
- Starting and stopping of machine

3. <u>MILLING</u>　　　　18 Hours

3.1. Types of Milling machines
- Horizontal milling machine
- Vertical milling machine
- Universal milling machine
- Bench milling machine
- Thread milling machine
- Copy – milling machine
- Multi spindle milling machine
- Gear Shaper
- Gear Hobbing

3.2. Drive of milling machines
- Cone pulley drive
- Step-less variable speed gear drive

3.3. Parts of the milling machine
- Base
- Column
- Over Arm
- Arbor support
- Spindle
- Table
- Saddle
- Knee
- Leveling screw, Speed control unit

3.4. Milling Accessories
- Indexing Head • Swival Vice
- Universal Vice
- Slotting Attachment
- Vertical head
- Rotary table
- Universal head
- Arbors
- Collets
- High speed Milling attachment
- Angle Plate
- Magnetic chuck
- Vacuum chuck

3.5. Vertical Milling cutters
- Single End mill
- Double End mill
- Ball End mill
- Shell End mill
- Taper end mill
- T-Slot Cutter
- Dovetail Cutter
- Face Milling Cutter

3.6. **Horizontal Milling cutters**
- Fly cutter
- Slitting Saw
- Slotting Cutter
- Side and Face cutter
- Convex Cutter
- Concave Cutter
- Single Angle Cutter
- Double Angle Cutter
- Corner Rounding Cutter
- Spur Gear Cutter

3.7. **Milling operations**
- Conventional Milling
- Climb Milling
- Slotting
- Straddle Milling
- Gange Milling
- Grooving
- Slitting (Sawinig)
- Angular Milling
- Circular Milling
- Gear cutting

3.8. **Indexing**
- Direct Indexing
- Simple Indexing
- Angular Indexing
- Differential indexing

4. <u>ENGRAVING</u>   08 Hours

4.1. Engraving machine

4.2. **Accessories**
- Electric etching apparatus
- Form engraving attachment
- Work holding devices
- Engraving templates

4.3. **Operating the machine**
- Setting the spindle speed
- Adjusting the pantograph
- Adjusting the engraving head to the work piece
- Aligning the template table to the work table
- Aligning of the work piece to the template
- Fixing the cutter

4.4. **The engraving cutter**
- High speed steel cutters
- Carbide engraving cutters
- Spring loaded engraving
- Engraving diamonds
- Etching pin
- Angles on the engraving cutters
- Different forms of cutter

4.5. **Engraving operations**

- Common engraving
- Copying of cams
- Electric etching
- Cutting speed for engraving

5. <u>WELDING AND FORGING</u>   10 Hours

   5.1. Definition of welding

   5.2. Welding processes
- Forge/ Pressure welding
- Fusion/ Non Pressure welding
- Resistance welding(spot, seam, projection,)

   5.3. Process and Equipments
- Oxy-acetylene welding
- Oxy-acetylene Welding equipments
- The gas cylinders
- Pressure regulator
- Blow pipe
- Cutting torch
- Radii cutting attachment
- Welding and filler rods
- Welding flux, its uses and advantages

   5.4. Electric arc welding and equipments
- Metal arc welding
- Submerged arc welding
- Tungsten inert gas(TIG) welding
- Metallic inert gas(MIG) welding
- DC generator
- AC welding transformer
- Welding Electrodes

   5.5. Forging and Forging processes
- Flat die forging(Smith forging)
- Closed die forging

   5.6. Forging Operations
- Upsetting
- Drawing down
- Setting down
- Punching
- Bending
- Cutting

6. <u>SOLDERING AND BRAZING</u>   4 Hours

   6.1. Soldering methods
- Torch soldering
- Soldering iron
- Furnace soldering
- Dip soldering
- Resistance soldering

   6.2. Define Brazing
- Torch brazing
- Furnace brazing
- Electric brazing

   6.3. Fluxes, its uses and advantages

Recommended Books

i.   Workshop Technology V-II   Published by PSTC, PCSIR
ii.   Technology of Machine Tools   by S.F. Karar
iii.   Workshop Technology by Gupta
iv.   Production Engineering by PC Sharma
v.   Workshop Technology by W. A. A. Champman Part 1
vi.   Workshop Technology by W. A. A. Champman Part 2
vii.   Workshop Technology by W. A. A. Champman Part 3

WT-227 WORKSHOP TECHNOLOGY-II

INSTRUCTIONAL OBJECTIVES:
Instructor / Teacher should ensure to:

1. **DEVELOP KNOWLEDGE OF LATHE MACHINE**

   - Identify and describe the use of different types of lathes
   - Identify lathe machine parts
   - Explain the construction of lathe machine
   - Understand driving and feed mechanism of lathe machine
   - Describe the utility of lathe attachments, accessories and tools
   - Perform various lathe operations

2. **DEVELOP KNOWLEDGE OF SHAPER AND PLANER**

   - Distinguish between shaper and planer
   - Identify and describe the utility of mechanical mechanism and hydraulic mechanic for driving shaper
   - Set length of stoke of shaper
   - Set different tools on shaper
   - Set work holding devices
   - Perform different operations on shaper independently

3. **DEVELOPMENT KNOLEDGE OF MILLING WORK**

   - Identify horizontal, vertical and universal milling machines
   - Identify copy milling, gear shaper and hobbing machine
   - Describe brief use of different types of milling machines
   - Describe the construction of parts for Horizontal, Vertical and universal milling machines
   - Use different milling attachments such as swivel vice, vertical head, slotting head, universal head, index head, arbors, rotary table etc.
   - Set and use Horizontal milling cutters
   - Set and use vertical milling cutters
   - Perform different milling operations affectively
   - Use indexing methods to cut spur gears

2. **DEVELOP KNOWLEDGE OF ENGRAVING**

   - Identify and explain the parts of engraving machine
   - Identify different types of engraving cutters
   - Set and use different engraving cutters
   - Select suitable speeds for various engraving cutters
   - Adjust pantograph to increase or decrease the size of job to be engraved
   - Set alignment of template to work table
   - Set alignment of work to template
   - Perform different engraving operations affectively

5. **DEVELOP KNOWLEDGE OF WELDING AND FORGING**

- Define welding process
- Describe the process of high pressure gas welding
- Describe the process of electric arc welding
- Describe the utility of gas welding equipment
- Describe the utility of arc welding equipment
- Understand the use of radii gas cutting attachment
- Set and use gas welding equipment
- Set and use of arc welding equipment
- Set and use equipment of (TIG) for welding
- Set and use equipment of (MIG) for welding
- Use exhaust system for (TIG) and (MIG) welding process
- Set fore forge (preheating furnace) properly
- Heat up the stock up to forging temperature properly
- Perform different forging operations properly such as upsetting, drawing down, twisting, punching, bending etc.

6.   DEVELOP KNOWLEDGE OF SOLDERING AND BRAZING

- Define soldering
- Define brazing
- Know the requirements of soldering and brazing
- Know about the fluxes used in soldering and brazing
- Use soldering iron properly
- Use brazing torch properly
- Perform soldering and brazing process

WT-227 WORKSHOP TECHNOLOGY-II

List of Practical   **480 Hours**

1. Square Fit Exercise
2. Gauges Exercise
3. Hammer Fabrication Exercise (Shaper Machine)
4. Drill Gauge Exercise
5. Chamfer Gauge Exercise
6. Tool Grinding Exercise
7. Step Turning Reaming and Hexagon Fit Exercise
8. Paper Weight Turning Exercise
9. Cylindrical Turning Exercise
10. Eccentric Turning Exercise
11. Scriber or Center or Pin Punch Turning Exercise
12. Boring Exercise
13. Taper Boring Exercise
14. Milling Block Exercise (Square Block)
15. Step Milling Exercise
16. T- Fit Milling Exercise
17. Sliding Fit Exercise
18. Engraving & Etching Exercise
19. Welding and Brazing Exercise
20. Practice of electric arc welding
21. Practice of flame making for gas welding
22. (a) Harsh Flame (b) Carburizing Flame (c) Neutral Flame (d) Oxidizing flame
23. Practice of oxy-acetylene welding
24. Practice of soldering
25. Practice of brazing
26. Hexagon Milling
27. Spur Gear Cutting
28. Use of Rotary Table for octagonal Block milling
29. Cutting right hand V-threads
30. Cutting left hand V-threads
31. Cutting double start (R/H) V-threads
32. Cutting double start (L/H) V-threads

COURSE OUTLINE YEAR – 3

GEN - 301

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کل وقت 20 گھنٹے

نصاب سال سوئم

حصہ اول اسلامیات

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 لمر اقلم 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 لیشمتہ اذا عطس و فصیحلہ اذا غاب او شھد

( ) لا تخن من خانک

( ) لا یدخل الجنتہ قاتع

( ) ان اللہ حرم علیکم عقوق المہات و اضاعتہ المال

( ) لیسر او لا تعسر او لا تنفر

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

( ) افضل الذکر لا الہ الا اللہ

3۔ حقوق وفرائض:

==حصول تعلیم بطور فرض، والدین اور اولاد کے حقوق وفرائض، بچوں کے حقوق، عورتوں کے حقوق، بزرگ==

==شہریوں کے حقوق، مخنث افراد کے حقوق۔==

4۔ اسلام کی اخلاقی اقدار:

صبر واستقلال، عفو و درگزر، ایفائے عہد، اخوت، ایثار و قربانی۔

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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 امسانی بساط میں ہے

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

( )   اللہ ایک ہے

( )   اللہ کسی کا محتاج نہیں نہ اسکا 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

()   <mark>بچوں کے حقوق بیان کر سکے</mark>

()   <mark>عورتوں کے حقوق کی پاسداری کر سکے</mark>

()   <mark>بزرگ شہریوں کے حقوق کا خیال رکھ سکے</mark>

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

()   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 معنیٰ 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 معنیٰ و مفہوم بیان کر سکے

()   اخوت اسلامی کی اہمیت بیان کر سکے

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

GEN - 301

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کل وقت 12 گھنٹے

مطالعہ پاکستان

حصہ دوئم

موضوعات:

() قیام پاکستان

() باؤنڈری کمیشن

() ریڈ کلف ایوارڈ

() تقسیم بنگال

() تقسیم پنجاب

() مسئلہ مہاجرین

() ریاست کا الحاق

() ریاست جموں کشمیر

() نہری پانی کا تنازعہ

() قرارداد پاکستان

() علماء کے بائیس نکات

() 1956ء 1962ء اور 1973ء کے دساتیر کی اسلامی را انسانی حقوق کی دفعات (8 تا 28)۔

() اقلیتوں کے حقوق ۔ دیگر محروم طبقات کے حقوق

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

() قدرتی وسائل (تیل، گیس، کوئلہ)

مطالعہ پاکستان (حصہ دوئم)

قیام پاکستان

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

نصاب اخلاقیات

سال سوئم

ٹی	پی	سی
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

( )   خود انحصاری

( )   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

نصاب اخلاقیات (سال سوئم)

تدریس مقاصد:

عمومی مقاصد:

( ) 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

( ) موضوعات کا مطلب بیان کر سکے

( ) عملی زندگی سے مثالوں کی نشاندہی کر سکے

( ) موضوعات کی اہمیت بیان کر سکے

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

( ) مثبت ذہن کے ساتھ کام کر سکے

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

( ) ماحول کو اخلاقی طور پر پاکیزہ بنائے

( ) کارکنوں کی بہتر طور پر دل جوئی کر سکے

( ) کارکردگی میں اضافہ کر سکے

( ) باہمی احترام کی برکات سے استفادہ 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 کے جان سکے اور ان کے حقوق کی پاسداری کر کے انہیں معاشرے کا ایک مفید فرد بنایا جا سکے

Mech-321 INDUSTRIAL PLANNING AND PRODUCTION METHODS

T	P	C
1	0	1

Total Contact Hours:	
Theory:	32
Practical:	0

AIMS: At the end of this course, the student will be able to:
- i)   Understand the fundamental functions of industrial concerns.
- ii)   Understand the methods generally employed in various manufacturing organizations

Detail of Contents:

1. Industrial Planning   3 Hrs.
   - 1.1   Need of industrial planning
   - 1.2   Phases of industrial planning
2. Site selection for Industry   2 Hrs.
   - 2.1 Economical and technical factors considered while selecting factory site
3. Plant layout   4 Hrs.
   - 3.1   Definition
   - 3.2   Objectives
   - 3.3   Types
   - 3.4   Criteria for a good lay out
   - 3.5   Advantages of a good lay out
   - 3.6   Preparing a lay out
   - 3.7   Production Routing sheets
   - 3.8   Identification & concept of:
     - 3.8.1 bottlenecks,
     - 3.8.2   Buffers
     - 3.8.3 Throughput
     - 3.8.4 Line balancing
     - 3.8.5 Capacity Utilization
4. **Production Methods**   3Hrs
   - 4.1   Introduction to production
   - 4.2   Important types of production
   - 4.3   Lean Manufacturing (waste identification & removal)
5. **Job Analysis**   **2 Hrs.**
   - 5.1 Motion study
   - 5.2 Time study
   - 5.3 Overall Equipment Efficiency (OEE)
   - 5.4 Single Minute Die Exchange
6. **Production planning and control**   **4 Hrs.**
   - 6.1   Production planning
   - 6.2   Production control
7. **Quality management**   **4 Hrs.**
   - 7.1   Inspection
   - 7.2   Quality control
   - 7.3   Quality Policy
   - 7.4   Control Charts

	7.5	Quality Plan	
	7.6	Documentation/ (SOPs)	
	7.7	Process capability & capability Index (Cp & Cpk)	
	7.8	Standard deviation & variance	
	7.9	Sigma capabilities	

8. Maintenance activities   4 Hrs.
8.1 Responsibilities of maintenance department
8.2 Types of maintenance
8.3 Comparison of different types of maintenance
8.4 Replacement studies

9. Cost determination and control   2 Hrs.
9.1 Cost calculation of industrial product.
9.2 Cost control

10. Types of Cost   2 Hrs.
10.1 Fixed
10.2 Variable
10.3 Opportunity cost
10.4 Cost of quality

11. Warehouse operations in industry   2 Hrs.
11.1 Inventory Management
11.2 LIFO & FIFO
11.3 ABC Classification
11.4 Material Handling Equipment

RECOMMENDED TEXTBOOKS:

1. Motion and time study by RALPH M. BARNES (Publisher: Wiley, 1980)
2. Industrial Engineering and Management System by Dr. Mansor Ali (Publisher: Urban Resource Center,2001}
3. Factory and Production Management by Lockyer (Publisher: Pitman, 1974)
4. Industrial Management by Prof. M.H. Zubairy

Mech-321   **INDUSTRIAL PLANNING AND PRODUCTION METHODS**

Instructional Objectives:
1. **Industrial planning**
    1.1 Explain the need of industrial planning
        1.1.1 Define industrial planning
        1.1.2 Explain need and importance of industrial planning
    1.2 Explain different phases of industrial planning
        1.2.1 Explain financial planning
        1.2.2 Explain product planning and selection of material
        1.2.3 Explain selection of process and equipment
2. **Know the Economical and technical factors considered during site selection Procedure**
    2.1 Explain economical and technical factors in site selection
        2.1.1 Define site (location of industry)
        2.1.2 Describe factors for site selection
        2.1.3 Economic factors (cost of site, rebate in taxes, special grants)
        2.1.4 Technical factor (availability of labor, raw material, market of Product, services, transportation etc.)
3. **Understand plant lay out**
    3.1 Define plant lay out and its importance
    3.2 Describe the objectives of lay out
    3.3 Describe the types of lay out (product/process) with its advantages and limitations
    3.4 Explain criteria for a good lay out
    3.5 Describe advantages of a good lay out
    3.6 Explain different factors *I* procedures followed in preparing layout
        3.6.1 Explain factors considered while preparing a lay out (man. Material, machine, Movement etc.)
        3.6.2 Describe procedure and various steps followed in developing a lay out
    3.7 Describe Production Routing sheets
    3.8 Identification & concept of
        3.8.1 bottlenecks,
        3.8.2 Buffers
        3.8.3 Throughput
        3.8.4 Line balancing
        3.8.5 Capacity Utilization
4. **Understand Production Methods**
    4.1 Define Production.
    4.2 Explain different types of production
        4.2.1 Explain Mass Production, Job order Production, Batch Production
        4.2.2 Explain flow Production
        4.2.3 Describe requirements of flow production
    4.3 Describe Lean Manufacturing (waste identification & removal)
5. **Understand Job Analysis**
    5.1 Explain motion study
        5.1.1 Define motion study
        5.1.2 Explain techniques developed by the gilbreth, like therbligs, process charts etc.
        5.1.3 Describe micro motion study
    5.2 Explain time study
        5.2.1 Define time study
        5.2.2 Describe uses of time study
        5.2.3 Describe instruments used in motion and time study
        5.2.4 Describe time study procedure
        5.2.5 Explain observation sheet (Time study tool)

Mech-333   MACHINE DESIGN & ANALYSIS

Total Contact Hours:	T	P	C
	2	3	3

Theory: 64 Hrs

Practical: 96 Hrs

AIMS: At the. end of the course the students will be able to:

i)   Calculate and analyze stresses induced in different machine parts

ii)   Design Simple machine parts, welded joints, Screwed joints, pressure vessels, shafts and Couplings, Keys, Belt Drives, helical springs, Bearings and CAMS & Followers.

Details of Contents:

1.   Design Methodology   2 Hrs.
   1.1   Fundamental designing
   1.2   Type of designing
   1.3   Design product concept
   1.4   Design methods
2.   **Simple Stresses in Machine Parts**   **6 Hrs**

   2.1   Load and its types
   2.2   Stress and strain
       2.2.1   Tensile stress and strain
       2.2.2   Compressive stress and strain
       2.2.3   Shear stress and strain
       2.2.4   Young's Modulus of elasticity; Hook's Law
       2.2.5   Modulus of rigidity or Shear Modulus
       2.2.6   Stress strain diagram
       2.2.7   Working stress
       2.2.8   Factor of safety
       2.2.9   Selection of Factor of Safety
       2.2.10   Poisson's Ratio
       2.2.11   Temperature stress
       2.2.12   Volumetric strain and bulk modulus
       2.2.13   Resilience and Toughness
       2.2.14   Solution of problems of the above topics by direct application of formulae
3. Pressure Vessels   **6 Hrs**

   3.1 Introduction
   3.2 Classification of pressure vessels
       2.2.15   According to dimensions.
       2.2.16   According to end - construction
   3.3 Stresses in a thin cylindrical shell due to internal pressure
           3.3.1   Hoop stress
           3.3.2   longitudinal stress
   3.4   Calculation of thickness of cylinder by direct application of formula, while all parameters are provided (e.g.), Pressure. Internal Dia, hoop or longitudinal stress and efficiency of joint are given)

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3.5   Calculation of hoop or longitudinal stress by direct application of formula, while P. d, t and efficiency of joint are given

3.6   Thin spherical shell subjected to internal pressure

3.7   Calculation of thickness of spherical shell when all other parameters are provided by direct application of formula

3.8   Thick cylindrical shell subjected to internal pressure

3.9   Calculation of thickness of thick vessel made of brittle material by LAME,S equation, while all other parameters are given

4. Welded Joints   6Hrs

4.1 Types of various welding joints

4.2 Strength of transverse and parallel fillet welded joint under static and fatigue loading

4.3 Calculation of length of weld under static loading, when load, plate thickness & width, tensile & shears stress are given

5. Screwed Joints   6Hrs

5.1 Introduction

5.2 Advantages and disadvantages

5.3 Thread terminology

5.4 Stress in screwed fastening due to external forces under static loading

5.5 Initial stress due to screwing up forces

5.6 Solution of simple problem by direct formula application

6. Design of Keys   5 Hrs

6.1 Introduction

6.2 Types of keys

6.3 Forces acting on a sunk key

6.4 Strength of a sunk key

6.5 Calculate length of sunk key by direct application of formula, while all parameters are directly provided

7. Shafts and Couplings   5 Hrs

7.1 Introduction to shaft

7.2 Materials used for shaft and its properties

7.3 Types of shafts

7.4 Standard sizes

7.5 Stresses in shafts

7.6 Shafts subjected to twisting moment
- i   Solid shaft
- ii   Hallow shaft

7.7 Calculate diameter of solid and hollow shafts by direct application of formula

7.8 Shafts subjected to bending moment
- 6.8.1 Solid shaft
- 6.8.2 Hollow shaft

7 .9 Calculate diameter of solid and hollow shaft (bending only) by direct application of formula

7.10   Calculation of dia. of shaft subjected to bending and twisting moments

7.11   Introduction of shaft coupling

7.12   Types of couplings

7.13   Design of flange coupling

7.14   Solve problems on calculation of sizes of different components in flange coupling by direct application of formula

8. Belt Drives   6 Hrs

8.1 Introduction to Belt and pulley drives

8.2 Selection of Belt drive

8.3 Types of Belt drive

8.4 Type of Belts and pullies

8.5 Type of Flat Belts drive

8.6 Velocity ratio of Belt drive

8. 7 Slip *I* creep of Belt

8.8   Length of open Belt drive

8.9   Solve problem to find out the speed of shaft considering the diameters of flat pulleys and slip between belt and flat pulleys

9. Springs   6 Hrs

9.1 Introduction

9.2 Types and uses of springs

9.3 Materials used for helical springs

9.4 Terms used in helical springs

9.5 Stresses in helical springs of circular wire

9.6 Deflection of helical springs of circular wire

9.7 Solution of simple problem on helical springs of circular wire regarding finding out stresses, deflection and diameter of wire by direct application of formulae

10. Bearings   6 Hrs

10.1   Functions of bearings
10.2   Classification of bearing
10.3   Depending upon the direction of load to be supported
10.4   Depending upon the nature of contact
10.5   Uses of bearings
10.6   Terms used in journal bearings
10.7   Lubrication of bearings
10.8   Solution of simple problems on journal bearings when fill parameter of journal bearing are directly provided

11. Cam and Follower Design   7Hrs
11.1   Cam and its Types
11.2   Followers and its Types
11.3   Terminology of Cam and Follower
11.4   Cam profile design

Recommended Textbooks:

1. Machine Design by: Paul H. Black (Published by McGraw Hill Book Company, New York)
2. Machine Design by Stanton. E. Wiston (Published by McGraw Hill Book Company, New York)
3. Machine Design by: Lafayette. Ind. (Purdue University of California)
4. Machine Design by Khurmi & Gupta

Mech-333 MACHINE DESIGN & ANALYSIS

Instructional Objectives:

1. **Design Methodology**
   1.1 Interpret Fundamental designing
   1.2 Enlist Type of designing
   1.3 Describe Design product concept
   1.4 Explain Design methods
2. **Simple Stresses in Machine Parts**
   2.1 Describe Load and its types
      2.1.1 Dead load
      2.1.2 Live load
      2.1.3 Suddenly applied load
      2.1.4 Impact load
   2.2 Describe Stress and strain
   2.3 Describe Tensile stress and strain
   2.4 Describe Compressive stress and strain
   2.5 Describe Shear stress and strain
   2.6 Describe Modulus of elasticity
   2.7 Describe Modulus of rigidity
   2.8 Explain Stress strain diagram
      2.8.1 Proportional limit
      2.8.2 Elastic limit
      2.8.3 Yield points
      2.8.4 Ultimate stress
      2.8.5 Breaking stress
      2.8.6 Percentage reduction in area
      2.8.7 Percentage elongation
      2.8.8 Describe Working stress 2.9 Describe Factor of safety
   2.10 Describe selection of factor of safety
   2.11 Describe Poisson's ratio
   2.12 Describe temperature stress
   2.13 Describe volumetric strain and bulk modulus
   2.14 Describe Resilience and Toughness
   2.15 Solve of simple problems of the above topics by direct application of formula
3. **Pressure Vessels**
   3.1 Describe pressure vessels
   3.2 Explain Classification of pressure vessels
      3.2.1 According to dimensions
      3.2.2 According to end - construction
   3.3 Explain Stresses in a thin cylindrical shell due to internal pressure
      3.3.1 Hoop stress
      3.3.2 Longitudinal stress
   3.4 Calculate thickness of cylinder by direct application of formula, while all parameters are provided (e.g., Pressure. Internal Dia, hoop or longitudinal stress and efficiency of joint are given)
   3.5 Calculate hoop or longitudinal stress by direct application of formula, while P. d, t and efficiency of joint are given
   3.6 Explain thin spherical shell subjected to internal pressure
   3.7 Calculate thickness of spherical shell when all other parameters are provided by direct application of formula

3.8   Explain Thick cylindrical shell subjected to internal pressure

3.9   Solve simple problem to Calculate of thickness of thick vessel made of brittle material by LAME, S equation, while all other parameters (e.g., Pressure. Internal Dia, tensile stress) are given

4.   Welded Joints

4.1   Describe list of types of various welding joints

4.2   Explain strength of transverse and parallel fillet welded joint under static and fatigue loading

4.3   Calculation of length of weld under static loading and fatigue loading, when load, plate thickness, plate width, tensile and shears stress are given

5.   Screwed Joints

5.1   Describe Screwed Joints

5.2   Describe Advantages and disadvantages of Screwed Joints

5.3   Explain Thread terminology

     5.3.1 Major diameter

     5.3.2 Minor diameter

     5.3.3 Pitch diameter

     5.3.4 Pitch

     5.3.5 Lead

     5.3.6 Helix and Helix angle

     5.3.7 Thread angle

     5.3.8 Root

     5.3.9 Crest and Apex

5.4   Explain Stresses in screwed fastening due to external forces under static loading

5.5   Describe Initial stress due to screwing up forces

5.6   Solve simple problem on screwed fastening by direct application of formula

6.   Design of Keys

6.1   Describe Keys and its use

6.2   Describe Types of keys

     6.2.1 Sunk keys

          6.2.1.1 Rectangular (Parallel & Taper) Sunk key

          6.2.1.2 Square {Parallel & Taper) Sunk key

          6.2.1.3 Gib-Head key

          6.2.1.4 Feather key

          6.2.1.5 Wood ruff key

     6.2.2 Saddle keys

          6.2.2.1 Flat Saddle Key

          6.2.2.2 Hollow Saddle Key

          6.2.2.3 Tangent keys

          6.2.2.4 Round keys

          6.2.2.5 Splines

          6.2.2.6 Describe Forces acting on a sunk key

6.3   Explain strength of a sunk key

6.4   Solve simple problem to Calculate length of sunk key (Square & Rectangular) by direct application of formula, while all parameters are directly provided

7.   Shafts and Couplings

7.1   Describe Shafts

7.2   Describe Materials used for shaft and its properties

7.3   Describe Types of shafts

7.4   Describe Standard sizes of shafts

7.5   Describe Stresses in shafts

7.6   Explain shafts subjected to twisting moment

     7.6.1 Solid shaft

Mech-333   MACHINE DESIGN & ANALYSIS

LIST OF PRACTICAL:

1.   Calculate (tensile, compressive and shear), stress and strain, modulus of elasticity, %age elongation, %age reduction in area, factor of safety for simple machine parts
2.   Calculate force required to punch a hole
3.   Calculate thickness and diameter of thin cylinders for hoop and longitudinal stresses
4.   Calculate thickness of thick cylinders by LAME 'S Equation S. Calculate thickness and diameter of spherical shell.

6.   Design welded joints for transverse and parallel fillet weld under static loading only
7.   Calculate stresses setup due to initial tightening and external load on screws.
8.   Check dimensions of square and rectangular keys due to failure in shearing and crushing.
9.   Design solid shaft subjected to twisting moment only.
10.   Design hollow shaft subjected to twisting moment only.
11.   Design Solid & Hollow shafts subjected to combined bending & twisting moment.
12.   Design un-protected flange coupling for specific torque.
13.   Check the speed of shaft when diameters of flat pulleys {Driver or Driven) and slip between belt and flat pulley is given.

14.   Design the dimensions of closely coiled helical spring of circular wire subjected to tensile load.

15.   Suggest suitable journal bearing, considering the load on shaft, speed, viscosity of lubricant, bearing pressure, coefficient of friction and bearing modulus.

16.   Design and draw the CAM profile with knife edge follower for uniform velocity
       (a) Out Stroke during 60°of Cam rotation
       (b) Dwell for next 30°of Cam rotation
       (c) return Stroke during next 60°of Cam rotation
       (d) Dwell of remaining 210°of Cam rotation
       (e) Stroke of follower is 22 mm
       (f) Minimum Radius of Cam is 50 mm
       (g) Axis of Follower is passing through axis of Cam shaft
       (h) Follower moves with uniform velocity during both out Stroke and return Stroke.

DMT-313   DIE DESIGN-II

	T	P	C
	2	3	3

Total Contact Hours:	
Theory:	64
Practical:	96

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 AND PART VARIETY**   06 HOURS
   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-313   DIE DESIGN-II

INSTRUCTIONAL OBJECTIVES

1. **UNDERSTAND SHEET METAL FORMING OPERATIONS**
    1.1. Describe Deep drawing
    1.2. Define Form drawing
    1.3. Define Coining, Embossing
    1.4. Define Flanging or Collar drawing
2. **KNOW ABOUT MAIN COMPONENTS OF DEEP DRAW TOOL AND IT OPERATIONS & DESGINING FACTORES**
    2.1. Define Deep Drawing Die
    2.2. What is Deep drawing Punch?
    2.3. Define Blank Holder
    2.4. Describe Blank
    2.5. Define Stripper
    2.6. Explain Deep drawing operations
    2.7. Describe the Factor influencing deep drawing operations
3. **KNOW BASIC DESIGNS OF DEEP DRAWING TOOL**
    3.1. Define Push through tool
    3.2. Define Return tools
    3.3. Define Inverted drawing tools
    3.4. Define Redrawing tools
    3.5. Describe Double drawing tools
    3.6. Describe Blanking tools/Drawing tool
    3.7. Define Multi station Drawing Tool
4. **KNOW ABOUT DESIGN PARAMTERS AND ITS CALCULATION**
    4.1. Write down Draw Clearance and its calculation
    4.2. Write down Draw Force and its calculation
    4.3. Define Blank Holder Pressure and its calculation
    4.4. Define Drawing Beads and its calculation
    4.5. Define Draw ratio and its calculation
    4.6. Define 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. Explain fine blanking tool and its application
    6.2. Write down 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. Define Tool Types
    7.2. Describe Die System
    7.3. Explain Die Design

7.4. Define Fine Blanking Presses and Lines

8. **KNOW ABOUT DIE REPAIRING AND COSTING OF DIES**
   8.1. Define Defects and their countermeasures
   8.2. Classify the Types of welding electrodes used
   8.3. Calculate Press Dies Cost

RECOMMENDED BOOKS:

- Fine Blanking Tool by PSTC , PCSIR
- Deep Drawing Tools by PSTC, PCSIR
- Press Tools by PSTC, PCSIR
- Sheet Metal Forming Fundamentals (ASM technical book) Edited by
- Taylan Altan; A. Erman Tekkaya
- Tool Engineering and Design by G.Nagpal
- Tool Design by Donalson Lecain Goold.
- Guide to Press Tool Design by William Francis Walke
- Fundamentals of Tool Design Sixth Edition by Chief Technical Reviewer and Managing Editor Dr. John G. Nee.
- Fundamentals of Press Tool Design by William Francis Walker
- Die Makers Handbook by JERRY ARNOLD
- Press Tools Design and Construction by Joshi P.H. publisher S Chand and Co. Ltd

DMT-313   **DIE DESIGN-II**

PRACTICAL   **96 Hrs.**

To design and develop a Deep Drawing/Fine blanking Die of any part on 3D CAD software: -

Following are Mandatory steps while designing a Fine Blanking/Deep Drawing Tool

1. Make arrangements for industrial visit of students to explore basic knowledge of Fine blanking and Deep Drawing Tools.
2. Product Modelling

    2.1   Create from 3D Scanner or developed 3D drawing from actual 3D model

        2.1.1   Or Import File from other Software

3. Make 2D Drawing from 3D Product Model

4. To design and develop a Fine Blanking/Deep Drawing Tool of any part on CAD software.
5. To design and develop a Fine Blanking/Deep Drawing Tool of any part on CAD software.
6. Development of Plan based on Types of dies.
7. To learn the development of Punch holder for different types of Fine Blanking/Deep Drawing Tool
8. To learn the multiple commands or tools based on the type of die for the designing of followings.
    - Backing plate
    - Drawing Die/Punch
    - Fine Blanking Die/Punch
    - Punch plate.
    - Stripper plate
    - Die plate.
    - Die holder.
    Drawing Beads
9. To learn the development and Importance of Animation of Fine Blanking/Deep Drawing Tool and exploded view.
    - To learn and practices different types of Illustration and Bill of Materials (BOM) in Fine Blanking/Deep Drawing Tool modelling.
    - To learn and practice types of Rotation or translation constraints for different types of Fine Blanking/Deep Drawing Tool
10. To learn and practices different types of Shedder, Beads etc for different types of Fine Blanking/Deep Drawing Tool
11. To learn and practices different types of Post bushes for different types of Fine Blanking/Deep Drawing Tool
12. To learn the development and Importance Guidepost for different types of Fine Blanking/Deep Drawing Tool

13. To learn and practices different types of Bolster plate for different types of Fine Blanking/Deep Drawing Tool
14. To learn the development and Importance Bed or press for different types of Fine Blanking/Deep Drawing Tool.
    - To learn and practices different types of Ejector pin for different types of Fine Blanking/Deep Drawing Tool.
15. To learn and practices different types Draw Cavity for different types of Fine Blanking/Deep Drawing Tool.

DMT 334   CNC Machines & CAD/CAM

T	P	C
2	6	4

Total Contact Hours:		
Theory:		64
Practical:		**192**

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

    I. Prepare Solid model for CAM machining/ operations
    II. CAM for Milling, Turning, Wire Cut(EDM) & Die Sinker
    III. Process Planning Course Contents:
    IV. Understand G code, M code and several types of CNC Tooling System.
    V. Operate Turning Center
    VI. Operate Machining Center
    VII. Operate Wire Cut
    VIII. Operate EDM sinker

COURSE CONTENTS
Detail of Contents:

1. **Introduction of CNC machine**   12 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
    1.9   Manufacturing Operations and Sequences
    1.10   Post processing

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**   6 Hours
    3.1   Preventive maintenance of CNC Lathe
    3.2   Preventive maintenance of CNC Milling
    3.3   Preventive maintenance of CNC EDM &Wire cut

4. **CAD /CAM**   20 Hr.
    4.1 Introduction of CAD / CAM
      1   User Interface of CAD / CAM software
          2   Prepare CAD model for CAM operations

Recommended Textbooks:

1. Mastering Solid Works by Ibrahim Zeid
2. The CNC Work Shop by Frank Nanfara (Publisher: SDC Publications, 2002)
3. Integrated Process & Fixture Planning, Theory & practice by Dr. Awais Ahmed Khan
4. CAD/CAM Principles, Practice & Manufacturing Management by Chris Mcmon 2nd Edition Pearson Education
5. Computer Numerical Control by Peter J. Amic, 1st Edition, Prentice hall Publishers
6. Automation Production Systems, & Computer-Integrated Manufacturing by Mikell P. Groover Prentice Hall 2nd edition 2000.
7. Fundamental Knowledge of Cutting, Technical Educational Publication in Japan
8. Machining Center, Technical Educational Publication in Japan
9. NC Machine Tools, Technical Educational Publication in Japan
10. NC Lathe, Technical Educational Publication in Japan

DMT 334   CNC Machines & CAD/CAM

Instructional Objectives:

1   CAD / CAM

1.1   Introduction of CAD/ CAM
1.2   Understand User Interface
1.3   Understand Setup of materials
1.4   Understand Setup of cutting tools
1.5   Understand Strategy and cutting processes
1.6   Understand Tool parts simulation

2   **2.5 D CAM**

2.1   Describe Holes Drilling

2.2 Describe Face cutting

2.3   Describe Side cutting

2.4   Describe Pocket cutting

2.5   Describe Slot cutting

3   CAM Lathe

3.1 Explain Facing

3.2   Explain Boring

3.3   Explain Grooving

3.4   Explain Threading (Inside and Outside)

3.5   Explain Cut off

4   CAM Milling

4.1   Rough cutting

    4.1.1   Describe Z Level Roughing

    4.1.2   Describe Parallel Roughing

    4.1.3   Describe Plunge Roughing

    4.1.4   Describe Flat Roughing

    4.1.5   Describe Cutting Boundaries

    4.1.6   Describe Step-overs and leads

4.2   Finish cutting

    4.2.1   Describe Parallel Finishing

    4.2.2   Describe Z Level Finishing

DMT 334   CNC MACHINES & CAD/CAM

List of Practical: **96 Hours**

1. **Prepare CNC machine for CAM operations**
   - 1.1 Perform warm up operations and preventive maintenance of CNC machine
   - 1.2 Perform job/tool setting according to required machining operation
   - 1.3 Perform job/ tool off-set/ reference setting in CNC machine
   - 1.4 Perform program data entry setting for execution
   - 1.5 Execution of machining operation
   - 1.6 Perform inspection of work piece
   - 1.7 Perform editing in off-setting/ program to accommodate dimensional variations and re-execute operations (if required)

2. **CAM Turning operations**
   - 2.1 Create Toolpath for facing and Turning operations
   - 2.2 Create Toolpath for facing and Turning operations with chamfering and radial profiles
   - 2.3 Create Tool path for Threading
   - 2.4 Create Tool path for Drilling/Slotting
   - 2.5 Execution of machining operation
   - 2.6 Perform inspection of work piece
   - 2.7 Perform editing in off-setting/ program to accommodate dimensional variations and re-execute operations (if required)

3. **Practice 2.5 CAD/ CAM**
   - 3.1 Create Toolpath for Drilling
   - 3.2 Create Toolpath for Side Cutting
   - 3.3 Create Toolpath for Face Cutting
   - 3.4 Create Toolpath for Pocket
   - 3.5 Execution of machining operation
   - 3.6 Perform inspection of work piece
   - 3.7 Perform editing in off-setting/ program to accommodate dimensional variations and re-execute operations (if required)

4. **Practice CAM Milling**
   - 4.1 Create Toolpath for Z-Level Rough Cutting
   - 4.2 Create Toolpath for Parallel Rough Cutting
   - 4.3 Create Tool path for Z-Level Finish Cutting
   - 4.4 Create Toolpath for Parallel Finish Cutting
   - 4.5 Create Toolpath for 3D Spiral Cutting
   - 4.6 Create Toolpath for Corner Re-machining
   - 4.7 Create Tool path for Pencil Cutting

4.8   Create Tool path for Horizon+ Vertical Cutting

4.9   Execution of machining operation

4.10   Perform inspection of work piece

4.11   Perform editing in off-setting/ program to accommodate dimensional variations and re-execute operations (if required)

5. **EDM Wire Cut**

5.1   Create tool path for wire cutting operations

5.2   Execution of machining operation

5.3   Perform inspection of work piece

5.4   Perform editing in off-setting/ program to accommodate dimensional variations and re-execute operations (if required)

6. **EDM Die Sinking**

6.1   Setting up an electrode on CNC EDM as per drawing

6.2   Setting up of process parameter on EDM machine

6.3   Execution of machining operation

6.4   Perform inspection of work piece

6.5   Perform editing in off-setting/ program to accommodate dimensional variations and re-execute operations (if required)

DMT-343   MOULD DESIGN-II

T	P	C
2	3	3

Total Contact Hours	
Theory:	64
Practical:	96

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   15 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

2. Die Cast Engineering by William Andresen

3. High-pressure Die Casting by H. L. Harvill, Paul Roe Jordan

4. Tool Design by Donalson Lecain Goold.

5. Fundamentals of Tool Design Sixth Edition by Chief Technical Reviewer and Managing Editor Dr. John G. Nee.

DMT-343   MOULD DESIGN-II

INSTRUCTIONAL OBJECTIVES

1   INTRODUCTION   04 Hours

    1.1   Define Types of casting

    1.2   Describe Casting Metals

    1.3   Explain Casting Machines

    1.4   Describe Manual Drive Arrangement

2   PRESSURE DIE CASTING   05 Hours

    2.1   Describe Pressure Die Casting Metals

    2.2   Define Application of casting

    2.3   State different Limitation of Pressure die casting

    2.4   Explain Pressure Die Casting Machine

    2.5   Describe Hot Chamber Machine

    2.6   Describe Cold Chamber Machine

3   DIE DESIGN   15 Hours

    3.1   Describe Materials for Die Casting Dies

    3.2   Define Split Cavities

    3.3   Define Drive of Cores and Splits

    3.4   Describe Shrinkage Allowance and Draft

    3.5   Define Split die casting

    3.6   Describe Pressure Die Casting Cavity Layout

    3.7   State Pressure Die Casting Parting Line and its selection

    3.8   Classify Disposition of Cavities

    3.9   Explain Die Components (mold bases and inserts)

    3.10 Describe Pressure Die Casting (Sleeve and distributers)

    3.11 Define Pressure Die Casting Runner

    3.12 Define Pressure Die Casting Gates

    3.13 Define Pressure Die Casting Vents

    3.14 Define Pressure Die Casting Overflows

    3.15 State Pressure Die Casting Mould Cooling

4   EJECTION ARRANGEMENT   **15** Hours

    4.1   Describe Pressure Die Casting Ejectors

    4.2   Define Pressure Die Casting Ejection (Machine Side)

    4.3   State Ejector Location

    4.4   Define Pin Ejector

    4.5   Define Ejector (Stripper Plate, Ring, Sleeve)

    4.6   Define Ejector Returns

    4.7   Describe Sliders (Angular pins and hydraulic cylinders)

    4.8   Define Cores

5   MACHINE PARAMETERS   10 Hours

    5.1   Describe Operating cycles

5.2 Define Die Lubricants

5.3 Explain about Trial Production

5.4 State Surface Finish and Quality of Castings

5.5 Explain General Casting Problems

5.6 Define Heat treatment

6 GRAVITY CASTING   15 Hours

6.1 Describe Gravity Casting Mould Design

6.2 Define Risers and Gates

6.3 Define Top Gating

6.4 Define Side Gating

6.5 Define Bottom Gating

6.6 Define Undercuts

6.7 Define Ejection

6.8 Describe Mould Material

DMT-343   MOULD DESIGN-II

LIST OF PRACTICALS   **96 Hrs.**

To design and develop a Pressure Die casting mould of any part on 3D CAD software: -

Following are Mandatory steps while designing Die casting Mould

1. Make arrangements for industrial visit of students to explore basic knowledge of Die Casting Mould (Pressure die casting machine, Die casting Mould parts such as Riser, Air vents, Runner, Core system, ejector system, Mould cooling etc

2. Product Modelling

    2.1   Create from 3D Scanner or developed 3D drawing from actual 3D model. Or Import File from other Software

3. Make 2D Drawing from 3D Product Model

4. Provide all the necessary information regarding Casting Material/ Alloy, Drawing Scale, created by, checked by, Job No., Drawing No., Company Profile etc.

5. Gathered all the information for the Die Casting Die to read the component physically or by Customer:

6. Types of Die casting, No. of Cavity, Riser Type, Air Vent, Ejection Type, Cooling system, Decision of Parting Line, etc.

7. Make calculations:

    7.1   Clamping Force/Die height adjustment, Machine Capacity/Features, Core/Core Plate Thickness, Sleeve size Runner Size, Design of gate bush, Gate size Sprue Size etc.

8. After Finalization of the Die casting Machine, Die Max. and Min. Opening and Closing, Safety system, spray head/spray gun system, injection system of die casting machine

9. Make an assembly drawing in 2D, using the 2D Product Drawing: Adjust the heights of Guiding system.

10. Using the 3D Model, Create Core and Cavity for the Die according to the design of the Die casting Die.

11. Make Die lay out in 2D as per 3D model.

12. Create Die Base, after completion of the 3D parts of the Die, create an Assembly modeling

13. Create a 2D Assembly Drawing from 3D Assembly Modeling:

14. Allot Numbers to all the standard and non-standard parts, Create a Material List/ bill of material, and bill quantity

15. Put all the necessary information in the Material List regarding Metal Materials, Quantities, Finished or Un-Finished Sizes of the Parts used in the Die casting Mould

16. Put overall Dimensions in the 2D Assembly drawing

17. Create 2D Drawings of Non-Standard parts used in the Die casting Mould:

18. With complete 2D views, Section Views, Detail Views, etc. put all the necessary dimensions with tolerances and also give all other information regarding part material, Qty., H/T, etc.

DMT-353 JIGS & FIXTURE DESIGN

T	P	C
2	3	3

Total Contact Hours:	
Theory:	64
Practical:	96

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

RECOMMENDED BOOKS:

1. Tool Making & Design-MT-353
2. Jigs & Fixtures By PSTC, PCSIR
3. Production Engineering by PC Sharma.
4. Tool Engineering and Design by G.Nagpal
5. Tool Design By Donoldson Lecain

DMT- 353 JIGS & FIXTURE DESIGN

INSTRUCTIONAL OBJECTIVES

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

2. UNDERSTAND DIFFERENT PARTS OF JIGS AND FIXTURES   08 HOURS
   2.1. Elaborate the parts of JIGS
   2.2. Explain function of each part
   2.3. Describe the 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. Describe the properties of each with respect to Jigs and Fixtures 3.3. Selection of best material

4. UNDERSTAND DESIGN PROCEDURE   12 HOURS
   4.1. Explain the design detail of Jig and Fixture
   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 all these parts

6. CHECKING FIXUTRES   24 HOURS
   6.1. Introduction
   6.2. Describe the Fixture Planning
      6.2.1.   Elaborate Process Chart
      6.2.2.   Define Panel Drawing
      6.2.3.   Define Welding Jig Planning Sheet
      6.2.4.   Decision on Use of CF
      6.2.5.   Define Welding Jig
      6.2.6.   State Meeting with Parts Inspection Department
      6.2.7.   State 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.   Define the fitment of the part
      6.3.2.   Define the Matching surface of the part
      6.3.3.   Define the Datum/MTG. Holes of part
      6.3.4.   State Part Clamping Position on Welding Jigs
      6.3.5.   Resting Areas/Stoppers on Welding Jigs
      6.3.6.   State Attaching Parts Behavior in Assembly

6.3.7.   Drain Holes and Non Functional Holes
6.4. Explain the Fixture Design Details
  6.4.1.   Define Datum Holes
  6.4.2.   Define Mtg. Holes
  6.4.3.   Define Holes for Nuts
  6.4.4.   Describe Drain Holes/Non Functional Holes
  6.4.5.   Define Resting Point/Clamping Position
  6.4.6.   State Template for Checking of Bolt Position
  6.4.7.   State Template for Checking of Part Profile
  6.4.8.   Elaborate Marking for Outer Profile/Trim Profile
  6.4.9.   Enlist Color Codes to Differentiate Fixture Surfaces
  6.4.10. Define Tolerances Basic Hole Systems
  6.4.11. Define Fixture Accuracy Standard
  6.4.12. Explain the Selection of Fixture Material and Matching
6.5. Describe Procedure of Inspection Jig Manufacturing
  6.5.1.   Explain Manufacturing of main negative (cavity) model from Styrofoam. (Styrofoam based Pattern)
  6.5.2.   Briefly explain the Construction of pipe structure
  6.5.3.   Briefly explain the Construction of main panel checker body
  6.5.4.   Briefly explain the Construction of foundation(Base)
  6.5.5.   Define the Machining of Surface
  6.5.6.   Define Manufacturing of swing gauge
  6.5.7.   Define Manufacturing of section gauge
  6.5.8.   Define Manufacturing of other parts and their mounting
  6.5.9.   Describe and show Paint and final finishing of Jig and Fixture

DMT- 353 JIGS & FIXTURE DESIGN

LIST OF PRACTICALS   **96 Hrs.**

1. Draw and Designing of angle jig
2. Draw and Designing of milling fixture.
3. Draw and Designing of turning fixture.
4. Draw and Designing 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. Draw and Designing of different types of cams
8. Draw and Designing of different types of followers
9. Cam profile design
10. Draw and Designing of Checking Fixtures

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 and its applications

2. COMPRESSION MOULD   03 Hours
  2.1. Difference b\w injection, blow & compression moulds
  2.2. Mould base
  2.3. Mould materials

3. MAIN PARTS OF COMPRESSION MOULDS   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
     4.1.1 Hand mould
     4.1.2 Flash mould
     4.1.3 Positive mould
     4.1.4 Landed plunger mould
     4.1.5 Semi positive mould
     4.1.6 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 OF RUBBER MOULDS   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

<div align="center">

DMT-361   COMPRESSION & RUBBER MOULDS
</div>

INSTRUCTIONAL OBJECTIVE

1. INTRODUCTION   03 Hours
1.1. Explain Compression mould
1.2. Describe Rubber mould
1.3. Explain types of Thermosetting plastics and its application

2. COMPRESSION MOULD   02 Hours
2.1. Difference b\w injection, blow & compression moulds
2.2. Explain parts of compression mould
    2.2.1 Enlist the Parts of Mould base
2.3. Describe Mould materials

3. MAIN PARTS OF COMPRESSION MOULD   03 Hours
3.1. Define Compression mould cavity
3.2. Define Compression mould core
3.3. Explain Compression mould Ejector
3.4. Explain Compression mould Injection
3.5. Describe Compression mould Parting line
3.6. Describe Mould Compression System
3.7. Describe Heating System

4. TYPES OF COMPRESSION MOULDS   08 Hours
4.1. Explain Compression mould
    4.1.1   Explain Hand mould
    4.1.2   Explain Flash mould
    4.1.3   Describe Positive mould
    4.1.4   Describe Landed plunger mould
    4.1.5   Explain Semi positive mould
    4.1.6   Explain Inverted mould

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

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

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

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

DMT-362 DIE AND MOULD MAINTENANCE

T	P	C
1	3	2

Total Contact Hours:	
Theory:	32
Practical:	96

AIMS: At the end of this course the students will be able to:
1. Understand the fundamentals of maintenance.
2. Understand the scope of Dies and Mould maintenance and its method.
3. Understand and develop knowledge of the methods generally applied in various categories of preventive and corrective maintenance.

COURSE CONTENTS

1. **INTRODUCTION TO DIE AND MOULD MAINTENANCE**   02 Hours
   1.1. Difference between corrective and preventive maintenance.
   1.2. Scope of Mould maintenance
   1.3. Scope Die maintenance

2. **PREVENTIVE MAINTENANCE**   09 Hours
   2.1. Die and Mould life.
   2.2. Die and Mould handling
   2.3. Inventory of standard part.
   2.4. Inventory of non-standard parts
   2.5. Over hauling
      a)   Preventive maintenance plan
      b)   Oiling and greasing

3. **CORRECTIVE MAINTENANCE**   15 Hours
   3.1. General problems and remedies.
   3.2. Replacement of core pins
   3.3. Replacement of inserts
   3.4. Welding
   3.5. Re sinking of electrodes
   3.6. Grinding of broken cutting edges
   3.7. Re matching of bearing faces
   3.8. Re polishing.

4. **TIG WELDING (TUNGSTUN INERT GAS WELDING/ARGON WELDING)**   03 Hrs
      4.1.   Introduction of TIG welding and its Machine
      4.2.   Function of argon Gas
      4.3.   Arc of Tungsten Electrode
      4.4.   Current Adjustment for welding process
      4.5.   Function of the Tungsten Electrode

5. **MIG WELDING (METAL INERT GAS WELDING/C02 WELDING)**   03 Hrs
      5.1.   Introduction of MIG welding and its Machine
      5.2.   Introduction to inert gases (Helium/Argon) and active gases (CO_2)
      5.3.   ARC of MIG welding

5.4. Filler metals of MIG welding

5.5. Current adjustment according to size of filler metal

5.6. Function of Co_2 gas

DMT-362 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. Understand scope of Mould maintenance

    1.3. Understand scope of Die maintenance

2. **KNOW BASICS OF PREVENTIVE MAINTENANCE**

    2.1. Have knowledge of Die and Mould life.

    2.2. Know how to handle Dies and Mould

    2.3. Have the knowledge of Inventory of standard parts.

    2.4. Know over hauling of dies and Moulds

    2.5. Have detail knowledge of Preventive maintenance plan

3. **HAVE KNOWLEDGE OF CORRECTIVE MAINTENANCE**

    3.1. Know General problems of Dies & Molds and remedies.

    3.2. Know how to Replace core pins.

    3.3. Know how to Replace inserts

    3.4. Know about repairs with Welding

    3.5. Know the Re sinking of electrodes

    3.6. Know the Grinding of broken cutting edges

    3.7. Know how to do Re matching.

    3.8. Know how to do Re polishing.

4. **TIG WELDING (TUNGSTUN INERT GAS WELDING/ARGON WELDING)**

    4.1. Describe TIG welding and its Machine

    4.2. Describe Function of argon Gas

    4.3. Describe Arc of Tungsten Electrode

    4.4. Describe Current Adjustment for welding process

    4.5. Describe Function of the Tungsten Electrode

5. **MIG WELDING (METAL INERT GAS WELDING/C02 WELDING)**

    5.1. Describe MIG welding and its Machine

    5.2. Define inert gases (Argon, CO_2)

    5.3. Describe ARC of MIG welding

    5.4. Describe Filler metals of MIG welding

    5.5. Describe Current adjustment according to size of filler metal

    5.6. Describe Function of CO_2 gas

DMT-362 DIE AND MOULD MAINTENANCE

LIST OF PRACTICALS   **96 HOURS**

1. To disassemble a Mould or Die.
2. Perform cleaning, De-Rusting/Anti Corrosion, and Oiling/Greasing of Die / Mold Parts.
3. Perform assembling of a Die / Mold.
4. To remove the inserts from Mould base and Die set.
5. To trouble shoot all Pins.
    3.1.1. Check bending in Pins and perform repairing/replacement where needed.
    3.1.2. Check breakage / damage in pins and perform repairing/replacement where needed.
    3.1.3. Check and rectify Opening/Closing Mechanism of Die/Mold.
    3.1.4. Check and rectify Ejector Mechanism of Die/Mold.

6. To over haul Dies and Moulds.
    4.1.1. Removal of excess material.
    4.1.2. Polishing of inserts, Core and Cavity.
    4.1.3. Re-nitriding of Moulds and Dies where needed.
    4.1.4. Perform checking and rectifying coolant system of Mold if needed.

7. To perform welding/machining and re-matching of bearing faces of Dies and Moulds.
    5.1.1. Check flashing on bearing faces.
    5.1.2. Welding of damage faces where needed.
    5.1.3. Machining of welded surface where needed.
    5.1.4. Re-matching of welded/machined surfaces where needed.

6.   Perform welding of damage edges of punch, cavity/ die or any part of tool with the help of TIG welding machine

7.   Perform welding of damage edges of punch, cavity/ die or any part of tool with the help of MIG welding machine

DMT-382 PROJECT

T	P	C
0	6	2

Total Contact Hours:	
Theory:	0
Practical:	192

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

1. Develop hands-on knowledge of drawing, design, material selection, process optimization (appropriate cost and suitable process) and assembly in completion of a project.
2. learn entrepreneurship, group working, and presentation skills.

COURSE CONTENTS

In this subject students have to manufacture a working model of any injection mold or press tool/die.
Following step should be followed while working on a project.

1. PROJECT SELECTION
2. MAKE FEASIBILITY OF PROJECT
    a. Make cost estimation
        i. Material cost (Raw material)
        ii. Machining cost
        iii. Heat-treatment cost
        iv. Transportation cost
        v. Over heads cost
3. DESIGN THE PROJECT
    a. Make detailed drawing of all parts
    b. Make working/ shop Drawings of all parts of projects
    c. Make assembly drawing of project
4. SELECTION OF MATERIALS
5. MANUFACTURING OF MOULDS
    a) Select appropriate and cost effective machines for each part
    b) Machining
    c) Apply heat treatment process on required parts
    d) Hardening Grinding, and polishing of parts
    e) Trouble shooting while assembling the parts and checking before final trial.
6. COMPARE ACTUAL MANUFACTURING COST WITH ESTIMATED COST AND FIND THE CAUSES OF DIFFERENCES BETWEEN THE COSTS
7. PREPARE TECHNICAL/ PROJECT REPORT AND POSTER
    a) Title page
    b) Summary
    c) Table of content, figures and list of table
    d) Introduction of the project
    e) Practical/ shop work
        i   Detailed and assembly Drawings or figures
        ii Tools, equipment, and machines employed
        iii Methods or Process used
    f) Safety measure observed during working of the project
    g) Conclusion
    h) Recommendations
    i) References

INSTRUCTIONAL OBJECTIVES:

1. Develop skill of fundamental processes for manufacturing of dies and moulds
2. Develop skill to prepare detail, working and assembly drawings (2D/3D) of a project
3. Develop skill of material selection to minimize the cost and maximize the life of a project
4. Develop skill of cost estimation (material, labour, machining, overheads etc.) of any new project
5. Develop skill for calculating of sale cost avoiding loss by assessing break-even point.
6. Develop skill of deciding sequence of different operations needed in completion of a project.
7. Develop skill to initiate project by selecting proper machines by using loading, dispatching and scheduling methodology in order to complete project within specified time
8. Develop skill in machining, heat treatment, grinding and polishing processes
9. Develop skill in trouble shooting in parts assembling and checking before final trial.
10. Develop skill to make project / technical reports and its presentation

DAE Dies and Mould Technology (3 years)

Minimum Qualification of Teacher/ Instructor

First Year

S#	Course Name	Min Qualification
1	Islamiyat/Pakistan Studies	M.A / B.S Islamiyat/Pakistan Studies with 3 years relevant experience
2	Tarjuma Tul Quran	M.A / B.S Islamiyat/Pakistan Studies with 3 years relevant experience
3	English	M.A / BS English with 3 years relevant experience
4	Applied Mathematics-I	M.Sc / B.S Math with 3 relevant experience
5	Applied Physics	M.Sc / B.S Physics with 3 years relevant experience
6	Technical Drawing & CAD	BS Mech, Engineering / B.Tech Hours with 3 years relevant experience, DAE Mechanical/Dies & Mould with 8 years relevant experience
7	Workshop Technology-I	
8	Applied Chemistry	M.Sc / B.S Chemistry with 3 years relevant experience
9	Introduction to Dies & Moulds	BS Mech, Engineering / B.Tech Hours with 3 years relevant experience, DAE Mechanical/Dies & Mould with 8 years relevant experience
10	Applied Electricity & Electronics	M.Sc Engr. with 1 years relevant experience, B.Sc. (Electrical) with 3 years relevant experience

Second Year

S#	Course Name	Min Qualification
1	Islamiyat/Pakistan Studies	M.A / B.S Islamiyat/Pakistan Studies with 3 years relevant experience
2	Tarjuma Tul Quran	M.A / B.S Islamiyat/Pakistan Studies with 3 years relevant experience
3	Applied Mathematics –II	M.Sc. / B.S Math with 3 years relevant experience
4	Metrology	MS Engr. with 1 year relevant experience, B.Sc. Mech. Engr. / B.Tech Hons. with 3 years relevant experience, DAE Mechanical/Dies & Mould with 8 years' experience.
5	Machine Design	M.Sc. Engineering with 1-year relevant experience, B.Sc. Mech. Engr. / B. Tech Hons. with 3 years relevant experience DAE Mechanical/Dies & Mould with 8 years' experience.
6	Die Design - I	M.Sc. Engineering with 1-year relevant experience, B.Sc. Mech. Engr. / B. Tech Hons. with 3 years relevant experience DAE Mechanical/Dies & Mould with 8 years' experience.
7	Applied Mechanics (Physics)	M.Sc. Engineering with 1 year relevant experience / B.S Physics with 3 years relevant experience, B.Sc. Engr. Mechanical
8	Material Science & Heat Treatment	MS Material Sciences with 1 year relevant experience, BS Metallurgy & Materials, B.Sc. Engr. with 3 years' experience in relevant field, DAE Mechanical/Dies & Mould with 8years experience,
9	Mould Design - I	M.Sc. Design Engr. with 1-year experience, B.SC Engr. Mechanical / B. Tech Hons. with 3 years relevant experience, DAE Mechanical/Dies & Mould with 8 years' experience
10	Workshop Technology - II	B. Tech Hons. with 3 years relevant experience, DAE Mechanical/Dies & Mould with 8 years' experience.

Third Year		
S#	**Course Name**	**Min Qualification**
1	Islamiyat/Pakistan Studies	M.A / B.S Islamiyat/Pakistan Studies with 1 year relevant experience
2	Die Design – II	M.Sc. Design Engr. with 1-year experience, B. Tech Hons. With 3 years relevant experience, DAE Mechanical/Dies & Mould with 8 years' experience
3	CNC Machines & CAD/CAM	M.Sc. Design Engr. with 1-year experience, B. Tech Hours with 3 years relevant CAD/CAM experience, DAE Mechanical/Dies & Mould with 8 years' experience.
4	Mould Design – II	M.Sc. Design Engr. with 1-year experience, B.Sc. Mech. Engr./ B.Tech.. Hons. With 3 years relevant experience, DAE Mechanical/Dies & Mould with 8 years' experience
5	Jigs & Fixture Design	
6	Industrial Engineering	
7	Compression & Rubber Mould	
8	Die & Mould Maintenance	
9	Project	

CH 112   APPLIED CHEMISTRY

List of Lab Equipment & Chemicals for class of 50 Students

S.No	Description	QTY
1.	Beakers I00 ml	10
2.	Beakers 250ml	10
3.	Beakers 500ml	10
4.	Beakers 1000ml	10
5.	Funnel 3 inch or 75mm	10
6.	China dish 60cc	10
7.	Bunsen burner With stop cork	10
8.	Tripod stand 8 inches or 6 inches	10
9.	Thermometer 110c	10
10.	Capillary tubes Good quality	10
11.	Universal pH paper Range 1-14	05
12.	Watch glass 3"	10
13.	Glass tube local	03 Meters
14.	Ostwald's viscometer	10
15.	Pippet 10ml	10
16.	Specific gravity bottle 25ml	10
17.	Electronic balance 0.1gm -500gm	03
18.	Stalagmo meter	10
19.	Pinch cork	05
20.	Hoffman's volta meter	05
21.	Connecting wires	05 meters
22.	D.C Adapter 300mili ampere	03
23.	Distilled water plant 5liters/h	01
24.	Copper plates 5cmx3cm	04
25.	Aluminum plates 5cmx2cm	04
26.	Ammeter (Ampere meter) 0-3 ampere	03
27.	Test tubes 16x150mm	60

28.	Test tube stand Plastic or steel	06
29.	Test tube brush For washing test tubes	06
30.	Test tube holder Good quality (Plastic)	10
31.	Measuring flask 1 liter	02
32.	Measuring flask 500 ml	10
33.	Measuring flask 250ml	10

34.	Conical flask 250ml	10
35.	Kipps apparatus 250 ml	01
36.	Conical flask 100ml	10
37.	Reagent bottles Small and middle size	20
38.	Burette 50ml	10
39.	Iron stand with clamps or burette stand	10
40.	Wire guaze	10
41.	Wash bottle plastic	05
42.	Dropper Medium size	05
43.	Glass stirrer Medium size	10
44.	Tongs	05
45.	Delivery tube	05
46.	Graduated cylinder 100ml	05
47.	Match box/ lighter	05
48.	Sand paper	05
49.	Filer For cleaning iron apparatus	03
50.	DC power supply 20 AMP	02
51.	DC power supply 60 AMP	02
52.	Tape for labeling	02
53.	Scissor	01
54.	Ammonia	1 pound
55.	Acetone	2 liters
56.	Ammonium acetate	100 gm
57.	Acidic acid	1 pound

58.	Ammonium sulphate	100 gm
59.	Ammonium carbonate	100 gm
60.	Ammonium chloride	100 gm
61.	Ammonium hydroxide	100 gm
62.	Ammonium sulphide yellow	½ liters
63.	Antimonium sulphate	100 gm
64.	Aluminium sulphate	100 gm
65.	Benzene	1 liter
66.	Barium chloride	100 gm
67.	Barium nitrate	100 gm
68.	Borax	100 gm
69.	Bismuth chloride	100 gm
70.	Copper sulphate	300 gm
71.	Concentrated sulphuric acid	3 literrs
72.	Calcium chloride	100 gm
73.	Cobalt nitrate	100 gm
74.	Calcium carbonate	100 gm
75.	Cadmium sulphate	100 gm
76.	Diphenylamine	100 gm
77.	Ethanol	1 liter
78.	Ether	1 liter
79.	Ferrous chloride	100 gm
80.	Ferrous sulphate	100 gm
81.	Ferric sulphate	100 gm
82.	Ferric chloride	100 gm
83.	Ferrous sulfide	100 gm
84.	Hydro chloric acid	3 liters
85.	Lead acetate	100 gm
86.	Lead nitrate	100 gm
87.	Litmus solution	½ liters

88.	Methyl orange	100 gm
89.	Magnesium sulphate	100 gm
90.	Methylated spirit	1 liters
91.	Mercuric chloride	100 gm
92.	Manganese sulphate	100 gm
93.	Mercuric chloride	100 gm
94.	Naphthalene	100 gm
95.	N –butanol	1 liter
96.	Nitric acid	2 liters
97.	Nikel sulphate	100 gm
98.	Potassium ferrocyanide	100 gm
99.	Potassium nitrate	100 gm
100.	Potassium permaganate	100 gm
101.	Potassium chromate	100 gm
102.	Potassium sulphate	100 gm
103.	Potassium iodide	200 gm
104.	Phosphoric acid	½ liters
105.	Potassium dichromate	100 gm
106.	Phenolphthalene	100 gm
107.	Potassium hydroxide	100 gm
108.	Plumbic chloride	100 gm
109.	Potassium ferricyanide	100 gm
110.	Sodium chloride	1 kg
111.	Sand	2 kg
112.	Sodium sulphate	100 gm
113.	Sodium phosphate	100 gm
114.	Sodium hydroxide	100 gm
115.	Sodium carbonate	100 gm
116.	Silver nitrate	100 gm
117.	Sodium thiosulphate	100 gm

118.	Stannous chloride	100 gm
119.	Sodium sulphide	100 gm
120.	Sodium bicarbonate	100 gm
121.	Sodium phosphste	100gm
122.	Sodium nitrite	100gm
123.	Zinc sulphate	100gm
124.	Zinc chloride	100gm
125.	Zinc nitrate	100gm

PHY 122 APPLIED PHYSICS

List of Lab Equipment for 50 Students

S.No	Description	QTY
1.	Graph Paper	50
2.	Meter Rod	10
3.	Drawing Board	10
4.	Vernier Caliper 0 to 150mm (0.05)	10
5.	Solid cylinder	10
6.	Outside Micro meter 0 to 25mm (0.01)	10
7.	Wire of different diameter	50
8.	Fletcher trolley apparatus	05
9.	Tuning fork of different frequencies(5 each of different frequencies)	05
10.	Rubber pads	05
11.	Resonance apparatus	05
12.	Beaker	20
13.	Thermometer 0-100C,	10
14.	V shaped wooden blocks	10

15.	Solid spheres	20
16.	Card stand	10
17.	Drawing pins packets	02
18.	Protractor/D	10
19.	Slotted cork	20
20.	Glass slabs	10
21.	Common pins packets	02
22.	Lead Pencils in dozens	05
23.	Tables 4'X8'X 3' height	04
24.	Concave mirror	08
25.	Knitting needles in packets	02
26.	Upright needles with stand	20
27.	Converging lenses	08
28.	Microscope with vernier scale	02
29.	Spectrometer with light source(Sodium lamp)	08
30.	index needle	20

31.	Convex lenses of small focal length	08
32.	Convex lenses of large focal length	08
33.	Pin hole camera Digital	08
34.	Tripod stand	20
35.	Bunsen burner	05
36.	Calorimeter along with wooden lid	05
37.	Stirrer	08
38.	Hangers	08
39.	Pulleys	20
50.	Weight Box,	08
41.	Drawing Board Half imperial size	08
42.	Mirrors strips 1"X6"	08

43.	Mirrors strips 4"X6"	08
44.	Cotton threads gola	04
45.	Universal stands/frame	08
46.	set square 30,60,45 degree medium size	08
47.	Toggle joint apparatus	03
48.	Spring balance 1-10Kg	08
49.	Spring balance 1-20Kg	08
50.	Steel yards/ steel meter rod	08
51.	wooden blocks	08
52.	Differential pulley block	4
53.	Simple harmonic motion apparatus	05
54.	Drawing sheets Imperial size (pack of 100 sheets)	1
55.	Hooks law apparatus (Helical spring type)	05
56.	Maxwell needle type magnetic apparatus for north and south pole determination	08
57.	Binoculars(door been)	02
58.	Stop watch digital	08
59.	Common balance	08
60.	Knife edges wooden	08
61.	Wedges wooden	08
62.	Forces on a Suspension Bridge Apparatus	05
63.	Pulley & Block Apparatus	05
64.	Bell Crank Lever Apparatus	05
65.	Wire Suspension Apparatus	05
66.	Steam Generator	02
67.	Half Degree Thermometer	08
68.	Calori Meter	02
69.	Flannel	08
70.	Blotting Paper	50

71.	Galvanometer	08
72.	Batteries 12 Volt 6 Amp	04
73.	Connecting Wire 90 Meter	01
74.	Hypsometer	02
75.	Optical Bench	05
76.	Kundt's tube	05
77.	V Shape Block	10
78.	Lycopodium Powder	1 kg
79.	Sono Meter	05
80.	Searles apparatus	05
81.	Steel Wire (Pieces)	50

DMT 113   TECHNICAL DRAWING & CAD

List of Lab Equipment for 50 Students

Sr No.	Name of Item with Brief specifications	Qty
1.	Drawing Table	50
2.	Drawing Stool	50
3.	3D wooden / Aluminum Models of different shapes	01
4.	Steel Cabinet/Almiraha	01
5.	Computer Core i7	50
6.	Computer Chairs	50
7.	Computer Tables	50
8.	Printer	01
9.	Teacher Computer Core i7 With Table and Chair	01
10.	Auto CAD Software for 51 seats / computers	01
11.	Microsoft Windows 11 for 51 seats / Computers	01

DMT-142 APPLIED ELECTRICITY & ELECTRONICS

List of Lab Equipment for 50 Students

Sr. No.	Name of Equipment	Qty
1	Amp Meter	10
2	Volte meter	10
3	Ohm meter	10
4	Energy meter	2
5	Digital Multi meter	10
6	Analog multi meter	05
7	DC power supply	05
8	Potentio meter	10
9	3-29/7-29 Connection Leads of different Length	01 coil each
10	Resistors with different values	50 Pcs
11	Resistive load Diff wattage 500 watt to 2000 watt	04
12	Stop watch	05
13	EMF generator prototype	03
14	Galvanometer	10
15	Tolls (combination plier, side cutting plier, long nose Piler, Screwdriver set)	10
16	Series test board	10
17	Circuit breakers (single pole, double Pole, three Pole) 10Amp, 20Amp, 50Amp TP	05 Each
18	3 induction motor	03
19	Thermal over load relay	10
20	Push buttons	20
21	Magnetic contactors	05
22	AC Generator	02
23	DC Generator	02
24	Welding Transformer	02

	25	Single Phase motor	02	
	26	Batteries different types Dry, Liquid Acid & Gel Type	06	
	27	Oscilloscope	01	
WT-	28	220 Transformer, Single Phase	02	**156**
	29	Bread board	10	
	30	Diode (IN5001)	20	
	31	Capacitor (of different values)	25	
	32	BJI (NPN , PNP)	20	
	33	Zener diode , Photodiode, LED (with UV, Different Colors)	03 Each	
	34	DIAC , TRIAC (NTE6508, FKPF8N08)	05 each value	
	35	SCRS	10	
	36	UJT	10	

WORKSHOP TECHNOLOGY-I

List of Machinery for class of 50 Students

S.NO.	DESCRIPTION	QTY.
1	Working Benches (2 ½ ft X 11 Ft) with 4 Drawers	10
2	Bench Vice/Parallel Vice 4 Inch	50
3	File Flat Bastard 12"	50
4	File Half Round Bastard 12"	20
5	File Flat Smooth 12"	50
6	File Square Smooth 12"	20
7	File Round Smooth 10"	20
8	File Half Round Smooth 10"	20
9	File Square Smooth 10"	20
10	File Flat Smooth 8"	50
11	File Flat 2nd Cut 8"	50
12	File Triangle smooth 8"	20
13	File Round Smooth 8"	20
14	File Square Smooth 8"	10

15	File Half Round Bastard 6"	20
16	File Round Smooth 6"	10
17	File Square Smooth 6"	10
18	File Triangle Smooth 6"	10
19	Needle File Set	10
20	Hollow Scraper	10
21	File Brush	20
22	Vice Brush	20
23	Bench Brush	10
24	Tray Galvanized	10
25	Flat Screw Driver 150mm	10
26	Flat Screw Driver 100mm	10
27	Phillip Head Screw Driver 100mm	10
28	Precision Screw Driver	10
29	Steel Rule 6 inch	50
30	Beveled Edge Square 4 inch	10
31	Try Square 4 inch	10
32	Spring Divider	20
33	Scriber 200mm	20
34	Center Punch 100mm	20
35	Chisel 12mm Flat	10
36	Chisel Round 150mm	10
37	Chisel Cross cut 150mm	10
38	Plier Flat	10
39	Plier Nose	10
50	Hacksaw Frame 12 inch	10
41	Wire Cutter	10
42	Hammer 500 grams	10
43	Hammer 150 grams	10
44	Safety Goggles	5
45	Oil Cans	5

46	Bench Drill Machine	4
47	Drill Chucks for drill machine	4
48	Taper/Reducing Sleeve	4
49	HSS Twist Drill 3.8mm, 5.2mm, 6.8mm,4.8mm,6.7mm, 8.4mm	10 Set
50	HSS Twist Drill 3mm, 4mm,5mm,6mm,7mm,8mm,10mm	10 Set
51	HSS Tap set M6, M8, M10	5 Set
52	HSS Counter bore tool (Dia 10mm, 11mm, 12mm)	5 Set
53	HSS Fixed Reamer (Dia 4 H7, 5H7, 6H7, 7H7,8H7,9H7,10 H7	5 Set
54	Rose bit (counter sink tools) 60◦	5
55	Rose bit (counter sink tools) 90◦	5
56	Outside Micrometer 0-25mm	20
57	Vernier Height Gauge	1
58	Surface Plate	1
59	Bevel Protractor	10
60	Combination Set	1

2nd YEAR

Phy-212   # APPLIED MECHANICS
List of Machinery for class of 50 Students

Sr No.	Name of Item with Brief specifications	Qty
1.	Gravesand Apparatus with following	10
	Plumb Line	
	Pulleys	
	Hangers	
	Slotted weights	
	Threads	
	Sheet of paper	
	Set Square	
2.	Stand with base	10
3.	Spring Balance	10
4.	Unknown Weights	10
5.	Jib Crane	05
6.	Universal Frame	05
7.	Heavy weights and Hanger	03
8.	Meter Stick or Measuring Tape	10
9.	Simple Roof Truss Apparatus	05
10.	Wooden Meter Rod	10
11.	Bell Crank	10
12.	Hanger and Weights	10
13.	Steel Yard (Ungraduated)	10
14.	Rider	10
15.	Set of Weight With rings	10
16.	Universal Frame	05
17.	Two spring balance	05
18.	Thread and Hooks	10
19.	Flywheel	05
20.	Hook	05

21.	Stop Watch	05
22.	Vernier Caliper	05
23.	Inclined Plane	10
24.	Wooden Block	10
25.	Friction Gear Model	05
26.	Friction Gears Of Different Diameter(double, Triple etc)	05
27.	Belt Driving	05
28.	Spur Gearing Apparatus	05
29.	Toothed Wheels of Different Diameter	10
30.	Model of Clutches of Different Types	10
31.	Worm and Worm Wheel	10
32.	Hang Slotted Weight	10
33.	Different Wheel and axle	10
34.	Differential Pulley Block	10
35.	Heavy Weights with Ring	10
36.	Crank and Connecting Rod Apparatus	05
37.	Drawing Board	10
38.	Cams of Different Types	10
39.	Followers of Different Types	10
50.	Searles Apparatus	05
41.	Micrometer Screw Gauge	10
42.	Helical Spring Apparatus With Vernier Arrangement	10
43.	Maxwells Needle	10
44.	Telescope	05
45.	Common Balance	10
46.	Torsional Apparatus	10
47.	Shear Force Apparatus	10
48.	Stand With U Bracket	10
49.	Form weights of Different Value	10
50.	Link Elements	10
51.	Link Mechanism of Different Types(straight, sliding, simple, toggle)	10

Mech-272   <u>**METROLOGY**</u>
List of Lab Equipment for 50 Students

S.No.	Description	Quantity
1.	Steel Rule (Metric scale)	50Nos.
2.	Hook Rule	10 Nos.
3.	Folding Rule	10 Nos.
4.	Trammels	05 Nos.
5.	Measuring Tapes 5M	10 Nos.
6.	Cast-Iron Surface Plate	02 Nos.
7.	Granite Surface Plate	02 Nos.
8.	Glass Surface Plate	05 Nos.
9.	Straight Edge	02 Nos.
10.	Spirit level	02 Nos.
11.	Engineers Level	02 Nos.
12.	Engineers Parallel	10 Nos.
13.	Outside Micrometer	20 Nos.
14.	Inside Micrometer (Rod Type)	02 Nos.
15.	Inside Micrometer (Caliper Type)	02 Nos.
16.	Hole Gauge/3 point Micrometer	02 Nos.
17.	Depth Micrometer 0 to 25 mm	05 Nos.
18.	Depth Micrometer (Adjustable)	02 Nos.
19.	Thread Micrometer	02 Nos.
20.	Hot Gauge Micrometer	02 Nos.
21.	Vernier Micrometer with Metric scale	02 Nos.
22.	Dial Indicator with stand	02 Nos.
23.	Vernier Caliper (only Metric Scale)	10 Nos.
24.	Vernier Height Gauge(only Metric Scale)	02 Nos.
25.	Vernier Depth Gauge (Hook Type)	01 Nos.
26.	Dial Vernier Caliper (0.02mm least Count) 200mm	02 Nos.
27.	Dial Thickness Gauge	02 Nos.
28.	Dial Bore-Gauge	01No.

29.	Bevel Protractor	10 Nos.
30.	Universal Bevel Protractor	02 Nos.
31.	Dial Protractor	02 Nos.
32.	Steel Protractor	10 Nos.
33.	Sine Bar	02 Nos.
34.	Fix Gauges (Ring-Plug-Snap-Radius)	5-set
35.	Adjustable Gauges	02-set
36.	Thread Gauges	5-set
37.	Standard wire gauge	05 Nos.
38.	Small Hole Gauges	5-set
39.	Telescope Gauges	5-set
50.	Digital Micrometer	03 Nos.
41.	Digital Caliper	03 Nos.
42.	Digital Depth Micrometer	02 Nos.
43.	Digital Depth Caliper	02 Nos.
44.	Digital Height Gauge	02 Nos.
45.	Digital Height Master	01 No.
46.	Digital Indicator with stand	02 Nos.
47.	Gear Tooth Caliper Metric scale	01 No.
48.	Mechanical Comparator	01 No.
49.	Electrical Comparator	01 No.
50.	Electronics Comparator	01 No.
51.	Gauge Block Set in mm	01 No.
52.	Tool Makers Microscope	01No.
53.	Coordinate Measuring M/c(2D,3D)	01No.
54.	Digital 3D Scanner	01No.
55.	Profile Projector/Shadow Graph	01No.
56.	Gear Testing machine	01No.
57.	Optical Flats	01 No.

DMT 232   DIE DESIGN – I

List of Lab Equipment for 50 Students

Sr No.	Name of Item with Brief specifications	Qty
1.	Computer Core i7	50
2.	Computer Table	50
3.	Computer Chair	50
4.	Multimedia Projector	01
5.	Microsoft Windows 11 for 51 seats /Computers	51
6.	Printer	01
7.	Scanner	01
8.	Teacher Computer Core i7 With Table and Chair	01
9.	Software for 51 seats (any 3D CAD / CAM)	01

DMT 243 MATERIAL SCIENCE, HEAT TREATMENT & TESTING

List of Lab Machine & Equipment for 50 Students

S.No.	Description	QTY
1.	Brinell Hardness Testing Machine(Work size: 200mm x 150mm)	01-set
2.	Rockwell Hardness Testing Machine(Work size: 200mm x 150mm)	01
3.	Izod Impact Testing Machine	1
4.	Universal Testing Machine	1
5.	Heat treatment Furnace	1
6.	Specimen Cutoff Machine	01
7.	Isomet Low speed saw Machine	02
8.	Specimen Grinding Machine	02

9.	Specimen Polishing Machine	02
10.	Specimen Mount Press	01
11.	Pedestal Grinder	01
12.	Metallurgical Microscope(1000x)	02
13.	Torsion Testing machine	1
14.	Fatigue testing machine	1
15.	Quenching Bath	1
16.	Ultrasonic testing equipment	1
17.	Chemical for Die penetrant Test	1
18.	Magnetic particle testing equipment	1
19.	X-Ray Machine for Radio Graphic Test	1

DMT 252   <u>MOULD DESIGN – I</u>

List of Lab Equipment for 50 Students

Sr No.	Name of Item with Brief specifications	Qty
1.	Computer Core i7	50
2.	Computer Table	50
3.	Computer Chair	50
4.	Multimedia Projector	01
5.	Microsoft Windows 11 for 51 seats /Computers	51
6.	Printer	01
7.	Scanner	01
8.	Teacher Computer Core i7 With Table and Chair	01
9.	Software for 51 seats (any 3D CAD / CAM)	01

WT-227 WORKSHOP TECHNOLOGY-II

List of Machinery for class of 50 Students

S.NO.	DESCRIPTION	QTY.
1.	LATHE MACHINE	04
2.	SHAPER	1
3.	PEDESTAL GRINDER	2
4.	MILLING MACHINE	4
5.	PEDESTAL DRILL MACHINE	4
6.	POWER SAW	1
7.	BAND SAW	1
8.	END MILL CUTTER of different size	20
9.	CARBIDE LATHE TOOL of different types (shapes)	50
10.	HSS TOOL BIT FOR LATHE	50
11.	Work Benches (2 ½ ft X 11 Ft) with 4 Drawers	10
12.	Bench Vice 4 Inch	20
13.	MICROMETER 0-25 MM	10
14.	STEEL RULE 150 MM	50
15.	BEVELED EDGE 100X75 MM	20
16.	FLAT SCREW DRIVER 8X200 MM	20
17.	PHILLIPS SCREW DRIVER 8X200 MM	20
18.	PLIER FLAT 150 mm	20
19.	PLIER NOSE 150 mm	20
20.	WIRE CUTTER	20
21.	HACKSAW FRAME (Metalic)	10
22.	HAMMER 500 GRAMS	10
23.	SAFETY GOGGLES	20
24.	BENCH BRUSH	20
25.	VICE BRUSH 2"	20
26.	OIL CANE (Metalic)	20
27.	FILE FLAT BASTERED (Nicholson) 12"	50

28.	FILE HALF ROUND BASTERED 12"	20
29.	FILE FLAT SMOOTH (Nicholson) 12"	50
30.	FILE ROUND SMOOTH (Nicholson) 10"	20
31.	FILE SQUARE SMOOTH (Nicholson) 10"	20
32.	FILE FLAT SMOOTH (Nicholson) 8"	20
33.	FILE FLAT SECOND CUT (Nicholson) 8"	20
34.	FILE TRIANGULAR SMOOTH (Nicholson) 8"	20
35.	FILE HALF ROUND BASTERED 6"	20
36.	FILE ROUND SMOOTH (Nicholson) 6"	20
37.	FILE SQUARE SMOOTH (Nicholson) 6"	20
38.	FILE BRUSH	50
39.	LATHE FILE FLAT (Nicholson) 10"	20
50.	VERNIER HEIGHT GAUGE	1
41.	Welding Transformer	02
42.	Electric Arc Welding Table	02
43.	Oxy-acetylene Gas Welding apparatus (Manifold type)	1 Set
44.	Oxy-acetylene Gas Welding Table	05
45.	Welding Helmet	05
46.	Welding Screen	05
47.	Gas welding Goggles	05
48.	Chipping Hammer	05
49.	Wire Brush	05
50.	Tongs	05
51.	Hand Shear	05
52.	Tin Snip	10
53.	Anvil 20 KG	1
54.	Forging Hardie	3
55.	Forging Furnace	1

3rd YEAR

MECH 333 MACHINE DESIGN & ANALYSIS

List of Lab Equipment for 50 Students

Sr No.	Name of Item with Brief specifications	Qty
1.	Computer Core i7	50
2.	Computer Table	50
3.	Computer Chair	50
4.	Multimedia Projector	01
5.	Microsoft Windows 11 for 51 seats /Computers	51
6.	Printer	01
7.	Scanner	01
8.	Teacher Computer Core i7 With Table and Chair	01
9.	Software for 51 seats (any 3D CAD / CAM & Analysis)	01

DMT 313   DIE DESIGN – II

List of Lab Equipment for 50 Students

Sr No.	Name of Item with Brief specifications	Qty
1.	Computer Core i7	50
2.	Computer Table	50
3.	Computer Chair	50
4.	Multimedia Projector	01
5.	Microsoft Windows 11 for 51 seats /Computers	51

6.	Printer	01
7.	Scanner	01
8.	Teacher Computer Core i7 With Table and Chair	01
9.	Software for 51 seats (any 3D CAD / CAM)	01

DMT 334   <u>CNC MACHINES & CAD/CAM</u>
List of Lab Machines & Equipment for 50 Students

S.No.	Description	QTY
1.	CNC Milling	01
2.	CNC Lathe	01
3.	CNC Machining center	01
4.	Work benches (2 ½ ft x 8 ft) with 3 drawers	14
5.	Bench vice 4 inch	50
6.	Tool box with standard Hand Tools	50
7.	EDM Wire Cut	01
8.	EDM sinker	01
9.	Computer Core i7	50
10.	Computer Table	50
11.	Computer Chair	50
12.	Multimedia Projector	01
13.	Microsoft Windows 11 for 51 seats /Computers	51
14.	Printer	01
15.	Scanner	01

16.	Teacher Computer Core i7 With Table and Chair	01
17.	Software for 51 seats (any 3D CAD / CAM)	01

DMT 343   <u>**MOULD DESIGN – II**</u>

List of Lab Equipment for 50 Students

Sr No.	Name of Item with Brief specifications	Qty
1.	Computer Core i7	50
2.	Computer Table	50
3.	Computer Chair	50
4.	Multimedia Projector	01
5.	Microsoft Windows 11 for 51 seats /Computers	51
6.	Printer	01
7.	Scanner	01
8.	Teacher Computer Core i7 With Table and Chair	01
9.	Software for 51 seats (any 3D CAD / CAM)	01

DMT 353   <u>**JIGS & FIXTURE DESIGN**</u>

List of Lab Equipment for 50 Students

Sr No.	Name of Item with Brief specifications	Qty
1.	Computer Core i7	50
2.	Computer Table	50
3.	Computer Chair	50
4.	Multimedia Projector	01
5.	Microsoft Windows 11 for 51 seats /Computers	51
6.	Printer	01

7.	Scanner	01
8.	Teacher Computer Core i7 With Table and Chair	01
9.	Software for 51 seats (any 3D CAD / CAM)	01

DMT 362   <u>DIE & MOULD MAINTENANCE</u>
List of Machines & Equipment for class of 50 Students

S/N	Name of Item with Brief specifications	Qty
1	CNC Lathe / turning centre	1
2	CNC vertical machining center/CNC milling machine	1
3	CNC electric spark erosion machine (EDM) (three axis)	1
4	CNC spark wire cut machine (4-axis)	1
5	Digital display single-column jig boring machine	1
6	Multiple use grinding machine / Tool & Cutter Grinding machine	1
7	Cylindrical grinding machine	1
8	Surface grinding machine with rectangular table	1
9	Universal tool sharpener	1

10	Lathe	4
11	Horizontal instrument lathe	2
12	Radial crane	1
13	Marking platform	1
14	Universal rotary head milling machine	4
15	Bench drilling machine	4
16	Shaper machine	1
17	Power hacksaw	1
18	Manual shears	1
19	Plastic injection molding machine	1
20	Box type resistance furnace	1
21	Dust-removing grinding / Pedestal Grinding machine	2
22	Electric hand drill machine	3
23	Oxygen –acetylene welding torch	10
24	Oil quenching bath	2
25	Bench vice	50
26	work bench (for 3 trainee each)	17
27	Tool Drawer / Tool Boxes with Standard hand tools	50
28	Computer Core I 7	50
29	Server Computer	1
30	Software (any 3D CAD / CAM)	1
31	TIG Welding unit	1
32.	MIG Welding unit	1
33.	END MILL CUTTER	20
34.	CARBIDE LATHE TOOL	50
35.	HSS TOOL BIT FOR LATHE	50
36.	Work Benches (2 ½ ft X 11 Ft) with 4 Drawers	10
37.	Bench Vice 4 Inch	20
38.	MICROMETER 0-25 MM	20
39.	STEEL RULE 150 MM	50
50.	BEVELED EDGE 100X75 MM	20
41.	FLAT SCREW DRIVER 8X200 MM	20

42.	PHILLIPS SCREW DRIVER 8X200 MM	20
43.	PLIER FLAT 150 mm	20
44.	PLIER NOSE 150 mm	20
45.	WIRE CUTTER	20
46.	HACKSAW FRAME (Metalic)	10
47.	HAMMER 500 GRAMS	10
48.	SAFETY GOGGLES	50
49.	BENCH BRUSH	20
50.	VICE BRUSH 2"	50
51	OIL CANE (Metalic)	20
52.	FILE FLAT BASTERED (Nicholson) 12"	50
53.	FILE HALF ROUND BASTERED 12"	20
54.	FILE FLAT SMOOTH (Nicholson) 12"	50
55.	FILE ROUND SMOOTH (Nicholson) 10"	20
56.	FILE SQUARE SMOOTH (Nicholson) 10"	20
57.	FILE FLAT SMOOTH (Nicholson) 8"	20
58.	FILE FLAT SECOND CUT (Nicholson) 8"	20
59.	FILE TRIANGULAR SMOOTH (Nicholson) 8"	20
60.	FILE HALF ROUND BASTERED 6"	20
61.	FILE ROUND SMOOTH (Nicholson) 6"	20
62.	FILE SQUARE SMOOTH (Nicholson) 6"	20
63.	FILE BRUSH	50
64.	LATHE FILE FLAT (Nicholson) 10"	20
65.	VERNIER HEIGHT GAUGE	1
66.	Welding Transformer	1
67.	Electric Arc Welding Table	1
68.	Oxy-acetylene Gas Welding apparatus	1 Set
69.	Oxy-acetylene Gas Welding Table	1
70.	Welding Helmet	05
71.	Welding Screen	05
72.	Gas welding Goggles	05