PUNJAB BOARD OF TECHNICAL EDUCATION

21-A, Kashmir Block Allama Iqbal Town, Lahore

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

SAY NO TO CORRUPTION

No PBTE/R&D/2024/624 Dated:- 26-08-25

NOTIFICATION

In pursuance of NAVTTC Notification No. DG(SS&C)/DAE/2024 dated 25-07-2025, it is notified that the following old courses of DAE (3 years) have been repealed and replaced with revised courses in respective fields of technology as detailed below:

i- Diploma of Associate Engineer in Mechanical Technology (Power) with specialization in Auto & Farm Machinery (3 Years).
ii- Diploma of Associate Engineer in Architecture Technology (3 Years).
iii- Diploma of Associate Engineer in Food Processing and Preservation Technology (3 Years).
iv- Diploma of Associate Engineer in Electronics Technology (3 Years).
v- Diploma of Associate Engineer in Telecommunication Technology (3 Years).

The implementation of said revised technologies shall be effective on the students who shall be registered from academic session 2025-26 and onward. Punjab Board of Technical Education, Lahore shall conduct the examinations of the said revised technologies w.e.f. 1st Annual Examination 2026 and onwards accordingly. However, the candidates enrolled in the previous versions of the aforesaid DAE technologies will avail the prescribed chances under the old curricula. Soft copy of the revised curricula of the aforesaid technologies may be downloaded from the website of PBTE i.e. www.pbte.edu.pk/textbooks.html

SECRETARY

CC To

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

DAE Mechanical Technology (Power) with Specialization in Auto & Farm Machinery

SCHEME OF STUDIES, Revised, March-2025

1st Year

Code		Subject	T	P	C
Gen	111	Islamiat & Pak Studies	1	0	1
TTQ / Civic	111	Tarjuma tul Quran / Civics-I	1	0	1
ENG	112	English	2	0	2
Math	113	Applied Mathematics-I	3	0	3
Phy	122	Applied Physics	1	3	2
AFM	113	Farm Machinery-I	2	3	3
Mech	113	Workshop Practice-I	1	6	3
AFM	123	I.C Engines	2	3	3
AFM	133	Automotive Electricity & Electronics	2	3	3
Comp	152	Computer Application	1	3	2
Mech	122	Basic Engineering Drawing	1	3	2
TOTAL			**17**	**24**	**25**

2nd Year

Code		Subject	T	P	C
Gen	201	Islamiat & Pak Studies	1	0	1
TTQ / Civic	211	Tarjuma tul Quran / Civics-II	1	0	1
CH	213	Applied Chemistry	2	3	3
Math	212	Applied Mathematics-II	2	0	2
PHY	212	Applied Physics/Applied Mechanics	1	3	2
Mgm	211	Business Communication	1	0	1
AFM	212	Electric Vehicles (E.V)	1	3	2
AFM	223	Suspension, Steering & Brakes	2	3	3
AFM	233	Workshop Practice-II	2	3	3
AFM	242	Applied Thermodynamics	1	3	2
AFM	251	Occupational Health & Safety Environment (OHSE)	1	0	1
AFM	263	Soil, Crops & Fertilizers	2	3	3
TOTAL			**17**	**21**	**24**

3rd Year

Code		Subject	T	P	C
Gen	301	Islamiat & Pak Studies	1	0	1
Mgm	332	Entrepreneurship and Freelancing	1	3	2
AFM	312	Motor Vehicle Inspection	1	3	2
AFM	323	Fuel Injection & Carburation	2	3	3
AFM	333	Automotive Transmission	2	3	3
AFM	343	CAD & Robotics	2	3	3
AFM	353	Farm Machinery-II	2	3	3
AFM	362	Earth Moving Machinery	1	3	2
AFM	374	Workshop Practice-III	2	6	4
TOTAL			**14**	**27**	**23**

اسلامیات/مطالعہ پاکستان

		ٹی	پی	سی
حصہ اول	اسلامیات Gen III	1	0	1

حصہ دوم مطالعہ پاکستان

موضوعات حصہ اول اسلامیات سال اول

کل وقت: 20 گھنٹے

کتاب و سنت

قرآن مجید

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

5- پندرہ منتخب آیات معہ ترجمہ

1- لن تنالوا البر حتی تنفقوا مما تحبون

2- واعتصموا بحبل الله جمیعا ولا تفرقوا

3- ولا یجرمنکم شنان قوم علی ان لا تعدلوا

4- ان الله یامرکم ان تودوا الامانات الی اهلها

5- ان الله یامر بالعدل والاحسان

6- ان الصلوة تنهی عن الفحشاء والمنکر

7- لقد کان لکم فی رسول الله اسوة حسنة

8- ان اکرمکم عند الله اتقاکم

9- ومآ اتاکم الرسول فخذوه ومانهاکم عنه فانتهو

10- واوفوبالعهد

11- وعاشروهن بالمعروف

12- یمحق الله الربوٰ ویربی الصدقات

13- واصبر علی ما اصابک

14- وقولوا قولا سدیدا

15- ان الدین عند الله الاسلام

(ب) **سنت**

1- **سنت کی اہمیت**

1- انما الاعمال بالنیات

2- انما بعث لاتمم مکارم الاخلاق

3- لایومن احدکم حتی یحب الا خیہ ما یحب لنفسہ

4- المسلم من سلم المسلمون من لسانہ ویدہ

5- قل امنت باللہ ثم استقم

6- خیرکم خیرکم لا ھلہ

7- سباب المسلم فسوق وقتالہ کفر

8- المومن اخوالمومن

9- کل المسلم علی المسلم حرام دمہ وما لہ وعرضہ

10- آیۃ المنافق ثلاثۃ اذا حدث کذب واذا اوتمن خان واذا وعد اخلف

2- **دین اسلام** (5)

2.1 اسلام کے بنیادی عقائد کی وضاحت اور انسان کی انفرادی واجتماعی زندگی پران کے اثرات

1- توحید

2- رسالت

3- آخرت

4- ملائکہ

5- آسمانی کتب

2.2 **عبادات** (5)

1- نماز 2- روزہ 3- حج 4- زکوۃ

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

4- دین اسلام

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

خصوصی مقاصد:

- ☆ لفظ دین اسلام کے لغوی اور اصطلاحی معنی بیان کر سکے۔
- ☆ اسلام کے بنیادی عقائد کی اہمیت بیان کر سکے۔
- ☆ اسلام کے بنیادی عقائد کے انسان کی انفرادی واجتماعی زندگی پر پڑنے والے اثرات بیان کر سکے
- ☆ عبادت کے لفظی واصطلاحی معنی بیان کر سکے۔
- ☆ عقیدے اور عبادت کا فرق بیان کر سکے۔
- ☆ عبادات (نماز، روزہ، حج، زکوٰۃ) کے فوری احکامات اور انسانی زندگی پر ان کے اثرات بیان کر سکے
- ☆ اسلامی عقائد وعبادات کے مطابق اپنی زندگی ڈھال کر ایک اچھا مسلمان بن سکے۔

نصاب اخلاقیات سال اول (غیر مسلم طلباء کیلئے)

حصہ اول اخلاقیات	Gen III	ٹی	پی	سی
		1	0	1

کل وقت: 20 گھنٹے

حصہ دوم مطالعہ پاکستان

موضوعات

اخلاقیات کی تعریف اور اہمیت

اخلاقیات کا معیار (قانون۔عقل۔الہامی کتب)

مندرجہ ذیل اخلاق کی وضاحت

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

نصاب اخلاقیات سال اول

تدریسی مقاصد

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

خصوصی مقاصد۔ طالب علم اس قابل ہوگا کہ:

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

مطالعہ پاکستان

حصہ دوم

تدریسی مقاصد۔ حریت فکر:

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

خصوصی مقاصد:

- حریت فکر کا 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 واقف ہو جائے

خصوصی مقاصد:

- نظریہ کی تعریف بیان کر سکے اور اس کی وضاحت کر سکے۔
- نظریہ پاکستان کی تعریف کر سکے اور اس کا مفہوم بیان کر سکے۔
- علامہ اقبال اور قائداعظم کے فرمودات کی روشنی میں نظریہ پاکستان بیان کر سکے۔

نظریہ پاکستان کا تاریخی پہلو

عمومی مقصد۔ نظریہ پاکستان کے تاریخی پس منظر سے واقفیت حاصل کر سکے۔

خصوصی مقاصد۔ محمد بن قاسم کے بارے میں بیان کر سکے۔

نصاب سال اول Gen III

حصہ دوم مطالعہ پاکستان کل وقت:12 گھنٹے

موضوعات

- حریت فکر

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

- نظریہ پاکستان

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

- نظریہ پاکستان کا تاریخی پہلو

محمد بن قاسم کی آمد۔ مجدد الف ثانی اور شاہ ولی اللہ کی تبلیغی خدمات، سید احمد شہید کی تحریک مجاہدین

- تعلیمی تحریکیں

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

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

علمی تحریکیں

عمومی مقصد۔

- برصغیر کی علمی تحریکوں سے آگاہی حاصل ہو سکے

خصوصی مقاصد

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

TTQ / Civic-111;

Tarjumat-ul-Quran / Civics

T	P	C
1	0	1

Total Contact Hours:

Theory: **32**
Practical: **0**

Note: Syllabi for this subject would be as per BISEs / General education, developed by Punjab Curriculum TextBook Board (PCTB)

Eng-112 ENGLISH

Total Contact Hours		T	P	C
Theory	64	2	0	2

LEARNING OUTCOMES.

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

Detail of Contents:

PAPER-A

1 Prose/text **16 Hours**

1.1 First eight essays of Intermediate English Book-II

2 Close 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.

PAPER-B

3 Grammar **26 Hours**

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

4 Composition **12 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 **6 Hours**

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

Recommended Textbooks:

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

Eng-112 ENGLISH

Instructional Objectives:

PAPER-A

1 Demonstrate better reading, comprehension and vocabulary

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

2 Understand facts of the text

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

PAPER-B

3 Apply the rules of grammar in writing and speaking

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

4 Apply the concepts of composition writing to practical situations

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

5 Applies rules of translation

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

MATH-113 APPLIED MATHEMATICS-I

Total Contact Hours		T	P	C
Theory	96	3	0	3

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

LEARNING OUTCOMES.

After completing the course the students will be able to

1. Solve problems of Algebra, Trigonometry, vectors, Mensuration, 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.

Detail of Contents:

1 Quadratic equations **6 Hours**

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 Hours**

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 Hours**

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 Hours**

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

5 Partial fractions **6 Hours**

5.1 Introduction
5.2 Linear Distinct Factors Case I
5.3 Linear Repeated Factors Case II
5.4 Quadratic Distinct Factors Case III
5.5 Quadratic Repeated Factors Case IV
5.6 Problems

6 Fundamentals of trigonometry **6 Hours**

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

7 Trigonometric functions and ratios **6 Hours**

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

8 General identities **6 Hours**

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

9 Solution of triangles **6 Hours**

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

10 Mensuration of solids **30 Hours**

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

11 Vectors **9 Hours**

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

12 Matrices and determinants **9 Hours**

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

Recommended Textbooks:

Applied Mathematics: Math-123, Developed by Nasir -ud-Din Mahmood, Sana-ullah Khan, Tahir Hameed, Evaluated by Syed Tanvir Haider, Javed Iqbal, Vol - I, National Book Foundation

MATH-113 APPLIED MATHEMATICS-I

Instructional Objectives:

1 Use different methods for the solution of quadratic equations.

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

5.1 Define a partial fraction, a proper and an improper fraction.
5.2 Explain all the four types of partial fractions.
5.3 Set up equivalent partial fractions for each type.
5.4 Explain the methods for finding 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 an 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 trigonometric functions.

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

8 Use trigonometric identities in solving technological problems.

8.1 List fundamental identities.
8.2 Prove the fundamental law.
8.3 Deduce important results.
8.4 Derive sum and 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 sines 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 mensuration in finding surfaces, volumes and weights of solids.

10.1 Define mensuration 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 solving technological 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 perpendicularity and parallelism of two vectors.
11.8 Solve problems

12 Use the concept of matrices & determinants in solving technological problems.

12.1 Define a matrix and a determinant.
12.2 List types of matrices.
12.3 Define transpose, adjoint 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

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

Pre-requisite: None.

LEARNING OUTCOMES.

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

Detail of Contents:

1 Measurements. 2 Hours

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

2 Scalars and vectors. 4 Hours

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

3 Motion 4 Hours

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

4 Torque, equilibrium and rotational inertia. 4 Hours

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

5 Wave motion. 5 Hours

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

6 Sound. 4 Hours

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

7 Light. 4 Hours

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

8 Optical fiber. 2 Hours

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

9 Lasers. 3 Hours

9.1 Corpuscular theory of light
9.2 Emission and absorption of light
9.3 Stimulated absorption and emission of light
9.4 Laser principle
9.5 Structure and working of lasers
9.6 Types of lasers with brief description.
9.7 Applications (basic concepts)
9.8 Material processing

9.9 Laser welding
9.10 Laser assisted machining
9.11 Micro machining
9.12 Drilling, scribing and marking
9.13 Printing
9.14 Lasers in medicine

Recommended Textbooks:

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

PHY-122 APPLIED PHYSICS

Instructional Objectives:

1 Use concepts of measurement to practical situations and technological problems.

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

2 Use concepts of scalars and vectors in solving problems involving these concepts.

2.1 Explain laws of parallelogram, triangle and polygon 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 of wave motion in solving relevant problems.

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

6 Understand concepts of sound.

6.1 Describe longitudinal wave and its propagation
6.2 Explain the concepts: Intensity, loudness, pitch and quality of sound
6.3 Explain units of Intensity of level and frequency response of ear
6.4 Explain phenomena of silence zones, beats
6.5 Explain Acoustics of buildings
6.6 Explain Doppler effect giving mathematical expressions.

7 Use the concepts of geometrical optics to mirrors and lenses.

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

8 Understand wave theory of light

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

9 Understand the structure, working and uses of optical fiber.

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

PHY-122 APPLIED PHYSICS

List of Practicals:

1 Draw graphs representing the functions:
   a) y=mx for m=0, 0.5, 1, 2
   b) $y=x^2$
   c) y=1/x
2 Find the volume of a given solid cylinder using vernier callipers.
3 Find the area of cross-section of the given wire using micrometer screw gauge.
4 Prove that force is directly proportional to (a) mass, (b) acceleration, using fletchers' trolley.
5 Verify law of parallelogram of forces using Grave-sands apparatus.
6 Verify law of triangle of forces and Lami's theorem
7 Determine the weight of a given body using
   a) Law of parallelogram of forces
   b) Law of triangle of forces
   c) Lami's theorem
8 Verify law of polygon of forces using Grave-sands apparatus.
9 Locate the position and magnitude of resultant of like parallel forces.
10 Determine the resultant of two unlike parallel forces.
11 Find the weight of a given body using principle of moments.
12 Locate the centre of gravity of regular and irregular shaped bodies.
13 Find Young's Modules of Elasticity of a metallic wire.
14 Verify 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 lense 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.

AFM-113 FARM MACHINERY-1

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

Pre-requisite: N/A

LEARNING OUTCOMES.

Students will be able to:

1. Explain the transmission of power in agriculture
2. Explain the use of tire for farm equipment
3. Explain the farm mechanization
4. Explain the tillage and traction dynamics of Tractor
5. Explain the primary tillage machinery
6. Explain the secondary tillage machinery
7. Explain the planting and seeding equipment
8. Explain the spraying equipment

Detail of Contents:

1 Farm Mechanization 4 Hours

1.1 Introduction of Farm Mechanization
1.2 Advantages of Farm Mechanization
1.3 Disadvantages of Farm Mechanization
1.4 Employment opportunities in agricultural power and machinery
1.5 Skills and competencies needed for job entry

2 Introduction of Modern Tractor 8 Hours

2.1 Traction and Tractor
2.2 Purpose and Advantages of Tractor
2.3 Make and model of tractors in Pakistan
2.4 Structure of Tractor & Weight transfer
2.5 Specification /salient features of different Tractors in Pakistan
2.6 Types of tractor w.r.t. HP & working
2.7 Tractor Hour meter purpose & working principal
2.8 Tractors instrument panel & Control levers (Draft control, position control, response control).
2.9 Periodic maintenance chart of tractor
2.10 Safety precautions regarding tractor Operations (safety signs for tractor)

3 Tires For Farm Equipment **4 Hours**

3.1 Types of Tires and their Advantages
3.2 Traction of tires
3.3 Agricultural tire code
3.4 Ply rating of tires
3.5 Tire size
3.6 Inflation pressure
3.7 Rim for tractor and implement tires
3.8 Effect of weighting and tires ballasting
3.9 Define rolling resistance and soil deformation under Tires

4 Transmission of Power **8 Hours**

4.1 Introduction
4.2 Direct drives
4.3 Pulleys and belts
4.4 Length of V belt
4.5 Precautions in using belts
4.6 Sprocket wheels and chains
4.7 Shafts and use of Power take-off shaft in Farm Machinery

5 Primary Tillage Machinery **10 Hours**

5.1 Tillage
5.2 Objectives of tillage
5.3 Purpose of primary tillage machinery
5.4 Mold board plows
5.5 Types of bottoms of M.B.Plows
5.6 Disk plow
5.7 Chisel plows
5.8 Sub- soilers
5.9 Hitches of plows
5.10 Laser land leveler

6 Secondary Tillage Machinery **10 Hours**

6.1 Purpose of secondary tillage machinery
6.2 Harrows
6.3 Uses of disk harrows
6.4 Cultivator
6.5 Field cultivators
6.6 Spike tooth harrows
6.7 Spring tooth harrows
6.8 Special harrows
6.9 Row crop cultivators
6.10 Rotary hoe
6.11 Rotary tiller
6.12 Rotary plows

7 Planting and Seeding Equipment 8 Hours

7.1 Purpose of planting and seeding equipment
7.2 Row-Crop planters
7.3 Modern Automatic planters
7.4 Planter parts
7.5 Planting depth
7.6 Working of grain drills
7.7 Classification and sizing of grain drills
7.8 Metering system of grain drills
7.9 Furrow openers
7.10 Seed metering rate of planter or drill
7.11 Preparing planting and seeding machinery
7.12 Calibrating the planter
7.13 Calibrating the grain drill

8 Plant Protection and Weed Control Machinery 10 Hours

8.1 Crop protection chemicals
8.2 Types of machinery used for weed, insect and fertility control
8.3 Liquid application equipment
8.4 Low pressure sprayers
8.5 High pressure sprayers
8.6 Recirculating sprayers
8.7 Mist applicators
8.8 Dry chemical application equipment
8.9 Calibrating the sprayers
8.10 Maintaining chemical application equipment
8.11 Variable Rate Spraying Technology
8.12 Ariel and Drone Spraying Technology

9 Pumps, Tube-well and Turbines in Agriculture 2 Hours

9.1 Irrigation pump and tube well
9.2 Components of pump and tube well
9.3 Solar pumping, components and design
9.4 Components of well turbine and its types.
9.5 Troubleshooting and their remedies of tube well and well turbine.

Reference Books :

1. Farm Machinery and Equipment By: Harris Pearson Smith, 2010.
2. Agricultural Power and Machinery By: Jacobs Harrell.
4. Fundamentals of Tractor & Energy Conservation By Faqeer Muhammad Chaudery & Dr. Gulam Sarwar.
5. Drone Technology and its application in Agriculture by S.M. Nalawade, S.D. Gorantiwar and others.

AF-113 FARM MACHINERY-I

INSTRUCTIONAL OBJECTIVES

On the completion of this course, the student will be able to:

1 Understand the Farm Mechanization

1.1 Describe the Farm Mechanization
1.2 State the advantages and disadvantages of Farm Mechanization
1.3 Identify the employment opportunities in agricultural power and machinery sector
1.4 List the skills and competencies needed for job entry in Agriculture

2 Introduction Of Modern Tractor

2.1 Define traction.
2.2 Describe the Purpose and Advantages of Tractor.
2.3 Enlist Manufacturers and Different models of tractors used in Pakistan.
2.4 Enlist the main parts of Tractor.
2.5 Describe the Specification /salient features of different Tractors used in Pakistan.
2.6 Describe Types of tractor w.r.t. HP.
2.7 Describe Tractor Hour Meter purpose.
2.8 Describe Tractors instrument panel.
2.9 Describe Control levers (Draft control, position control, response control).
2.10 Prepare periodic maintenance chart of tractor.
2.11 Enlist the Safety precautions regarding tractor Operations (safety signs for tractor).

3 Understand the use of Tires For Farm Equipment

3.1 Describe the types of tires and their advantages.
3.2 Describe the term traction of tire.
3.3 Describe the Agricultural tire code.
3.4 Describe ply rating and its types
3.5 Describe the tire size
3.6 Describe the inflation pressure
3.7 Describe the rims for tractor and implement tires.
3.8 Describe the effect of weighting and tires blasting
3.9 Describe rolling resistance and soil deformation

4 Transmission Of Power

4.1 Introduction
4.2 Direct drives
4.3 Pulleys and belts
4.4 Length of V belt
4.5 Pulleys and sheaves
4.6 Rules for belts
4.7 Precautions in using belts

4.8 Sprocket wheels and chains
4.9 Power take-off shafts

5 Primary Tillage Machinery

5.1 Define Tillage.
5.2 Enlist the Objectives of tillage.
5.3 State the purpose of primary tillage machinery.
5.4 Describe the purpose, parts and types Mold Board plow.
5.5 Explain the purpose, construction and parts of Disk plow.
5.6 Describe the function, construction and types of Chisel plows.
5.7 Describe the purpose and types of Sub-Soilers.
5.8 Describe the purpose and types Rotary plows.
5.9 Explain the principle of hitching Procedure of Implements.
5.10 Describe the purpose, advantages and working of Laser land leveler.

6 Secondary Tillage Machinery

6.1 State the purpose of secondary tillage machinery.
6.2 Define harrows.
6.3 Describe the uses of disk harrows.
6.4 Describe the function and construction Spike tooth harrows.
6.5 Explain the purpose and construction of spring tooth harrows.
6.6 Describe the function of special harrows
6.7 Describe the purpose and function of cultivators.
6.8 Describe the types of Row crop cultivators
6.9 Explain the function of Rotary tiller
6.10 Describe rotary hoe and rotary plows

7 Understand the Planting And Seeding Equipment, describe purpose of planting and seeding equipment.

7.1 Describe the parts of planter.
7.2 Describe the rice planter.
7.3 Describe the modern automatic planters
7.4 Enlist the components of rice planter.
7.5 Describe the Working of Rice Planter.
7.6 Explain the function and working of planter.
7.7 Describe the method of controlling planter depth.
7.8 Describe the working of grain drills.
7.9 Describe the classification and sizing of grain drills.
7.10 Explain the metering system of gram drills.
7.11 Describe the purpose and types of furrow openers of drill.
7.12 Explain the procedure of preparing planting and seeding machinery.
7.13 Explain the method of calibrating the planter.

7.14 Explain the method of calibrating the gram drill.

8 Understand the working of Plant Protection and Weed Control Machinery

8.1 Describe the purpose of crop production chemicals.
8.2 Describe the types of machinery used for weed, insect and fertility control.
8.3 Describe the working of liquid application equipment.
8.4 Describe the low pressure sprayers.
8.5 Describe the high pressure sprayers.
8.6 Explain the working of recirculating sprayers.
8.7 Describe the function of mist applicators.
8.8 Describe dry chemical application equipment.
8.9 Explain the calibration of sprayers.
8.10 Describe the methods of maintaining chemical application equipment.
8.11 Describe the variable rate Spraying Technology.
8.12 Describe Drone Spraying Technology.

9 Understand the working and types pumps, tube-well and turbines 2 Hours

9.1 Describe irrigation pump and tube well.
9.2 Enlist components of pump and tube well.
9.3 Introduction to solar pumping, components and design.
9.4 Describe the components of well turbine and its types.
9.5 Explain the troubleshooting and their remedies of tube well and well turbine.

AFM-113 FARM MACHINERY-I

List of Practicals

1. Practice to Drive Tractor in the open field under the supervision of class instructor
2. Perform service, adjustments and maintenance of belts and chain.
3. Perform shop and field adjustments of Mould Board plows.
4. Perform shop and field adjustments of Chiesel Plow.
5. Perform shop and field adjustments of Disk plows.
6. Perform shop and field adjustments of Cultivators.
7. Perform shop and field adjustments of Rotavator.
8. Perform shop and field adjustments of Harrows.
9. Perform shop and field adjustments of Sub-Soiler.
10. Perform shop and field adjustments of Grain Drill.
11. Calibrate the grain Drill and Planter in shop.
12. Calibrate the fertilizer broadcaster in shop.
13. Perform hitching of different tillage machinery.
14. Practice to operate different tillage equipment.
15. Practice on planting and seeding machine for field operation.
16. Practice to operate fertilizer broadcaster in the field.
17. Calibrate the field sprayers in the workshop
18. Practice on drone spraying in the field.
19. Prepare a seed bed for sowing of crops and vegetable
20. Visit of Tractor assembling industry
21. Visit of Farm Machinery manufacturing industry
22. Visit of modern progressive farm

Mech-113 WORKSHOP PRACTICE-I

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

Pre-requisite: None

LEARNING OUTCOMES

1. Know different basic machines like Drill machine, Grinder, Lathe, and Shaper
2. Understand methods of producing simple jobs on Lathe and Shaper.
3. Explain the shop setting of Metal work, wood work, welding and foundry.
4. State shop rules and regulations of individual shops
5. Explain the use of tools involved in these shops.
6. Identify the main parts of each tool and machine of all these shops.
7. Exercise proper care and maintenance of each tool and machine of Metal work, welding and Foundry.
8. Prepare jobs/projects in all the aforesaid shops

(PART-A) MACHINE SHOP

Details of Contents:

1 Lathe construction **2 Hours**

1.1 Parts of lathe
1.2 Description of each part
1.3 Types of lathe
1.4 Description of each type
1.5 Size of lathe
1.6 Accessories, attachments, work holding devices with uses

2 Lathe cutting tools **1 Hour**

2.1 Types of lathe cutting tools
2.2 Description of each and their angles

3 Cutting speed, feed, and cut **2 Hours**

3.1 Speed and feed
3.2 Method of speed and feed calculation
3.3 Relationship between speed and feed
3.4 Depth of cut

4 Lathe operation and drilling 5 Hours

4.1 Methods of centering the job
4.2 Importance of centering job
4.3 Method of turning a job
4.4 Shoulder turning/ step turning
4.5 Taper Turning
4.6 Principle of taper turning
4.7 Formulae for taper turning angle
4.8 Methods of taper turning
4.9 Definition of knurling
4.10 Purpose of knurling
4.11 Knurling Methods
4.12 Definition of thread
4.13 Pitch and lead
4.14 Thread cutting calculation
4.15 Thread cutting calculation based on system
4.16 Thread cutting operation
4.17 Definition of facing
4.18 4Facing operation
4.19 Method of drilling on lathe machine
4.20 Methods of boring, reaming and types of reamers

5 Drill press/drilling. 2 Hours

5.1 Types of drill machines
5.2 Description of each type
5.3 Parts of a drill machine
5.4 Drilling operation
5.5 Parts of a drill
5.6 Explanation of each part

6 Tool grinder. 2 Hours

6.1 Parts of grinder
6.2 Grinding operation

7 Shaper work. 3 Hours

7.1 Parts of a shaper
7.2 Forward/backward stroke of a shaper
7.3 Shaper stroke adjustment
7.4 Types of shaper tools
7.5 Explanation of each part
7.6 Adjustment of shaper speed and feed
7.7 Different clamping devices for job and tool

(PART- B) METAL SHOP, WELDING PRACTICE AND FOUNDRY

Details of Contents:

8 Metal work tools and machines. 8 Hours

8.1 Hand Tools
8.2 Measuring tools
8.3 Layout tools.
8.4 Cutting tools
8.5 Chisels
8.6 Files
8.7 Hacksaw
8.8 Drill
8.9 Miscellaneous tools
8.10 Drilling Machine.
8.11 Power Hacksaw
8.12 Bending Machine
8.13 Rolling Machine
8.14 Shearing machine.

9 Welding, hand tools and machines. 3 Hours

9.1 Gas welding Tools.
9.2 Welding processes
9.3 Welding tests and equipment
9.4 Welding materials and electrodes

10 Hand forging operations. 2 Hours

10.1 Drawing
10.2 Swaging
10.3 Up-setting
10.4 Punching
10.5 Cutting.
10.6 Forge welding

11 Foundry shop tools and machines 2 Hours

11.1 Hand Moulding Tools.
11.2 Moulding boxes.
11.3 Pit furnace.
11.4 Core baking furnace.
11.5 Grinding and brushing machines.

Recommended Textbooks:

Chapman Vol-I - Workshop Technology

Mech-113 WORKSHOP PRACTICE-I

(PART-A) MACHINE SHOP

Instructional Objectives:

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

MACHINE SHOP

1 Know function of lathe parts.

1.1 List the parts of lathe
1.2 Describe each part
1.3 List types of lathe
1.4 Describe each type
1.5 Describe size of lathe
1.6 Describe accessories, attachments, work holding devices with uses

2 Understand lathe cutting tools.

2.1 List types of lathe cutting tools
2.2 Explain each type of lathe cutting tool and their angles

3 Know cutting speed, feed, and cut.

3.1 Define speed and feed
3.2 Describe method of speed and feed calculation
3.3 Describe relationship between speed and feed
3.4 Describe depth of cut

4 Understand lathe operation and drilling.

4.1 List methods of centering the job
4.2 Explain importance of centering job
4.3 Explain method of turning a job
4.4 Explain shoulder turning/ step turning
4.5 Explain taper turning
4.6 State principle of taper turning
4.7 The use of formulae for taper turning angle
4.8 Explain methods of taper turning
4.9 Define knurling
4.10 Describe purpose of knurling
4.11 Describe method knurling
4.12 Define thread
4.13 Describe pitch and lead
4.14 Calculate the pitch and TPI of threads

4.15 Explain thread cutting calculation based on system
4.16 Explain thread cutting operation
4.17 Define facing
4.18 Describe facing operation
4.19 Describe method of drilling on lathe machine
4.20 Describe methods of boring, reaming and types of reamers

5 Understand drill machines.

5.1 List types of drill machines
5.2 Describe each type
5.3 List parts of a drill machine
5.4 Explain drilling operation
5.5 List parts of a drill
5.6 Explain each part

6 Understand tool grinder.

6.1 List parts of grinder
6.2 Explain grinding operation

7 Understand shaper machine.

7.1 List parts of a shaper
7.2 Explain forward/backward stroke of a shaper
7.3 Explain shaper stroke adjustment
7.4 List types of shaper tools
7.5 Explain each type
7.6 Explain adjustment of shaper speed and feed
7.7 List different clamping devices for job and tool

(PART-B) METAL SHOP, WELDING PRACTICE AND FOUNDRY

Instructional Objectives:

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

8 Understand kinds of tools and machines

8.1 Describe Hand Tools
8.2 Describe the Measuring tools
8.3 Define the Layout tools.

8.4 Explain the Cutting tools
8.5 Explain the Chisels
8.6 Explain the Files
8.7 Explain the Hacksaw
8.8 State the purpose of Drill
8.9 State the Miscellaneous tools
8.10 Explain Drilling Machine.
8.11 Explain Power Hacksaw
8.12 Explain Bending Machine
8.13 Explain Rolling Machine
8.14 Explain Shearing machine.

9 Understand welding shop tools and machines.

9.1 Describe Gas welding Tools.
9.2 Describe Welding processes Gas, Electric, TIG,MIG.
9.3 Explain Welding tests and equipment
9.4 State Welding materials and electrodes

10 Understand forging operations.

10.1 Explain Drawing,
10.2 Describe Swaging
10.3 State Up-setting
10.4 Describe Punching
10.5 State Cutting.
10.6 Explain Forge welding

11 Know kinds of foundry shop tools and machines.

11.1 Describe Hand Moulding Tools.,
11.2 Describe Moulding boxes, moulding sands and moulding methods.
11.3 Describe Pit furnace and types of cores.
11.4 Describe Core baking furnace.
11.5 Describe grinding and brushing machines.

Mech-113 WORKSHOP PRACTICE-I

List of Practicals:

A) Machine shop

1. Practice of facing
2. Practice of plain turning
3. Practice of Drilling & Boring
4. Practice of Threading (External)
5. Practice of Taper Turning

B) Metal shop

1. Practice of hacksaw cutting
2. Practice of filing
3. Practice of drilling on flat piece
4. Practice of threading on flat piece

C) Welding

1. Practice of making Butt Joint
2. Practice of making Lap Joint
3. Practice of making Tee Joint

D) Forging

1. Practice of Drawing
2. Practice of Swaging

AFM-123 I.C ENGINES

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

Pre-requisite: None

Learning Outcomes:-

1. Understand the working principles of petrol and diesel engines.
2. Understand the construction and working of engine systems.
3. Understand the systems based upon pressure and volume
4. Identify main parts of petrol and diesel engine
5. Know different types of IC engines
6. Compare between petrol and diesel engine

Detail of Contents:

ENGINE HISTRORY/CONSTRUCTION AND FUNDAMENTALS.

1 History and Development of Automobile . 2 Hours

1.1 History of Automobile.
1.2 History of an Engine.

2 Main components of vehicle. 2 Hours

2.1 Different Types of Automobiles.
2.2 Main components of Vehicle and draw the Lay-out of their position.
2.3 Engine, Frame, and chassis.
2.4 Types of engines
- 2.4.1 IC Engines.
- 2.4.2 EC engines.

3 Construction and Working of IC Engine Parts. 14 Hours

3.1 Function, types, materials, construction and working of following engine parts.
- 3.1.1 Piston
- 3.1.2 Piston rings,
- 3.1.3 Piston pin,
- 3.1.4 piston pin locks.
- 3.1.5 Connecting rod.
- 3.1.6 Crankshaft.

3.1.7 Vibration Damper
3.1.8 Fly Wheel
3.1.9 Cylinder Block
3.1.10 Cylinder,
3.1.11 Cylinder Liner and its characteristics.
3.1.12 Camshaft.
3.1.13 Engine Valve
3.1.14 Rocker arm
3.1.15 Cylinder Head.
3.1.16 Combustion chamber.
3.1.17 Gaskets.
3.1.18 Timing Gears
3.1.19 Timing belt.

4 IC Engines Fundamental and Operations. 6 Hours

4.1 Terminology of IC Engine.
4.1.1 Bore & Stroke.
4.1.2 TDC & BDC.
4.1.3 Clearance Volume.
4.1.4 Swept /Displacement Volume.
4.1.5 Cylinder total Volume.

4.2 Working Principle of
4.2.1 4-Stroke Petrol Engine.
4.2.2 2-Stroke Petrol Engine.
4.2.3 4-Stroke Diesel Engine.
4.2.4 2-Stroke Diesel Engine.

4.3 Engine Compression ratio and its formula.
4.4 Capacity of engine in Cubic Centimeter(CC) and Calculate the Swept Volume of the engine cylinder.
4.5 Compare 4-stroke cycle engine with 2-stroke cycle engine.
4.6 Compare Petrol engine with diesel engine.

5 Construction, types, and working of valve train mechanism. 4 Hours

5.1 Function, construction and working of the components of valve train mechanism.
5.2 Inlet Valve
5.3 Exhaust valve.
5.4 Valve seat.
5.5 Valve Guide
5.6 Valve return spring.
5.7 Valve retainer.

5.8 Push rod.
5.9 Valve lifter and its types
5.10 Camshaft
5.10.1 Camshaft timing gear
5.10.2 Rocker arm assembly.
5.10.3 Lay-out of Valve train assembly.

5.11 Crankshaft timing gear and cam shaft timing gear.
5.12 Engine Valve timing diagram.
5.13 Valve overlapping.
5.14 Types of valve arrangements.
5.15 Variable valve timing intelligent system (VVT-i).

6 Classifications of Engines. 6 Hours

6.1 Classifications/types of engines w.r.t.
6.1.1 Fuel
6.1.2 Strokes.
6.1.3 Ignition.
6.1.4 Cylinder arrangements.
6.1.5 No of Cylinders.
6.1.6 Valve arrangements.
6.1.7 Camshaft arrangements.
6.1.8 Cooling systems.
6.1.9 Lubrication systems.
6.1.10 Engine capacity.
6.1.11 Combustion chambers.

6.2 Working Principle of Wankle Engine.
6.3 Introduction and lay-out of main components of Gas Turbine.
6.4 Introduction and lay-out of main components of Hybrid Vehicle.
6.5 Introduction and lay-out of main components of Electric Vehicle.

7 Engine bearings. 2 Hours

7.1 Purpose of bearings.
7.2 Types of bearings and their use in vehicles.
7.3 Purpose of lubrication of bearings.

ENGINE SYSTEMS.

8 Engine Intake System. 2 Hours

8.1 Function, and features of intake system.
8.2 Function And Types of air cleaner.

8.3 Parts of intake system
8.4 Water body leakage.

9 Engine Exhaust System. 2 Hours

9.1 Purpose of exhaust system.
9.2 Parts of engine exhaust system.

10 Purpose, Types, Construction of Engine Cooling System. 6 Hours

10.1 Purpose of Engine Cooling System.
10.2 Types of Engine Cooling System.
10.3 Construction and Working of each component of Engine Cooling system.
10.3.1 Radiator.
10.3.2 Radiator Pressure Cap.
10.3.3 Radiator expansion tank.
10.3.4 Hose pipe,
10.3.5 Water pump.
10.3.6 Water Jackets.
10.3.7 Thermostat Valve.
10.3.8 Fan Shroud.
10.3.9 Automatic Electric Fan.
10.3.10 Fluid Coupling fan.
10.3.11 Fan belt.
10.4 Purpose and Characteristics of Anti-Freeze Coolant (Ethyleneglycol).
10.5 Causes and Remedies of Engine Cooling System Faults.

11 Purpose, Types, Construction & Working of an Engine 6 Hours

11.1 Lubricating system.
11.2 Purpose of Engine Lubricating System.
11.3 Types of Engine Lubricating System(Forced Feed & Splash System)
11.4 Construction and Working of each component of Engine Lubricating system. i.e.
11.4.1 Oil Sump
11.4.2 Oil strainer
11.4.3 Oil Pump and its types.
11.4.4 Oil pressure relief valve.
11.4.5 Oil Filter.
11.4.6 Oil Gallery.
11.4.7 Oil pressure gauge and its circuit.
11.4.8 cylinder oil passages
11.4.9 oil return line.

11.5 Function of engine Oil.
11.6 Engine Oil Viscosity and viscosity index i.e. SAE-30.
11.7 Schedule for changing of engine oil.
11.8 Causes and Remedies of Engine Lubricating System Faults.

12 Construction and Working of Petrol Engine Fuel System. 4 Hours

12.1 Purpose of Engine Fuel System.
12.2 Main Components and function of fuel system.
12.3 Main components of Carburetor.
12.4 Basic Working Principle of Carburetor.

13 Working of Petrol Engine Ignition System. 4 Hours

13.1 Purpose of Engine ignition System.
13.2 Main Components of ignition system.
13.3 Purpose, construction and working of following components of ignition system. i.e.
13.3.1 Battery.
13.3.2 Ignition Switch.
13.3.3 Ballast resistor
13.3.4 Ignition coil.
13.3.5 Distributor.
13.3.6 CB Points,
13.3.7 dwell angle.
13.3.8 Condenser.
13.3.9 High tension leads.
13.3.10 Spark plugs and its types.
13.3.11 firing order.

13.4 Causes and remedies of Engine Ignition System Faults.

14 4-Stroke Motorcycle Engine and Electric Bike 4 Hours

14.1 Main components of motorcycle.
14.2 Main components of motorcycle engine.
14.3 Working principle of motorcycle engine.
14.4 Construction and working of each component of motorcycle engine.
14.5 Electric Bike Components
14.6 Working of Electric Bike
14.7 Advantage and Disadvantage of an Electric Bike

Recommended Textbooks:

1. Auto fundamentals by Martin W. Stockal
2. Modern Automotive Mechanics by James E. Duffy.

3. Automotive Technology A System Approach by Jack Erjavec

AFM-123 I .C ENGINES

Instructional Objectives:

ENGINE HISTRORY/CONSTRUCTION AND FUNDAMENTALS.

1 Know the History and Development of Automobile .

1.1 Describe the History of Automobile.
1.2 Describe the History of engine.

2 Understand identification of the main components of vehicle.

2.1 Describe the different Types of Automobiles.
2.2 Enlist the main components of Vehicle and draw the Lay-out of their position.
2.3 Define engine, Frame, and chassis.
2.4 Describe types of engines
- 2.4.1 IC Engine
- 2.4.2 EC engine.

3 Understand the construction and working of IC engine parts .

3.1 Describe the function, types, materials, construction and working of following engine parts.
- 3.1.1 Piston
- 3.1.2 Piston rings
- 3.1.3 Piston pin,
- 3.1.4 Piston pin locks.
- 3.1.5 Connecting rod.
- 3.1.6 Crankshaft.
- 3.1.7 Vibration Damper
- 3.1.8 Fly Wheel
- 3.1.9 Cylinder Block,
- 3.1.10 Cylinder,
- 3.1.11 Cylinder Liner and its characteristics.
- 3.1.12 Camshaft.
- 3.1.13 Engine Valve
- 3.1.14 Rocker arm
- 3.1.15 Cylinder Head.
- 3.1.16 Combustion chamber.
- 3.1.17 Gaskets.
- 3.1.18 Timing Gears
- 3.1.19 Timing belt.

4 Understand the IC engine fundamentals and operations.

4.1 Define the following terminology of IC Engine.
- 4.1.1 Bore
- 4.1.2 Stroke.
- 4.1.3 TDC
- 4.1.4 BDC.
- 4.1.5 Clearance Volume.
- 4.1.6 Swept /Displacement Volume.
- 4.1.7 Cylinder total Volume.

4.2 Explain the working Principle of
- 4.2.1 4-Stroke Petrol Engine.
- 4.2.2 2-Stroke Petrol Engine.
- 4.2.3 4-Stroke Diesel Engine.
- 4.2.4 2-Stroke Diesel Engine.

4.3 Describe the Engine Compression ratio and its formula.
4.4 Describe the Capacity of engine in Cubic Centimeter(CC) and Calculate the Swept Volume of the engine cylinder.
4.5 Compare 4-Stroke Cycle Engine with 2-Stroke Cycle Engine.
4.6 Compare Petrol engine with Diesel engine.

5 Understand the construction, types, and working of valve train mechanism.

5.1 Describe the function ,construction and working of the components of valve train mechanism.
- 5.1.1 InletValve.
- 5.1.2 Exhaust valve,
- 5.1.3 Valve seat,
- 5.1.4 Valve Guide,
- 5.1.5 Valve return spring,
- 5.1.6 Valve retainer,
- 5.1.7 Push rod,
- 5.1.8 Valve lifter and its types,
- 5.1.9 Camshaft
- 5.1.10 camshaft timing gear,
- 5.1.11 Rocker arm assembly,
- 5.1.12 Lay-out of Valve train assembly.

5.2 Describe ratio between crankshaft timing gear and cam shaft timing gear.
5.3 Explain Engine Valve timing diagram.
5.4 Describe Valve overlapping.
5.5 Enlist different types of valve arrangements.
5.6 Describe variable valve timing intelligent system (VVT-i).

6 Understand the Classifications of Engines.

6.1 Describe the Classifications/types of engines w.r.t.
- 6.1.1 Fuel
- 6.1.2 Strokes.
- 6.1.3 Ignition.
- 6.1.4 Cylinder arrangements.
- 6.1.5 No of Cylinders.
- 6.1.6 Valve arrangements.
- 6.1.7 Camshaft arrangements.
- 6.1.8 Cooling systems.
- 6.1.9 Lubrication systems.
- 6.1.10 Engine capacity.
- 6.1.11 Combustion chambers.

6.2 Describe working principal of Wankle engine.
6.3 Brief Introduction and lay-out of main components of Gas Turbine.
6.4 Brief Introduction and lay-out of main components of Hybrid Vehicle.
6.5 Brief Introduction and lay-out of main components of Electric Vehicle.

7 Understand the Engine Bearings.

7.1 State the purpose of bearings.
7.2 Enlist the types of bearing and their use in vehicles.
7.3 State the purpose of lubrication of Bearing .

ENGINE SYSTEMS.

8 Understand the Working of an Engine Intake System.

8.1 State the function, and features of intake system.
8.2 State the function of Air Cleaner.
8.3 Enlist the parts of intake system.
8.4 Explain the working of each part of inlet system
8.5 Discuss water body leakage.

9 Understand the Working of Engine exhaust System.

9.1 State the purpose of exhaust system.
9.2 Enlist the parts of engine exhaust system.
9.3 Explain the working of each part of exhaust system.

10 Understand the Purpose, Types & Construction of Engine Cooling System .

10.1 State the Purpose of engine Cooling System.

10.2 Describe the types of Engine Cooling System.
10.3 Describe the Construction and Working of each component of Engine Cooling system. i.e.
10.3.1 Radiator,
10.3.2 Radiator Pressure Cap,
10.3.3 Radiator expansion tank,
10.3.4 Hose ,
10.3.5 Water pump,
10.3.6 Water Jackets,
10.3.7 Thermostat valve,
10.3.8 fan Shroud,
10.3.9 Automatic Electric Fan,
10.3.10 Fluid Coupling fan,
10.3.11 Fan belt

10.4 Describe the Purpose and Characteristics of Anti-Freeze Coolant (Ethyleneglycol).
10.5 Describe Causes and remedies of Engine Cooling System Faults.

11 Understand the Purpose, Types , Construction & Working of an Engine Lubricating System.

11.1 State the Purpose of Engine Lubricating System.
11.2 Describe the types of Engine Lubricating System
11.2.1 Forced Feed
11.2.2 Splash System.

11.3 Describe the Construction and Working of each component of engine lubricating system. i.e.
11.3.1 Oil Sump,
11.3.2 Oil strainer,
11.3.3 Oil Pump and its types,
11.3.4 Oil pressure relief valve,
11.3.5 Oil Filter,
11.3.6 Oil gallery,
11.3.7 Oil pressure gauge and its circuit,
11.3.8 Cylinder oil passages
11.3.9 Oil return line.

11.4 Describe the function of engine oil.
11.5 Describe the engine oil Viscosity and viscosity index i.e. SAE-30.
11.6 Describe the Schedule for changing of engine oil.
11.7 Describe causes and remedies of engine lubricating system faults.

12 Understand the purpose, types , construction and working of petrol engine fuel system.

12.1 State the Purpose of Engine Fuel System.
12.2 Enlist and explain the Main Components of fuel system.

12.3 Enlist the main components of carburetor.
12.4 Describe the Basic Working Principle of Carburetor.

13 Understand the Purpose, Construction and Working of Petrol Engine Ignition System

13.1 State the Purpose of Engine ignition System.
13.2 Enlist the Main Components of ignition system.
13.3 Describe the purpose, construction and working of following components of ignition system. i.e.
13.3.1 Battery,
13.3.2 Ignition Switch,
13.3.3 Ballast resistor,
13.3.4 Ignition coil,
13.3.5 Distributor,
13.3.6 CB Points
13.3.7 Dwell angle,
13.3.8 Condenser,
13.3.9 High tension leads,
13.3.10 Spark plugs and its types
13.3.11 Firing orders.
13.4 Describe Causes and remedies of Engine Ignition System Faults.

14 Understand the construction and working of 4-stroke motorcycle engine

14.1 Enlist the main components of motorcycle.
14.2 Enlist the main components of motorcycle Engine.
14.3 Explain the working principle of motorcycle Engine.
14.4 Describe the construction and working of each component of Motorcycle.
14.5 Electric Bike Components
14.6 Working of Electric Bike
14.7 Advantage and Disadvantage of Electric Bike

AFM-123 I. C. ENGINES

List of Practicals:

1. Identify the main components of vehicle and sketch them.
2. Identify the main components of engine and sketch them.
3. Identify the main components of Piston and sketch them.
4. Measure the size of piston, piston pin, crankshaft main journal by using Vernier caliper and Micrometer.
5. Identify the parts of crankshaft & camshaft, and sketch them.
6. Disassemble & Assemble the cam shaft and crankshaft on engine block.
7. Measure the Swept Volume of given engine cylinder .
8. Practice to use Piston Ring Compressor.
9. Measure the size of Crankshaft Journal by Using Micrometer
10. Identify the Vehicle Lubricating Points and Lubricate them by using Grease Gun.
11. Perform the engine valve lapping and inspect the valves face and valve seat.
12. Check and adjust the engine valve clearance.
13. Practice to change the engine Oil.
14. Identify the engine cylinder liners.
15. Identify the intake and exhaust system parts and their location.
16. Identify the main components of engine cooling system and sketch them.
17. Identify the main components of engine lubricating system and sketch them.
18. Identify the main components of engine ignition system and sketch them.
19. Carry out the Complete overhauling of a 4-stroke Motorcycle engine.
20. Visit at Modern Automotive workshop to familiar with the working environment of Auto workshop.

AFM-133 AUTOMOTIVE ELECTRICITY & ELECTRONICS

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

Pre-requisite: Applied Physics

LEARNING OUTCOMES:

1. Know the basic principles of electricity and electronics
2. Recognize the different electrical units of an automobile
3. Repair and maintain the electrical and electronics units fitted on an automobile
4. Service, repair and maintain all types of batteries
5. Trace and rectify faults in electrical system of an automobile
6. Understand wiring diagrams of various makes of automobiles
7. Understand electronics devices, transistors, rectifiers, amplifiers, S.C.R; S.C.O; sensors and microprocessors.
8. Know the purpose of modern accessories.

Detail of Contents:

BASIC ELECTRICITY

1 Principle of basic electricity **4 Hours**

1.1 Atom and its particles (electron, neutrons& protons).
1.2 EMF
1.3 Voltage drop
1.4 Current
1.5 Resistance
1.6 AC & DC
1.7 Volt,
1.8 Ampere,
1.9 Ohm
1.10 Ohms law,
1.11 Capacitance.
1.12 Series and Parallel circuits and their characteristics.
1.13 Problems of series and parallel circuits using OHM's Law
1.14 Use of AVO meter
1.15 Color code scheme of Wires in electrical system
1.16 Electrical, electronic symbols used in vehicle electrical circuits.

2 Magnet, magnetism, conductor, insulator, semiconductor and their materials. 4 Hours

2.1 Magnet, magnetism and permanent magnet.
2.2 Electromagnet
2.3 Flux
2.4 Inductance
2.5 Mutual-induction
2.6 Conductance
2.7 Magnetic force
2.8 Conductor
2.9 Insulator
2.10 Semiconductor
2.11 Doping
2.12 Differentiate between p-type & n-type materials
2.13 Working of diode
2.14 Working of transistor

3 Storage battery its working and testing. 4 Hours

3.1 Battery and its types.
3.2 Construction of dry charged battery.
3.3 Construction of lead acid battery.
3.4 Chemical activities in lead acid battery.
3.5 Battery rating .
3.6 Effects of temperature on battery .
3.7 Service procedure of lead acid battery.
3.8 Procedure of preparation of electrolyte.
3.9 Methods of storage of batteries.
3.10 Lithium Battery, Construction, working and Life Cycle

4 Troubleshooting of batteries. 4 Hours

4.1 Factors effecting battery life.
4.2 Discharging, sulphation, internal short circuiting.
4.3 Battery failures.
4.4 Overcharging, causes of loss of water, discoloring of
4.5 Electrolyte and specific gravity variation.
4.6 Charging system of battery in vehicle.
4.7 Battery charging methods (series & parallel).
4.8 Problems of battery
- 4.8.1 Plucked off.
- 4.8.2 Deterioration of plates.
- 4.8.3 Cracking of container.
- 4.8.4 Corrosion of battery terminals and clamps.

5 Charging system AC & DC . 5 Hours

5.1 Charging system
5.2 Generator (dc & ac)
5.3 Components of dc generator
5.4 Construction & working of dc generator
5.5 Charging circuit of dc generator
5.6 Charging circuit of Hybrid and EV System
5.7 Construction and working of alternator
5.8 Charging circuit of alternator.
5.9 Half-wave and full-wave rectifier.
5.10 DC and AC Generator
5.11 Construction & working principle of Cut out Relay.
5.12 Voltage and current Regulator.

6 CB Point and Magneto ignition system. 5 Hours

6.1 Purpose, function of ignition system.
6.2 Types of ignition system.
6.3 Components of CB point's type ignition system.
6.4 Dwell angle, cam angle and ignition timing.
6.5 Advance mechanism and its types.
6.6 Construction, types, heat ranges of spark

7 Electronic ignition system. 6 Hours

7.1 Electronic ignition system.
7.2 Advantages of electronic ignition system.
7.3 Types of Electronic ignition system
7.4 Construction and working of
- 7.4.1 Pick -up Coil type.
- 7.4.2 Hall Effect ignition system.
- 7.4.3 Optical type
- 7.4.4 High energy ignition system (HEI)
- 7.4.5 Distributer less ignition system (DIS)
- 7.4.6 Coil on plug (Cop) ignition system
- 7.4.7 CDl system
- 7.4.8 Intelligent dual sequential ignition system.

7.5 Trouble shooting of Electronic ignition system

8 Starting system. 4 Hours

8.1 Push button start
8.2 Starting system.
8.3 Construction and working of starting system.

8.4 Function of each part of starting motor.
8.5 Types of starting Motors
- 8.5.1 Bendix drive
- 8.5.2 Lucus Drive
- 8.5.3 Gear reduction Drive

8.6 Construction and working of Solenoid switch
8.7 Starting circuit diagram.
8.8 Faults of Starting system.

9 Lighting system and its troubleshooting. 4 Hours

9.1 Function of the head light, tail light, brake light, fog light, backup light and vehicle interior lights.
9.2 Parts of head light
9.3 Aiming of headlight.
9.4 Automatic head light aiming.
9.5 Auto light control system.
9.6 Electrical wiring diagram of a car/vehicle using symbol & color code.

10 Construction & working of horn, windshield wiper & washer. 4 Hours

10.1 Horn circuit.
10.2 Method of fault finding and adjustment of horn .
10.3 Working of wind shield wiper system.
10.4 Faults of wiper system.
10.5 Wiper with rain drop sensor system.
10.6 Rear screen wiper.

11 Working of instrument panel gauges, meters, & warning lights. 3 Hours

11.1 Describe the Working of fuel gauge.
11.2 Describe the Working of Engine temperature gauge
11.3 Describe cruise control.
11.4 Describe the Working of Engine Cooling system Electric Fan.
11.5 Describe the Working of Engine oil pressure Light .and Gauge.
11.6 Different warning lights.
- 11.6.1 Low oil pressure light.
- 11.6.2 Charging system light.
- 11.6.3 Engine Malfunction Light (MIL)
- 11.6.4 Gear Selected indicator Light

11.7 Purpose of following dash board meters.
- 11.7.1 Digital Speedo meter.
- 11.7.2 Odometer
- 11.7.3 Tachometer.

BASIC ELECTRONICS

12 Transistor, thermistors, thyristors and their applications. 4 Hours

12.1 Transistor.
12.2 Working of PNP-Transistor and NPN-Transistor.
12.3 Oscillator and their uses.
12.4 Working and use of Silicon Control rectifier (SCR).
12.5 DIAC
12.6 TRIC.

13 Logic gates/ integrated circuit. 3 Hours

13.1 Electronic Logic Gates.(AND, OR, NOT,NAND,NOR)
13.2 Printed circuit and integrated circuit (IC).

14 Purpose and application of different types of sensors in automotive. 3 Hours

14.1 Sensor and its importance in automotive
14.2 Types of sensors.
14.3 Purpose of different sensors .
- 14.3.1 Voltage generating sensors
- 14.3.2 Zirconium dioxide sensors
- 14.3.3 Piezoelectric sensors
- 14.3.4 Magnetic sensors.
- 14.3.5 Reference voltage sensor
- 14.3.6 Potentiometers.
- 14.3.7 Switches.
- 14.3.8 Thermistors

15 Microcomputers. 3 Hours

15.1 Micro Computers.
15.2 Components of Microcomputer.
- 15.2.1 Microprocessor
- 15.2.2 Memory
- 15.2.3 Programmable Read Only Memory (PROM)
- 15.2.4 Keep alive memory
- 15.2.5 Electronically Erasable PROMES (EEPROMS)
- 15.2.6 Input Device.
- 15.2.7 Output Device.

15.3 Explain operation of a Microcomputer

16 Automotive accessories **4 Hours**

16.1 State the vehicle following accessories.

16.1.1 Vehicle immobilizer system.
16.1.2 Vehicle navigation system.
16.1.3 Vehicle communication system.
16.1.4 Vehicle tracking system.
16.1.5 Power window system.
16.1.6 Night vision mode.
16.1.7 Climate control system.
16.1.8 Key less entry system
16.1.9 Cigarette lighter.
16.1.10 Central locking door system.
16.1.11 Power side mirror.
16.1.12 Vehicle rear camera.
16.1.13 Child door lock system.
16.1.14 Rear screen defogger.
16.1.15 Glass embedded point antenna
16.1.16 Door suction system.
16.1.17 Supplementary restraint system (SRS).
16.1.18 Heated rear window system.
16.1.19 Auto light control system (Head lights turn on automatically according to the level of darkness)
16.1.20 EBD
16.1.21 HAC (Hill-start Assist Control)
16.1.22 MCB (Multi-Collision Braking)

Recommended Textbooks:

1. Automotive Electrical and Electronic systems by Frank C. Derato
2. Automotive Electricity & Electronics by Barry Hollembea

AFM-133 AUTOMOTIVE ELECTRICITY & ELECTRONICS

Instructional Objectives:

BASIC ELECTRICITY

1 Understand the principle of basic electricity.

1.1 Describe atom and its particles (electron, neutrons& protons).
1.2 Describe EMF
1.3 Describe Voltage drop
1.4 Describe Current
1.5 Describe Resistance
1.6 Describe AC & DC
1.7 Describe Volt,
1.8 Describe Ampere,
1.9 Describe Ohm ,
1.10 Describe Ohms law,
1.11 Describe Capacitance.
1.12 Explain Series and Parallel circuits and their characteristics.
1.13 Solve problems of series and parallel circuits using OHM's Law
1.14 Describe the use of AVO meter .
1.15 Color code scheme of Wires in electrical system
1.16 Enlist all electrical, electronic symbols used in vehicle electrical circuits.

2 Understand magnet, magnetism, conductor, insulator, semi conductor and their materials.

2.1 Define magnet, magnetism and permanent magnet.
2.2 Define electromagnet.
2.3 Define flux,
2.4 Describe inductance,
2.5 Describe mutual induction
2.6 Describe conductance
2.7 Explain magnetic force.
2.8 Explain conductor,
2.9 Describe insulator
2.10 Describe semiconductors.
2.11 Define doping.
2.12 Differentiate between p-type & n-type materials.
2.13 Describe the construction and working of diode
2.14 Describe transistor.

3 Understand the storage battery and its working and testing.

3.1 Define battery and its types.

3.2 Describe the construction of dry charged batteries.
3.3 Describe the construction of Lead Acid Battery.
3.4 Describe the chemical activities in Lead Acid Battery.
3.5 Describe the battery rating.
3.6 State the effects of temperature on battery.
3.7 Discuss the service procedure of Lead acid battery.
3.8 Describe the procedure of preparation of electrolyte.
3.9 State the methods of storage of batteries.
3.10 Lithium Battery, Construction, working and Life Cycle

4 Understand the troubleshooting of batteries

4.1 Describe the Factors affecting battery life.
4.2 Define self-discharging, sulphation, internal short circuiting.
4.3 Discuss causes of battery failures.
4.4 Discuss the overcharging, causes of loss of water, discoloring of
4.5 Electrolytes, plates and specific gravity variation.
4.6 Describe the charging system of battery in vehicle.
4.7 State the battery charging methods (series & parallel).
4.8 Identify the following problems of a battery
- 4.8.1 Plucked off.
- 4.8.2 Deterioration of plates.
- 4.8.3 Cracking of container.
- 4.8.4 Corrosion of battery terminal and clamps.

5 Understand charging system AC & DC.

5.1 State the purpose of charging system
5.2 Define Generator (DC & AC)
5.3 Enlist the components of DC generator
5.4 Describe the construction & working of DC generator
5.5 Charging circuit of DC generator
5.6 Charging circuit of Hybrid and EV System
5.7 Explain the construction and working of Alternator
5.8 Describe half-wave and full-wave rectifier.
5.9 Differentiate DC and AC Generator
5.10 State the construction & working principle of Cut out Relay.
5.11 Trouble shooting of DC, & AC Generator
5.12 Trouble shooting of current and Voltage Regulator.

6 Understand CB Point and Magneto ignition system.

6.1 Explain the purpose, function of ignition system.
6.2 Enlist the types of ignition system.
6.3 Enlist the components of C.B point's type ignition system.
6.4 Describe dwell angle, cam angle and ignition timing.
6.5 Describe the advance mechanism and its types.

6.6 Describe the construction, types, heat ranges of spark plug.

7 Understand the electronic ignition system.

7.1 Define electronic ignition system.
7.2 State the advantages of electronic ignition system.
7.3 Enlist the types of electronic ignition system
7.4 Describe the construction and working of
- 7.4.1 Pick -up Coil type.
- 7.4.2 Hall Effect ignition system.
- 7.4.3 Optical type
- 7.4.4 High energy ignition system (HEI)
- 7.4.5 Distributer less ignition system (DIS)
- 7.4.6 Coil on plug (Cop) ignition system
- 7.4.7 Capacitor discharge ignition (CDl) system
- 7.4.8 Intelligent dual sequential ignition system.

7.5 Trouble shooting of Electronics ignition system.

8 Understand the starting system.

8.1 Describe the Push button start
8.2 Define starting system.
8.3 Explain the construction and working of starting system.
8.4 Enlist and define the function of each part of Starting motor.
8.5 Enlist the types of starting motor.
- 8.5.1 Bendix drive
- 8.5.2 Lucus Drive
- 8.5.3 Gear reduction Drive

8.6 Explain the construction and working of Solenoid switch
8.7 Draw the starting circuit diagram.
8.8 Identify the faults of Starting system.

9 Understand Lighting system and its trouble shooting.

9.1 State the function of the head light, tail light, brake light, fog light, backup light and vehicle interior lights.
9.2 Enlist the parts of Head Light
9.3 Explain aiming of headlight.
9.4 Describe automatic headlight aiming.
9.5 Describe an auto light control system.
9.6 Draw the electrical wiring diagram of a car/vehicle using symbol & color code.

10 Understand construction & working of horn, windshield wiper & washer.

10.1 Describe Horn circuit.

10.2 Explain the method of fault finding and adjustment of horn.
10.3 Describe the construction and working of wind shield wiper system.
10.4 Identify the faults of wiper system.
10.5 Define wiper with rain drop sensor system.
10.6 Define rear screen wiper.

11 Understand the construction & working of instrument panel gauges, meters, & warning lights.

11.1 Describe the Working of fuel gauge.
11.2 Describe the Working of Engine temperature gauge.
11.3 Describe cruise control.
11.4 Describe the Working of Engine Cooling system Electric Fan.
11.5 Describe the Working of Engine oil pressure Light .and Gauge.
11.6 State purpose of different warning lights.
- 11.6.1 Low oil pressure light.
- 11.6.2 charging system light.
- 11.6.3 Engine Malfunction Light (MIL)
- 11.6.4 Gear Selected indicator Light

11.7 State the Purpose of following dashboard meters.
- 11.7.1 Digital Speedo meter.
- 11.7.2 Odometer
- 11.7.3 Tachometer.

BASIC ELECTRONICS

12 Understand transistors, thermistors, thyristors and their applications.

12.1 Define transistor.
12.2 Describe the construction & working of PNP-Transistor and NPN-Transistor.
12.3 Define Oscillator and their uses.
12.4 Explain the working and use of Silicon Control rectifier (SCR).
12.5 Define DIAC
12.6 TRIC.

13 Understand logic gates/ integrated circuit.

13.1 Describe the purpose, application, and working of following electronic Logic Gates. (AND, OR, NOT, NAND, NOR)
13.2 Describe printed circuits and integrated circuit (IC).

14 Understand the purpose and application of different types of sensors in automotive.

14.1 Define a sensor and its importance in automotive
14.2 Enlist types of sensors.
14.3 State the Purpose of different sensors.
- 14.3.1 Voltage generating sensors
- 14.3.2 Zirconium dioxide sensors
- 14.3.3 Piezoelectric sensors
- 14.3.4 Magnetic sensors.
- 14.3.5 Reference voltage sensor
- 14.3.6 Potentiometers.
- 14.3.7 Switches.
- 14.3.8 Thermistors

15 Understand microcomputers.

15.1 Define Micro Computers.
15.2 State the function of following components of Microcomputer.
- 15.2.1 Microprocessor
- 15.2.2 Memory
- 15.2.3 Programmable Read Only Memory (PROM)
- 15.2.4 Keep alive memory
- 15.2.5 Electronically Erasable PROMES (EEPROMS)
- 15.2.6 Input Device.
- 15.2.7 Output Device.

15.3 Describe briefly the operation of a Microcomputer.

16 Automotive accessories.

16.1 State the vehicle following accessories.
- 16.1.1 Vehicle immobilizer system.
- 16.1.2 Vehicle navigation system.
- 16.1.3 Vehicle communication system.
- 16.1.4 Vehicle tracking system.
- 16.1.5 Power window system.
- 16.1.6 Night vision mode.
- 16.1.7 Climate control system.
- 16.1.8 Key less entry system
- 16.1.9 Cigarette lighter.
- 16.1.10 Central locking door system.
- 16.1.11 Power side mirror.
- 16.1.12 Vehicle rear camera.
- 16.1.13 Child door lock system.
- 16.1.14 Rear screen defogger.

16.1.15Glass embedded point antenna
16.1.16Door suction system.
16.1.17Supplementary restraint system (SRS).
16.1.18Heated rear window system.
16.1.19Auto light control system (Head lights turn on automatically according to the level of darkness)
16.1.20EBD
16.1.21HAC (Hill-start Assist Control)
16.1.22MCB (Multi-Collision Braking)

AFM-133 AUTOMOTIVE ELECTRICITY AND ELECTRONICS

List of Practicals:

1. Make electromagnet (Solenoid).
2. Verify OHM'S Law.
3. Make series and parallel circuits on a bench board.
4. Disassemble unserviceable Lead acid Battery and identify its parts.
5. Measure voltage of a battery.
6. Measure Current of a Circuit.
7. Prepare electrolyte for Lead Acid Battery.
8. Check the Specific gravity of electrolyte of a battery.
9. Charge the batteries in series and parallel using Battery Charge
10. Identify the Problems of Charging System.
11. Check Starting Motor Solenoid Switch (i) Pull-in (ii) Hold-in Windings.
12. Disassemble and assemble DC Generator.
13. Disassemble Alternator and check the Stator winding
14. Adjust the Head Light aiming.
15. Make the Horn Circuit on a Bench board.
16. Make the Head Light Circuit on a Bench board.
17. Identify the Sensors , Actuators and Microcomputer on Vehicle
18. Visit at modern automotive workshop to familiar how modern electronic diagnostic equipment are being used to find out the faults of vehicle electrical systems.
19. Prepare a project (circuit/system) relevant to the subject (This activity may be performed in a group of students)

COMP-152 **COMPUTER APPLICATIONS**

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

Pre-requisites: None

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

Course Contents:

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

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

2. MS-WINDOWS 10 2 Hrs

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

3. MS-OFFICE (MS-WORD -2016) 8 Hrs

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

3.11 Insert the Table and it's Editing
3.12 Printing the document
3.13 Saving a document file as PDF format

4. MS-OFFICE (MS-EXCEL -2016) 9 Hrs

4.1 Introduction to MS-Excel & its Screen
4.2 Entering data & apply formulas in worksheet
4.3 Editing & Formatting the Cells, Row & Colum
4.4 Insert Graphs in sheet
4.5 Page setup, Print Preview & Printing
4.6 Types & Categories of Charts

5. MS. OFFICE (MS-POWER POINT- 2016) 4 Hrs.

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

6. INTERNET & E-MAIL 3Hrs

6.1 Introduction to Internet & browser window
6.2 Searching, Saving and Print a page from internet
6.3 Creating, Reading & Sending E-Mail
6.4 Drop Box / Online/ Sky drive/ Cloud data etc.
6.5 File attachment.
6.6 Uploading and downloading file(s) and software(s)
6.7 Explain some advance features over the internet and search engines
6.8 Difference between Internet, Intranet and Extranet

Recommended Textbooks:

1. Bible Microsoft Office 2016 by John Walkenbach
2. Bible Microsoft Excel 2016 by John Walkenbach
3. Bible Microsoft PowerPoint 2016 by John Walkenbach

COMP-152 COMPUTER APPLICATIONS

Instructional Objectives:

1. **UNDERSTAND ELECTRONIC DATA PROCESSING (E.D.P)**
   - 1.1. Describe Basic Terms of Computer Science. Data & its Types, Information, Hardware, Software
   - 1.2. Explain Computer & its types
   - 1.3. Generations of Computers
   - 1.4. Explain Block diagram of a computer system
   - 1.5. State the terms such as BIT, Byte, RAM & ROM
   - 1.6. Identify Input & Output devices
   - 1.7. Describe Secondary Storage devices
   - 1.8. Explain Types of Software
   - 1.9. Introduction to Programming Language
   - 1.10. Explain Applications of computer in different fields
   - 1.11. Application in Engineering, Education & Business
2. **UNDERSTAND MS-WINDOWS 10**
   - 2.1 Explain Introduction to Windows
   - 2.2 How to install Drivers in Windows
   - 2.3 Describe Loading & Shut down process
   - 2.4 Explain Introduction to Desktop items (Creation of Icons, Shortcut, Folder & modify Taskbar)
   - 2.5 Explain Desktop properties
   - 2.6 Describe use of Control Panel (add/remove program, time & date, mouse and create user account)
   - 2.7 Explain the method of searching a document
3. **UNDERSTAND MS-OFFICE (MS-WORD – 2016)**
   - 3.1 Explain Introduction to MS-Office
   - 3.2 Describe -Introduction to MS-Word & its Screen
   - 3.3 Describe create a new document
   - 3.4 Explain Editing & formatting the text
   - 3.5 Describe saving & Opening a document
   - 3.6 Explain Page setup, (Set the Margins & Paper)
   - 3.7 Describe Spell Check & Grammar
   - 3.8 Explain Paragraph Alignment
   - 3.9 Explain Inserting Page numbers, Symbols, Text box & Picture in the document
   - 3.10 Describe Use the different Format menu drop down commands (Drop Cap, Change Case, Bullet &Numbering and Border & Shading)
   - 3.11 Explain Insert the Table and its Editing and modifying
   - 3.12 Describe printing the document
   - 3.13 Describe the method of file saving as a PDF Format
4. **UNDERSTAND MS-OFFICE (MS-EXCEL- 2016)**
   - 4.1 Explain Introduction to MS-Excel & its Screen

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

5. UNDERSTAND MS-OFFICE (MS-POWER POINT-2016)

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

6. UNDERSTAND INTERNET &E-MAIL

6.1 Explain Introduction to Internet and browser window
6.2 Explain Searching, Saving and Print a page from internet
6.3 Describe Creating, Reading & Sending E-Mail
6.4 Interpret Drop Box / Online/ Sky drive/ Cloud data etc.
6.5 File attachment.
6.6 Uploading and downloading file(s) and software(s)
6.7 Explain some advance features over the internet and how to search topics on different search engines
6.8 Enlist the Difference between Internet, Intranet and Extranet

COMP-152 **COMPUTER APPLICATIONS**

List of Practical:

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

2. **MS WINDOWS 10** **12 Hrs**
   - 2.1 Practice of loading and shutdown of operating system
   - 2.2 How to install Drivers in Windows
   - 2.3 Creating items (icons, shortcut, folders etc) and modifying taskbar
   - 2.4 Changing of wallpaper, screensaver, and resolution
   - 2.5 Practice of control panel items (add/remove, time and date, mouse, and create user account)

3. **MS OFFICE (MS-WORD 2016)** **27 Hrs**
   - 3.1 Identifying the MS Word Screen and its menu
   - 3.2 Practice of create a new document, saving and re-opening it from the location and spell check & grammar
   - 3.3 Practice of Page Formatting (Borders, Character Spacing, Paragraph, Bullets & Numberings and Fonts)
   - 3.4 Practice of different tool bars like standard, format& drawing tool bars
   - 3.5 Practice of Insert pictures, clipart, and shapes
   - 3.6 Practice of header and footer
   - 3.7 Practice of insert table and also format of table
   - 3.8 Practice of page setup, set the page margins, and printing documents

4. **MS OFFICE (MS-EXCEL 2016)** **27 Hrs**
   - 4.1 Identifying the MS EXCEL Screen and its menu
   - 4.2 Practice of create a new sheet, saving and re-opening it from the location and spell check
   - 4.3 Practice of insert and delete of row and columns (format of cell)
   - 4.4 Practice of entering data and formulas in worksheet (Add, Subtract, Multiplying, and Divide & Average)
   - 4.5 Repeating practical serial number04
   - 4.6 Practice of insert chart and its types
   - 4.7 Practice of page setup, set the page margins, and printing

5. **MS OFFICE (MS-POWER POINT 2016)** **15 Hrs**
   - 5.1 Identifying the MS POWER POINT Screen and its menu
   - 5.2 Practice of create a new presentation and save
   - 5.3 Practice of open saves presentations
   - 5.4 Practice of inset picture and videos

6. **INTERNET & E-MAIL** **12 Hrs**
   - 6.1 Identifying internet explorer
   - 6.2 Practice of searching data from any search engine
   - 6.3 Practice of create an E-Mail account and how to send and receive mails, download attachments
   - 6.4 File attachment.
   - 6.5 Uploading and downloading file(s) and software(s)

Mech-122 BASIC ENGINEERING DRAWING

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

Pre-requisite: N/A

LEARNING OUTCOMES:

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

1. Fundamentals of Engineering Drawing used in the various fields of industry especially in the Auto and Farm Machinery.
2. Familiarize with the use of conventional drawing equipment as well as the modern techniques used for this subject.

Detail of Contents:

1 Application of Technical Drawing **2 Hours**

- 1.1 Importance of Technical Drawing
- 1.2 Language of engineering terminology
- 1.3 Uses of Technical Drawing
- 1.4 Types of Drawing
- 1.5 Application of Technical Drawing.

2 Drafting Equipment, Construction Uses, and Care **2 Hours**

- 2.1 Introduction and importance of drafting equipment
- 2.2 List of drawing equipment
- 2.3 Construction, uses and care of all equipment
- 2.4 Drafting board, Table and machine
- 2.5 Tee, Triangles and protractors
- 2.6 Instruments Box and its accessories
- 2.7 Drawing Pencil, their grading, sharpening and using techniques
- 2.8 Scale and its types.

3 Types of Lines **2 Hours**

- 3.1 Basic lines
- 3.2 Importance of lines
- 3.3 Common Types of lines
- 3.4 Uses and correct line weight age
- 3.5 Use of pencil for different lines
- 3.6 Application of lines
- 3.7 Objectives in drafting

4 Lettering **3 Hours**

4.1 Importance of a good lettering
4.2 General Proportion of lettering
4.3 Composition of letters
4.4 Guide lines
4.5 Classification of lettering
4.6 Style of letters
4.7 Lettering devices

5 Drafting Geometry **2 Hours**

5.1 Introduction to geometry, plane and solid type
5.2 Definition of terms
5.3 Different conventional shapes, surfaces and objects
5.4 Basic geometrical construction

6 Sketching and shape description **2 Hours**

6.1 Introduction to sketching techniques
6.2 Techniques of sketching straight lines in different directions
6.3 Sketching circles and arcs
6.4 Sketching Ellipse
6.5 Sketching of pictorial views
6.6 Proportions in sketching

7 Engineering Curves **3 Hours**

7.1 Introduction to the curve
7.2 Application of engineering curves
7.3 Cone and conic section
7.4 Spiral and Involutes
7.5 Cycloid, Epicycloids, Hypocycloid

8 Introduction to multi-view drawings **5 Hours**

8.1 Introduction to the plane and its types
8.2 Dihedral and Trihedral angles
8.3 Projection of point, lines, plane and solids
8.4 Definition and concept of multi-view drawings
8.5 Perceptual views of plan of projections
8.6 Orthographic projections
8.7 1st angle and 3rd angle projection
8.8 Principal views and its arrangements
8.9 Multi-view drawings and missing lines

9 Introduction to Pictorial drawing **5 Hours**

9.1 Uses of pictorial/3D
9.2 Three types of pictorial views
9.3 Isometric sketching of rectangular block with Arcs and circles
9.4 Oblique sketching of rectangular block
9.5 One point perspective sketching of rectangular block
9.6 Two points perspective sketching of rectangular block
9.7 Preparation of pictorial drawings of simple objects

10 Basic Dimensioning **3 Hours**

10.1 Definition of dimensioning
10.2 Types of dimensioning
10.3 Elements of dimensioning
10.4 System of measurements
10.5 Dimensioning of multi view drawing
10.6 Dimensioning pictorial views
10.7 Dimensioning rules and practices
10.8 Note & specification.

11 Development of Orthographic Projections **3 Hours**

11.1 Introduction to the surface development
11.2 Methods to develop the surfaces
11.3 Application of Orthographic Projections in Packaging Industry
11.4 Geometrical solids and development

Recommended Textbooks:

1. Mechanical Drawing (12th Addition) by French. Svensen, Helsel and Urbanick
2. Drafting Fundamentals by scot. Foy, Schwendan
3. Engineering Drawing and Design 2nd addition by Cecil Jenson / Jay Helsel
4. Engineer Drawing by M.B. Shah (B.C.Rana)

Mech-122 BASIC ENGINEERING DRAWING

Instructional Objectives:

1 Know the application of Technical Drawing

1.1 Describe the technical drawing and its importance
1.2 Describe the role of Inventor, Engineer, Designer, Technician, Craftsman etc.
1.3 Describe the uses of drawing in manufacturing and construction fields
1.4 Describe the free hand and instrumental drawing
  1.4.1 Explain the types of instrumental drawing
  1.4.2 Describe Multi-view, Pictorial and Schematic drawing
1.5 Recognize the different application of technical drawing

2 Know and use the common Drafting equipment and accessories

2.1 Explain the introduction and importance of drafting equipment
2.2 Identify the different instruments used in drafting
2.3 Describe the construction, uses and care of all equipment
2.4 Describe the Drafting Board, Table and Drafting machine
2.5 Explain the Tee, Triangles and Protractor
2.6 Describe the Compasses Divider, Lengthening Bar, Attachments etc.
2.7 Describe the use of pencils, their Grading and sharpening techniques
2.8 Explain the scale and its different types

3 Understand the Types of lines, correct weight age and their application in technical Drawings.

3.1 Describe the point, line and types of straight lines
3.2 Describe the importance of lines
3.3 Describe the common types of lines
3.4 Identify the each line characteristics
3.5 Describe Horizontal, Vertical and inclined lines with proper grade pencil
3.6 Describe each line with his correct weight
3.7 Describe the objectives in drafting, Accuracy, Speed, Legibility and Neatness

4 Applies the good lettering on a drawing

4.1 Know the importance of good lettering in Engineering drawing
4.2 Know the general proportion of lettering such as normal, condensed and extended lettering
4.3 Describe and Identify the composition of letters
  4.3.1 Perform the best spacing between letters and words
  4.3.2 State the size and stroke of a letter
4.4 Describe the Guide lines
4.5 Describe the Gothic, Roman and free hand lettering

4.5.1 Print single stroke, Double stroke lettering, Light face, Bold face lettering, Upper case, Lower case lettering

4.6 Print vertical and Inclined style of Gothic lettering
- 4.6.1 State the proper pencil for lettering with holding techniques
- 4.6.2 Describe the general rules for lettering

4.7 Describe and use of different lettering devices such as lettering guide and lettering instrument

5 Apply drawing skill with the aid of drawing instruments in geometrical construction

5.1 Define the concept of common terms used in Geometrical construction
5.2 Explain different geometrical shapes, surfaces of objects
5.3 Bisecting a line, angles
5.4 Describe basic geometrical constructions
- 5.4.1 Define Triangles, Quadrilateral, Polygons
- 5.4.2 Name and draw the parts of circle

6 Understand sketching of circles, arcs and view of objects

6.1 Describe sketching material
6.2 State Sketching Technique of Horizontal, Vertical and inclined lines
6.3 Describe circular arc using circular line method
6.4 Draw a circular arc using square method
6.5 Draw an ellipse using rectangular method
6.6 Described the sketching of pictorial views
6.7 Proportions in sketching of views
6.8 Enlargement and Reduction

7 Know and draw the different Engineering Curves used in various mechanism

7.1 Describe the different engineering curves
7.2 Describe the application of different Engineering curves
7.3 Define cone and conic sections
- 7.3.1 Describe the Ellipse, Parabola & Hyperbola by different methods

7.4 Define the Archimedean Spiral and involutes
- 7.4.1 Define the Involutes curves of square, Triangle, Circle and Hexagon

7.5 Describe the Cycloid curves
- 7.5.1 Define Cycloid, Epicycloids and Hypocycloid curves

8 Understand the multi-view projections of specific object

8.1 Describe the plane and its types
8.2 Define Dihedral and Trihedral angles
8.3 Explain the projection of point, lines, plane and solids in different shapes
8.4 Define the concept of multi-view drawings

8.5 Know the Plane of projections
8.6 Know the orthographic method of projection
8.7 Explain the 1st and 3rd angle projections
8.8 State six principal views
8.9 Practice of multi-view projections and missing lines

9 Apply the use, types and methods of pictorial views

9.1 Describe the importance of pictorial views
9.2 State three types of pictorial drawings
9.3 Describe isometric view of rectangular blocks, arcs, circles
9.4 Describe oblique sketching of a rectangular blocks
9.5 Describe one point perceptive view of rectangular block
9.6 Describe two point perspective view of a rectangular block
9.7 Prepare/draw pictorial drawings of simple objects

10 Apply good dimensioning on multi-view and pictorial drawings

10.1 Define dimensioning
10.2 Identify the types of dimensioning
10.3 Enlist the elements of dimensioning
10.4 Identify the system of measurements
10.5 Indicate complete dimension on multi-view drawings
10.6 Indicate complete dimension on pictorial drawings
10.7 Follow the general rules of dimensioning
10.8 Indicate notes and specification or multi-view drawings

11 Know the surface development and their procedure to develop and its role in packing industry

11.1 Define the surface development
11.2 Describe the methods to draw the development
  11.2.1 Parallel line or Rectangle method
  11.2.2 Radial line or Triangle method
  11.2.3 Triangulation method
11.3 Explain the role of development in Packaging Industry
11.4 Define and draw the different Geometrical solids and their development

Mech-122 BASIC ENGINEERING DRAWING

List of Practical:

1. Practice of single stroke capital vertical & inclined lettering
2. Double stroke lettering
3. Use of tee-square and set squares for drawing horizontal, vertical and inclined lines
4. Use of compass, circles, half circles, radius
5. Different types of drawing lines
6. Construction of angles and triangles
7. Construction of quadrilaterals and circles elements
8. Draw of inscribe and circumscribe figures (square, triangle and hexagon)
9. Construction of pentagon by different methods
10. Draw of hexagon, Octagon by general and different methods
11. Construction of ellipse by four different methods
12. Construction of parabola curve by four different methods
13. Draw of hyperbola curve
14. Construction of Archimedean Spiral curve
15. Draw of involutes curve of square rectangle hexagon and circle
16. Construction of cycloid, epicycloids, and hypocycloid
17. Orthographic projection 1st and 3rd angle wooden block-1
18. Orthographic projection 1st and 3rd angle wooden block-2
19. Orthographic projection 1st and 3rd angle wooden block-3
20. Orthographic projection and Isometric Drawing
21. Orthographic projection and Oblique Drawing
22. Construction of perspective drawings (One point, Two Point, Three Point)
23. Construction of multi view drawing of Gland
24. Construction of multi view drawing of Simple Bearing
25. Construction of multi view drawing of Open Bearing
26. Missing lines and portions on given views
27. Development of prism
28. Development of cylinder
29. Development of cone
30. Development of pyramid
31. Reading of various complex Drawings
32. Replicate Industrial Drawings

GEN-201

اسلامیات/مطالعہ پاکستان

نصاب سال دوئم

حصہ اول اسلامیات

حصہ دوئم مطالعہ پاکستان

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1	0	1

کل وقت 20 گھنٹے:

موضوعات:

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

2۔ دس منتخب احادیث مع ترجمہ وتشریح

() خیر کم من تعلم القرآن و علمه

() لا ایمان لمن لا امانته له ولا دین لا من لا اعهد له

() و یاکم و الظن ان الظن اکرب الحدیث

() من احدث فی امرنا هذا ما لیس منه فهورد

() من حمل علینا السلاح فلیس منا

() انا و کافل الیتیم فی الجنه

() لا ضرور ولا ضرار فی السلام

() کلکم راع و کلکم راع و کلکم مسول عن رعیته

3۔ سیرۃ طیبہ

() مکی زندگی۔ولادت۔بعثت۔ہجرت

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

4۔ حضورﷺ بحیثیت

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

() معلم کامل۔سربراہ خاندان

5۔ اسلامی معاشرہ

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

جہاد۔کسب حلال۔مسجد(اہمیت وفضیلت)

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

اسلامیات

تدریس مقاصد:

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

() قرآن مجید () منتخب آیات قرآنی

خصوصی مقاصد:

() قرآنی آیات کا ترجمہ

() قرآنی آیات کی تشریح

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

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

احادیث نبوی:

عمومی مقاصد:

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

خصوصی مقاصد:

() احادیث کا ترجمہ بیان کر سکے

() احادیث کی تشریح کر سکے

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

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

سیرت طیبہ:

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

خصوصی مقاصد:

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

() حضورﷺ کی ہجرت کا واقع بیان کر سکے

() حضورﷺ کی مدنی زندگی اختصار سے بیان کر سکے

() حضورﷺ کی بطور معلم خصوصیات بیان کر سکے

() حضور ﷺ کی بطور سربراہ بیان کر سکے

حضور ﷺ بحیثیت

() خطبہ حجۃ الوداع۔ انسانی حقوق کا اعلامیہ رحقوق 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 ومفہوم کر سکے

() اسلامی معاشرہ کی امتیازی خصوصیات بیان کر سکے

() اسلامی معاشرہ میں عدل واحسان کی اہمیت بیان کر سکے

() تبلیغ کے لغوی معنی بیان کر سکے

() تبلیغ کی اہمیت اور ضرورت بیان کر سکے

() جہاد کے لفظی واصطلاحی 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 کی 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
حصہ دوم

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1	0	1

کل وقت 12 گھنٹے

موضوعات:

() دوقومی نظریہ
() تحریک پاکستان
() انڈین کانگریس
() مسلم لیگ
() تقسیم بنگال
() میثاق لکھنو
() تحریک خلافت
() سندھو تحریک
() تجاویز دہلی
() نہرو رپورٹ
() قائداعظم کے چودہ نکات
() خطبہ آلہ آباد
() انتخابات 1938 اور انتقال اقتدار
() قرارداد پاکستان

حصہ دوم

مطالعہ پاکستان

تدریس مقاصد:

تحریک پاکستان:

عمومی مقاصد:

() قیام پاکستان کے اسباب 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 بیان کریں

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

() مسلم لیگ کے قیام پاکستان کے لیے جدو جہد بیان کر سکے

(غیر مسلم طلباء کے لیے)

نصاب اخلاقیات

ٹی	پی	سی
1	0	1

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 کو قبول 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 وجذبہ۔وسیع النظری۔بے غرض۔انسانی دوستی شعور۔پاس آزادی۔کامل آگاہی اور خود شناسی کی اہمیت

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

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

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

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

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

Tarjumat-ul-Quran / Civics-II

TTQ-211 / Civic-211;

T	P	C
1	0	1

Total Contact Hours:

Theory: **32**
Practical: **0**

Note: Syllabi for this subject would be as per BISEs/General education, developed by Punjab Curriculum TextBook Board (PCTB)

CH-213 APPLIED CHEMISTRY

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

LEARNING OUTCOMES.

After studying this course a student will be able to:

1. Understand significance and role of chemistry in the development of modern technology.
2. Become acquainted with the basic principles of chemistry as applied in the study of relevant technology.
3. Know scientific methods for production, properties and use of materials of industrial & technological significance.
4. Gain skill for the efficient conduct of practical in a chemistry lab.

Details of Contents:

1 Introduction. 4 Hours

1.1 Scope and significance of the subject.
1.2 Orientation with reference to this technology.
1.3 Terms used & units of measurements in the study of chemistry.

2 Fundamental concepts of chemistry. 4 Hours

2.1 Symbols, Valency, Radicals, formulas.
2.2 Chemical Reactions & their types.
2.3 Balancing of equations by ionic method.

3 Atomic structure. 4 Hours

3.1 Sub-atomic particles.
3.2 Architecture of atoms of elements, Atomic No. and Atomic weight.
3.3 Periodic classification of elements, periodic law.

4 Chemical bond. 4 Hours

4.1 Nature of Chemical Bond.
4.2 Electrovalent bond with examples.
4.3 Covalent Bond (Polar and Non-polar) sigma & Pi Bonds. with examples.
4.4 Co-ordinate Bond with examples.

5 Gases and liquids. 4 Hours

5.1 The liquid and gaseous state.
5.2 The Liquids and their general properties (Density, viscosity, surface tension capillary action etc.)
5.3 Gases and their general properties.
5.4 Gas laws (Boyle's law, Charle's law & Graham's law of diffusion).
5.5 Problems involving gas laws.

6 Water. 4 Hours

6.1 Chemical nature and properties.
6.2 Impurities.
6.3 Hardness of water (types, causes & removal)
6.4 Scales of measuring hardness (Degrees Clark, French, PPM, Mg-per liter).
6.5 Boiler feed water, scales and treatment.

7 Acids, bases and salts. 4 Hours

7.1 Definitions with examples.
7.2 Properties, their strength, Basicity & Acidity.
7.3 Salts and their classification with examples.
7.4 pH-value and scale.

8 Oxidation & reduction. 4 Hours

8.1 The process, definition & scope with examples.
8.2 Oxidizing and Reducing agents.
8.3 Oxides and their classification.

9 Nuclear chemistry. 4 Hours

9.1 Introduction.
9.2 Radioactivity (alpha, beta & gamma rays).
9.3 Half-life process.
9.4 Nuclear reaction & transformation of elements.
9.5 Isotopes and their uses.

10 Alloys. 4 Hours

10.1 Introduction with need.
10.2 Preparation and properties.
10.3 Some important alloys and their composition.
10.4 Uses.

11 Fuels. 4 Hours

11.1 Introduction with their significance.

11.2 Solid fuels.
11.3 Liquid Fuels.
11.4 Gaseous Fuels.

12 Corrosion. **4 Hours**

12.1 Introduction, causes and types.
12.2 Rusting of iron.
12.3 Corrosion control.

13 Metallurgy. **4 Hours**

13.1 General processes/operation of metallurgy.
13.2 Chemistry of Iron, copper and Aluminum with their Ores.
13.3 Ores, extraction and metallurgy of iron.
13.4 Cast iron, Wrought iron and steel.

14 Thermo-chemistry. **4 Hours**

14.1 Introduction with its significance in modern technology.
14.2 Thermo-chemical units and reactions.
14.3 Heat of reaction and heat of combustion.
14.4 Hess's Law.
14.5 The process of combustion.
14.6 Calorific value.
14.7 Numerical problems pertaining to combustion.

15 Lubricants. **4 Hours**

15.1 Introduction.
15.2 Classification.
15.3 Properties of lubricants.
15.4 Selection of lubricants.

16 Pollution. **4 Hours**

16.1 The problem and its dangers
16.2 Causes of pollution.
16.3 Air pollution and its control.

BOOKS RECOMMENDED:

1. Text Book of Intermediate Chemistry (I & II)
2. Ilmi Applied science by Sh. Ata Mohammad.
3. Applied chemistry for engineers by Eric S. Gyngell.
4. Engineering Chemistry by M.A. Usmani.

CH-213 APPLIED CHEMISTRY

Instructional Objectives:

1 Understand the scope, significance and role of the subject.

1.1 Define chemistry and its terms.
1.2 Define the units of measurements in the study of chemistry.
1.3 Explain the importance of chemistry in various fields of specialization.
1.4 Explain the role of chemistry in the concerned technology.

2 Understand language of chemistry and chemical reactions.

2.1 Define symbol, valency, radical, formula with examples of each.
2.2 Write chemical formula of common compounds.
2.3 Define chemical reaction and equation.
2.4 Describe types of chemical reactions with examples.
2.5 Explain the ionic method of balancing the equation.

3 Understand the structure of atoms.

3.1 Define atom.
3.2 Describe the fundamental sub atomic particles
3.3 Distinguish between atomic no. and mass no; and between isotopes and isobars.
3.4 Explain the arrangements of electrons in different shells and sub energy levels.
3.5 Explain the grouping and placing of elements in the periodic table.
3.6 State the periodic law of elements.

4 Understand the nature of chemical bonds.

4.1 Define chemical bond.
4.2 Describe the nature of chemical bond.
4.3 Differentiate between electrovalent and covalent bonding.
4.4 Explain the formation of polar and non-polar sigma and pi-bond with examples.
4.5 Describe the nature of coordinate bond with examples.

5 Gases and liquids.

5.1 Understand the gaseous and liquid states of matter.
  5.1.1 Describe the liquid and gaseous states of matter.
  5.1.2 Describe the general properties of liquid.
  5.1.3 Describe the general properties of gases.

5.2 Understand gas equation.

5.2.1 State Boyle's law, Charle's law, Graham's law of diffusion, Dalton's law of partial pressure.
5.2.2 State the mathematical form of these laws.
5.2.3 Derive gas equation.
5.2.4 Solve problems using gas law and gas equation.

6 Understand the chemical nature of water.

6.1 Describe the chemical nature of water with its formula.
6.2 Describe the general impurities present in water.
6.3 Explain the causes and methods to remove hardness of water.
6.4 Express hardness in different units like mg/liter, ppm, degrees Clark and degrees French.
6.5 Describe the formation and nature of scales in boiler feed water.
6.6 Explain the method for the treatment of scales.
6.7 Explain the sewage treatment and desalination of sea water.

7 Understand the nature of acids, bases and salts.

7.1 Define acids, bases and salts with examples.
7.2 Describe general properties of acids and bases.
7.3 Differentiate between acidity and basicity and use the related terms.
7.4 Define salts, give their classification with examples.
7.5 Explain pH value of solution and pH scale.

8 Understand the process of oxidation and reduction.

8.1 Define oxidation.
8.2 Explain the oxidation process with examples.
8.3 Define reduction.
8.4 Explain reduction process with examples.
8.5 Define oxidizing and reducing agents with examples.
8.6 Define oxides.
8.7 Classify the oxides with examples.

9 Understand the fundamentals of nuclear chemistry.

9.1 Define nuclear chemistry and radio activity.
9.2 Differentiate between Alpha , Beta and Gamma particles.
9.3 Explain half-life process.
9.4 Explain nuclear reactions resulting in transformation of elements with examples.
9.5 State the uses of isotopes.

10 Understand the nature of alloys used in the relevant technology.

10.1 Define alloy.
10.2 Describe different methods for the preparation of alloys.
10.3 State important properties of alloys.
10.4 Explain composition, properties and uses of different alloys.

11 Understand the nature and uses of solid, liquid and gaseous fuels.

11.1 Define fuel and give their significance in technological advancements.
11.2 Distinguish among solid, liquid and gaseous fuels.
11.3 Explain calorific value.
11.4 Describe coal with its utilization.
11.5 Describe petroleum and its utilization.
11.6 Describe various gaseous fuels.
11.7 Enlist nuclear and special fuels.

12 Understand the process of corrosion.

12.1 Define corrosion.
12.2 Describe different types of corrosion.
12.3 State the causes of corrosion.
12.4 Explain the process of rusting of iron.
12.5 Describe methods to prevent/control corrosion.

13 Understand the process involved in the extraction of metals like iron, copper and aluminum.

13.1 Define metallurgy
13.2 Explain concentration, roasting, calcination and reduction.
13.3 Describe physical & chemical properties of iron, copper and aluminum.
13.4 Enlist relevant ores of iron, copper and aluminium with their formulae.
13.5 Explain the method of extraction and metallurgy in a blast furnace of relevant ores of iron.
13.6 Outline important properties of cast iron, wrought iron and steel.

14 Understand thermo chemistry.

14.1 Define Thermo chemistry and state Thermo chemical units.
14.2 Explain heat of formation, combustion and neutralization.
14.3 Explain Hess's law.
14.4 Explain the process of combustion.
14.5 Solve numerical problems relating to quantities of air & other gases in combustion.

15 Understand the chemistry of lubricants.

15.1 Define a lubricant
15.2 Explain the uses of lubricants.
15.3 Describe classification of lubricants with examples.
15.4 State the properties of oils, greases and solid lubricants.
15.5 Explain the method of selecting lubricant for particular purpose/job.

16 Understand the nature of pollution.

16.1 Define pollution (air, water, soil).
16.2 State the causes of environmental pollution.
16.3 Enlist air pollutant gases.
16.4 Explain the methods used to control air pollution.

CH-213 APPLIED CHEMISTRY

List of Practicals:

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 analyze 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-212 APPLIED MATHEMATICS-II

Total Contact Hours		T	P	C
Theory	64	2	0	2

Pre-requisite: Must have completed Mathematics I.

LEARNING OUTCOMES.

After completing the course the students will be able to:

1. Solve problems of Calculus and Analytic Geometry.
2. Develop mathematical skill, attitudes and logical perception in the use of mathematical instruments.
3. Apply principles of Differential Calculus to work out rate measures, velocity, acceleration, maxima & minima values
4. Use Principles of Integral Calculus to compute areas and volumes.
5. Acquire proficiency in solving technological problems with mathematical clarity and insight.

Detail of Contents:

1 Functions & limits. 4 Hours

1.1 Constant & Variable Quantities
1.2 Functions & their classification
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 Differential Coefficient or Derivative
2.3 Differentiation ab-initio or by first Principle
2.4 Geometrical Interpretation of Differential Coefficient
2.5 Differential Coefficient of X^n, $(ax + b)^n$
2.6 Three important rules
2.7 Problems

3 Differentiation of algebraic functions 4 Hours

3.1 Explicit Functions
3.2 Implicit Functions
3.3 Parametric forms
3.4 Problems

4 Differentiation of trigonometric functions 4 Hours

4.1 Differential Coefficient of Sin x, Cos x, Tan x from first principle.
4.2 Differential Coefficient of Cosec x, Sec x, Cot x
4.3 Differentiation of inverse Trigonometric functions.
4.4 Problems.

5 Differentiation of logarithmic & exponential functions 4 Hours

5.1 Differentiation of ln x
5.2 Differentiation of Log a^x
5.3 Differentiation of a^x
5.4 Differentiation of e^x
5.5 Problems

6 Rate of change of variable. 4 Hours

6.1 Increasing and decreasing functions
6.2 Maxima and Minima values
6.3 Criteria for maximum & minimum values
6.4 Methods of finding maxima & minima
6.5 Problems

7 Integration 8 Hours

7.1 Concept
7.2 Fundamental Formulas
7.3 Important Rules
7.4 Problems

8 Methods of 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 Equations of the straight line **6 Hours**

11.1 Some important Forms
11.2 General Form
11.3 Angle Formula
11.4 Parallelism & Perpendicularity
11.5 Problems

12 The equations 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 & Coordinates of the centre
12.5 Problems

REFERENCE BOOKS

1. Applied Mathematics: Math-123, Developed by Nasir -ud-Din Mahmood, Sana-ullah Khan, Tahir Hameed, Evaluated by Syed Tanvir Haider, Javed Iqbal, Vol - I, National Book Foundation

MATH-212 APPLIED MATHEMATICS-II

Instructional Objectives:

1 Use the concept of functions and their limits in solving simple problems.

1.1 Define a function.
1.2 List all types of functions.
1.3 Explain the concept of limit and limit of a function.
1.4 Explain fundamental theorems 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 mathematical expression for a differential coefficient.
2.2 Explain geometrical interpretation of differential coefficient.
2.3 Differentiate a constant, a constant associated with a variable and the sum of finite number of functions.
2.4 Solve related problems.

3 Use rules of differentiation to solve problems of algebraic functions.

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

4 Use rules of differentiation to solve problems involving trigonometric functions.

4.1 Differentiate from first principle sin x, Cos x, tan x.
4.2 Derive formulas for derivation of Sec x, Cosec x, Cot x.
4.3 Find differential coefficients of inverse trigonometric functions.

5 Use rules of differentiation to logarithmic and exponential functions.

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

6 Understand rate of change of one variable with respect to another.

6.1 Write expression for velocity, acceleration and slope of a line.
6.2 Define an increasing and a decreasing function, maxima and minima values, point of inflexion.
6.3 Explain criteria for maxima and minima values of a function.
6.4 Solve problems involving rate of change of variables.

7 Apply concept of integration in solving technological problems.

7.1 Explain the concept of integration.
7.2 Write basic theorems 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 methods of solving definite integrals.

9.1 Define definite integral.
9.2 List properties of definite integrals using definite integrals.
9.3 Find areas under the 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 formulas.
10.5 Derive Slope formula.
10.6 Solve problem 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 of a straight line.
11.4 Derive expression for angle between two straight lines.
11.5 Derive conditions of perpendicularity and parallelism of two straight 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 standard, central and general forms of the equation of a circle.
12.3 Convert general form to the central form of equation of a circle.
12.4 Deduce formulas for the radius and the coordinates of the center of a 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/ APPLIED PHYSICS

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

Pre-requisite: N/A

LEARNING OUTCOMES.

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

Detail of Contents:

1 Measurements **2 Hours**

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

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

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

3 Moments and couples: **2 Hours**

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

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

4.1 Non-concurrent forces

4.2 Free body diagram
4.3 Varignon's theorem
4.4 Conditions of total Equilibrium.
4.5 Ladders

5 Moment of inertia: 3 Hours

5.1 Review: Rotational Inertia
5.2 Moment of Inertia, Theorems
5.3 Moment of Inertia of symmetrical bodies
5.4 M.I. of Fly wheel with applications
5.5 Energy stored by Fly wheel

6 Friction: 2 Hours

6.1 Review: Laws of friction
6.2 Motion of body along an inclined plane (up & down)
6.3 Rolling friction & Ball Bearings
6.4 Fluid Friction, Stokes' Law

7. Work, energy and power 3 Hours

7.1 Work-Energy relationship
7.2 Work done by variable force.
7.3 Power
7.4 I.H.P, B.H.P and Efficiency
7.5 Dynamometer.

8. Transmission of power: 3 Hours

8.1 Belts, Ropes.
8.2 Chains.
8.3 Gears.
8.4 Clutches, functions and types with application

9. Machines: 3 Hours

9.1 Efficiency of machines
9.2 Inclined plane - Review
9.3 Reversibility of machines
9.4 Single purchase crab
9.5 Double purchase crab.
9.6 Worm and worm wheel.
9.7 Differential Screw Jack.
9.8 Differential Pulley, Wheel and Axle

10. Vibratory motion: 2 Hours

10.1 S.H.M. - Review

10.2 Pendulums
10.3 Speed Governors.
10.4 Helical spring.
10.5 Cams
10.6 Quick return motion

11. Elasticity: 3 Hours

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

12. Simple mechanism: 1 Hour

12.1 Introduction
12.2 Kinematic link or Element
12.3 Kinematic pair and types.
12.4 Kinematic chains and types.

13. Velocity in mechanism: 2 Hours

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

Recommended Textbooks:

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

PHY-212 APPLIED MECHANICS

Instructional Objectives:

1. Use the concepts of measurement in practical situations/problems

1.1 Explain Dimensional formula
1.2 Explain systems of measurement
1.3 Use concept of significant figures and degree of accuracy to solve problems

2. Use the concept of addition and resolution of vectors to problems on equilibrium involving concurrent forces

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

3. Use the principle of moments and concept of couple to solve problems.

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

4. Use the laws of total equilibrium of forces to solve problems involving forces in equilibrium.

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

5. Use concepts of moment of inertia to practical situations and problems.

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

6. Understand the concepts and laws of solid and fluid friction.

6.1 Define Coefficient of friction between a body placed on an inclined plane and the surface.
6.2 Explain motion of a body placed on an inclined plane
6.3 Calculate the force needed to move a body up and down an inclined plane.
6.4 Explain rolling friction and use of ball bearings.
6.5 Describe fluid friction and Stoke's law.

7. Understand work, energy and power.

7.1 Derive work-energy relationship
7.2 Use formulae for work done by a variable force to solve problems.
7.3 Explain Power, I.H.P, B.H.P and efficiency.
7.4 Describe dynamometers.
7.5 Use the concepts to solve problems on power and work-energy

8. Understand transmission of power through ropes and belts.

8.1 Describe the need for transmission of power.
8.2 Describe methods of transmission of power.
8.3 Describe transmission of power through ropes and belts.
8.4 Write formula for power transmitted through ropes and belts.
8.5 Describe transmission of power through friction gears and write formula.
8.6 Describe transmission of power through chains and toothed wheels/gears.
8.7 Use the formulae to solve/problems on transmission of power.
8.8 Describe types and function of clutches with applications

9. Use the concepts of machines to practical situations.

9.1 Explain theoretical, actual mechanical advantage and efficiency of simple machines.
9.2 Use the concept to calculate efficiency of an inclined plane.
9.3 Describe reversibility of machines.
9.4 Calculate the efficiency of:
  i. Single purchase crab.
  ii. Double purchase crab.
  iii. Worm and worm wheel.
  iv. Differential screw jack, Diff. Pulley, Wheel and Axle.
9.5 Use the formulae to solve the problems involving efficiency, M.A of the above machines.

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

10.1 Define vibratory motion giving examples.
10.2 Describe circular motion and its projection on diameter of the circular path.
10.3 Relate rotatory motion to simple vibratory motion.
10.4 State examples of conversion of rotatory motion to vibratory motion and vice versa.
10.5 Describe speed governors, cams quick return motion.
10.6 Derive formulae for position, velocity and acceleration of a body executing S.H.M.
10.7 Use the concept of S.H.M to helical springs.
10.8 Use the concept S.H.M to solve problems on pendulum.

11. Understand bending moments and shearing forces.

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

11.6 Describe torsion and tensional stresses giving formula

12. Understand simple mechanisms.

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

13. Understand the method of finding velocity in mechanisms.

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

PHY-212 APPLIED PHYSICS/ APPLIED MECHANICS

List of Practicals:

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

Mgm-211 BUSINESS COMMUNICATIONS

T	P	C
1	0	1

Total contact hours

Theory 32 Hrs.

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

LEARNING OUTCOMES The course has been designed to enable the students to.

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

COURSE CONTENTS

1. COMMUNICATION PROCESS. 6 Hours

- 1.1 Purposes of communication
- 1.2 Communication process
- 1.3 Distortions in communication
- 1.4 Consolidation of communique
- 1.5 Communication flow
- 1.6 Communication for self-development

2. ORAL COMMUNICATION SKILLS. 6 Hours

- 2.1 Significance of speaking.
- 2.2 Verbal and non-verbal messages.
- 2.3 Strategic steps of speaking.
- 2.4 Characteristics of effective oral messages.
- 2.5 Communication Trafficking.
- 2.6 Oral presentation.

3. QUESTIONING SKILLS. 3 Hours

- 3.1 Nature of question.
- 3.2 Types of questions.
- 3.3 Characteristics of a good question.
- 3.4 Questioning strategy

4. LISTENING SKILLS. 5 Hours

- 4.1 Principles of active listening.
- 4.2 Skills of active listening.
- 4.3 Barriers to listening.
- 4.4 Reasons of poor listening.
- 4.5 Giving Feedback.

5. INTERVIEWING SKILLS. 3 Hours

- 5.1 Significance of interviews.
- 5.2 Characteristics of interviews.
- 5.3 Activities in an interviewing situation
- 5.4 Types of interviews.
- 5.5 Interviewing strategy.

6. REPORT WRITING. 3 Hours

- 6.1 Goals of report writing
- 6.2 Report format.

6.3 Types of reports.
6.4 Report writing strategy.

7. READING COMPREHENSION. 2 Hours

7.1 Reading problems.
7.2 Four Reading skills.

8. GROUP COMMUNICATION. 4 Hours

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

RECOMMENDED BOOKS

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

Mgm-211 BUSINESS COMMUNICATIONS.

INSTRUCTIONAL OBJECTIVES

1. **UNDERSTAND THE COMMUNICATION PROCESS.**
   - 1.1 State the benefits of two way communication.
   - 1.2 Describe a model of communication process.
   - 1.3 Explain the major communication methods used in organization.
   - 1.4 Identify the barriers to communication and methods of overcoming these barriers.
   - 1.5 Identify misconceptions about communication.
2. **UNDERSTAND THE PROCESS OF ORAL.**
   - 2.1 Identify speaking situations with other peoples.
   - 2.2 Identify the strategy steps of speaking.
   - 2.3 Identify the characteristics of effective speaking.
   - 2.4 State the principles of one-way communication.
   - 2.5 State the principles of two-way communication.
   - 2.6 Identify the elements of oral presentation skills.
   - 2.7 Determine the impact of non-verbal communication on oral communication.
3. **DETERMINE THE USES OF QUESTIONING SKILLS TO GATHER AND CLARIFY INFORMATION IN THE ORAL COMMUNICATION PROCESS.**
   - 3.1 Identify different types of questions.
   - 3.2 Determine the purpose of each type of question and its application.
   - 3.3 Identify the hazards to be avoided when asking questions.
   - 3.4 Demonstrate questioning skills.
4. **DEMONSTRATE THE USE OF ACTIVE LISTENING SKILL IN THE ORAL COMMUNICATION PROCESS.**
   - 4.1 State the principles of active listening.
   - 4.2 Identify skills of active listening.
   - 4.3 Identify barriers to active listening.
   - 4.4 State the benefits of active listening.
   - 4.5 Demonstrate listening skills.
   - 4.6 Explain the importance of giving and receiving feed back.
5. **Determine the appropriate interview type for the specific work-related situation and conduct a work-related interview.**
   - 5.1 State the significance of interviews.
   - 5.2 State the characteristics of interviews.
   - 5.3 Explain the activities in an interviewing situation.
   - 5.4 Describe the types of interviews.
   - 5.5 Explain the interviewing strategy.
   - 5.6 Prepare instrument for a structured interview.
6. **PREPARE A REPORT OUT-LINE, BASED ON SUBJECT MATTER AND AUDIENCE.**
   - 6.1 Identify the different types of reports.
   - 6.2 Determine when to use an informal or formal report presentation.
   - 6.3 Identify the stages of planning a report.
   - 6.4 Identify the parts of a report and choose the parts appropriate for each type of report.
   - 6.5 Draft a report outline.
7. **DEMONSTRATE READING COMPREHENSION.**

7.1 Identify major reading problems.
7.2 Identify basic reading skills.
7.3 State methods of previewing written material.
7.4 Identify methods of concentration when reading.
7.5 Demonstrate reading comprehension.

8. UNDERSTAND THE PRINCIPLES OF GROUP COMMUNICATIONS.

8.1 State the purpose and characteristics of major types of meeting.
8.2 Explain responsibilities of a meeting/committee.
8.3 Identify problems likely to be faced at meeting and means to overcome these problems.
8.4 Distinguish between content and process at meetings.
8.5 Explain the key characteristics of a good group facilitator.

AFM-212 Electric Vehicles (E.V)

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

Pre-requisite: AD-143 Automotive Electricity & Electronics

LEARNING OUTCOMES

Students will be able to

1. To explore the transition of automotive domain from Internal Combustion Engine to electric vehicles
2. To explain the basic of Electric vehicles and its major parts.
3. To illustrate the working of motors and conversions.
4. To identify and illustrate the various hybrid electric power trains and their different modes of operations.
5. Demonstrate standardized safety handling practices of high voltage systems.
6. Locate and describe hybrid vehicle components (on-vehicle).
7. Distinguish between a cranking and running hybrid gasoline engine.
8. Identify plug-in hybrid EVAP system operation.
9. Diagnose various plug-in hybrid concerns and DTC.
10. Accurately repair various conditions of hybrid and EV systems.
11. Comply with environmental health and safety regulations.

Detail of Contents:

1 Introduction of EVs **2 Hours**

1.1 Electric Vehicles History.
1.2 EV Comparison with IC Engine
1.3 EV Benefits and Challenges
1.4 Structures of EV and HEV
1.5 EV types/classification
1.6 BEV, HEV, and FCEV
1.7 EV Terminology.
1.8 MPGe of an electric vehicle.
1.9 EV accessories with the highest range impact
1.10 Series hybrid and parallel hybrid
1.11 Instant torque
1.12 Advantages of electric motors over IC engines
1.13 ECU and VCU
1.14 EV frames

2 Direct Current Circuit **2 Hours**

2.1 Voltages in a series circuit
2.2 Kirchhoff's Voltage Law and Current Law
2.3 Voltage divider and current divider rule
2.4 Effect of connecting voltage sources in parallel
2.5 Positive ground and negative ground
2.6 Resistance in a series-parallel circuit
2.7 Troubleshoot DC circuits

3 Alternating Current Circuit **1 Hour**

3.1 Sine waves
3.2 Impedance
3.3 Phase relationships between alternating current and voltage
3.4 Operating principle of transformers
3.5 Define harmonics
3.6 Effects of inductive and capacitive reactance on AC circuits
3.7 Power in AC circuits

4 Power Electronics **2 Hours**

4.1 Introduction to Power electronics
4.2 Difference between a FET, BJT, Mosfet & IGBT
4.3 Enhancement and depletion mode
4.4 Operation of an SCR
4.5 Inverters and converters
4.6 Types of rectifiers
4.7 Difference between a coupling and bypass capacitor
4.8 Purpose of filters in power electronic circuits
4.9 Troubleshoot diodes, rectifiers, and transistors
4.10 DC-DC converters, DC-AC Converters and AC-DC Converters used in EV applications

5 Battery and Fuel Cells **3 Hours**

5.1 Battery basics.
5.2 Battery working principle.
5.3 Battery selection criteria.
5.4 Battery management system
5.5 Calendar life, charge cycle, and cycle life
5.6 Battery capacity
5.7 Approximate range depending upon battery capacity
5.8 Difference between SoH and SoC
5.9 Internal resistance of a battery
5.10 Types of batteries used in EVs
5.11 Types of cathode materials in a lithium-ion battery
5.12 Types of fuel cells

6 Battery Charging System **4 Hours**

6.1 Charging station
6.2 Sizing of charging station
6.3 Components of charging station
6.4 Diagram of charging station
6.5 Differentiate Level 1, 2, 3 chargers
6.6 Principle of bi-directional charging
6.7 Types of EV connectors
6.8 Charging time and charging cost
6.9 Safety hazards associated with EVSEs
6.10 Safe charging of an EV

7 DC Motors & control **4 Hours**

7.1 EV Motors and Characteristics
7.2 Main components of a DC motor
7.3 Purpose of commutation between a stator and an armature
7.4 Torque of a DC motor
7.5 Operating principle of BLDC motors
7.6 Speed regulation of a DC motor
7.7 Types of stepper motors
7.8 Dynamic and regenerative braking
7.9 Types of Motors
7.10 Selection and sizing of Motor
7.11 RPM and Torque calculation of motor
7.12 Motor Controllers
7.13 Mechanical connection of motor
7.14 Electrical connection of motor

8 AC Motors & control **3 Hours**

8.1 Principle of induction motors
8.2 Synchronous and asynchronous motors
8.3 Torque developed in a 3-phase induction motor
8.4 Types of synchronous motors
8.5 Permanent magnet synchronous motor
8.6 Advantages of a PMSM over an induction motor
8.7 Main components of speed control in AC motor

9 Power train **5 Hours**

9.1 DC motor drives.
9.2 Power train, drive train and driveline
9.3 EV transmission
9.4 Differentials used in EVs

9.5 Difference between 4WD and AWD
9.6 Components in a motor controller
9.7 Main components in an EDU
9.8 Reduction gearbox
9.9 Un-sprung weight affects in wheel motors (add specific term)
9.10 Semi-hybrid and fully-hybrid

10 Sensors & actuators **2 Hours**

10.1 Sensors in EVs
10.2 NTC and PTC thermistor
10.3 Applications for pressure sensors in EVs
10.4 Digital cameras in driver assist systems
10.5 Operation of solenoid valves in EV applications
10.6 Temperature sensors in EV power trains
10.7 Steps for troubleshooting sensors and actuators

11 Communication & Control System **2 Hours**

11.1 Communication control system of a bus
11.2 Gateway in a communication system
11.3 Types of communication protocols used in EVs
11.4 Main difference between CAN and CAN FD
11.5 Benefits of automotive Ethernet (review)
11.6 Communication conductors in EVs
11.7 Operating principles of MCUs
11.8 VCU and ECU

12 Safety, Maintenance and Repair **2 Hours**

12.1 Active safety and passive safety
12.2 Safety features found in EVs
12.3 Main safety risks associated with ADAS
12.4 Arc flash and an arc blast
12.5 Active and passive discharge system
12.6 Battery protection unit and battery management system
12.7 Maintenance procedures for high voltage vehicles
12.8 Types of sensors in an EV charging station
12.9 Typical EV maintenance schedule
12.10 PIDs and DTCs
12.11 Types of essential PPE for troubleshooting HV systems
12.12 Troubleshooting practices to HV systems

Recommended Textbooks:

1. Hand Book of Automotive Power Electronics and power drive By Tailor & Francis
2. Automotive Mechatronics by Konred Reif
3. Electric Vehicle Engineering by Per Enge 2021

AFM-212 Electric Vehicles

Instructional Objectives:

1 Introduction of EVs

1.1 Electric Vehicles History.
1.2 Comparison with Internal combustion Engine : Technology
1.3 Comparison with Internal combustion Engine: Benefits and Challenges
1.4 Structures of EV and HEV(Components of Electric Vehicle)
1.5 EV types/classification and their electrification levels
1.6 Differentiate between a BEV, HEV, and FCEV
- 1.6.1 Battery Electric vehicle (BEV)
- 1.6.2 Hybrid electric vehicle (HEV)
- 1.6.3 Plug-in hybrid vehicle (PHEV
- 1.6.4 Fuel cell electric vehicle (FCEV)
- 1.6.5 Solar Power operated Electric vehicles
- 1.6.6 Comparison of fuel vs Electric and solar power
- 1.6.7 Photovoltaic solar based EV design.

1.7 EV terminology.
1.8 Calculate the MPGe of an electric vehicle.
1.9 Describe two EV accessories with the highest range impact
1.10 Differentiate between series hybrid and parallel hybrid
1.11 Define the term instant torque
1.12 Name four advantages of electric motors over internal combustion engines (ICEs)
1.13 Describe the main difference between an ECU and VCU
1.14 List three types of EV frames

2 Direct Current Circuit

2.1 Describe how voltages are distributed in a series circuit
2.2 Define Kirchhoff's Voltage Law and Current Law
2.3 Use the voltage divider and current divider rule
2.4 Describe the effect of connecting voltage sources in parallel
2.5 Define positive ground and negative ground
2.6 Determine the total resistance in a series-parallel circuit
2.7 Troubleshoot DC circuits

3 Alternating Current Circuit

3.1 Identify sine waves
3.2 Define impedance

3.3 Describe the phase relationships between alternating current and voltage
3.4 Explain the basic operating principle of transformers
3.5 Define harmonics
3.6 Explain the effects of inductive and capacitive reactance on AC circuits
3.7 Discuss power in AC circuits

4 Power Electronics

4.1 Define power electronics
4.2 Explain the difference between a FET, BJT, Mosfet & IGBT
4.3 Differentiate between enhancement and depletion mode
4.4 Describe the operation of an SCR
4.5 Compare inverters and converters
4.6 List three types of rectifiers
4.7 Explain the difference between a coupling and bypass capacitor
4.8 Describe the purpose of filters in power electronics circuits
4.9 Troubleshoot diodes, rectifiers, and transistors
4.10 Power Conversion – DC-DC converters, DC-AC Converters and AC-DC Converters used in EV applications

5 Battery and Fuel Cells

5.1 Battery basics, battery pack configuration, construction
5.2 internal chemical reactions & working principal.
5.3 Battery selection criteria.
5.4 Battery management system
5.5 Differentiate between calendar life, charge cycle, and cycle life
5.6 Define the term “battery capacity”
5.7 Discuss the approximate range depending upon battery capacity
5.8 Explain the difference between SoH and SoC
5.9 Calculate the internal resistance of a battery
5.10 List the three main types of batteries used in EVs
5.11 Name three types of cathode materials in a lithium-ion battery
5.12 List five types of fuel cells

6 Battery Charging System

6.1 Type of Charging station
6.2 Selection and Sizing of charging station
6.3 Components of charging station
6.4 Single line diagram of charging station
6.5 Differentiate between Level 1, Level 2 and Level 3 chargers
6.6 Describe the principle of bidirectional charging
6.7 List the five basic types of EV connectors

6.8 Calculate charging time and charging cost
6.9 Discuss the two main safety hazards associated with EVSEs
6.10 List seven steps that ensure safe charging of an EV

7 DC Motors & control

7.1 EV Motors and Characteristics
7.2 Name the main components of a DC motor
7.3 Explain the purpose of commutation
7.4 Differentiate between a stator and an armature
7.5 Define torque and counter EMF
7.6 Explain the operating principle of BLDC motors
7.7 Determine the % speed regulation of a DC motor
7.8 List five types of stepper motors
7.9 Define the terms dynamic and regenerative braking
7.10 Types of Motors
7.11 Selection and sizing of Motor
7.12 RPM and Torque calculation of motor
7.13 Motor Controllers
7.14 Mechanical connection of motor
7.15 Electrical connection of motor

8 AC Motors & control

8.1 Explain the basic operating principles of induction motors
8.2 Differentiate between synchronous and asynchronous motors
8.3 Describe how torque is developed in a 3-phase induction motor
8.4 Name three types of synchronous motors
8.5 Describe operation of a permanent magnet synchronous motor
8.6 List three advantages of a PMSM over an induction motor
8.7 Name the main components in AC motor speed control

9 Power train

9.1 Power Converters for DC motor drives
9.2 Describe power train, drive train and driveline.
9.3 Describe the operation of an EV transmission
9.4 List the three types of differentials used in EVs
9.5 Explain the difference between 4WD and AWD
9.6 Name the main components in a motor controller
9.7 Name the three main components in an EDU
9.8 Explain the purpose of a reduction gearbox
9.9 Describe how unsprung weight affects in-wheel motors
9.10 Differentiate between a mild hybrid and full hybrid

10 Sensors & actuators

10.1 List the four main quantities measured by sensors in EVs
10.2 Describe the difference between and NTC and PTC thermistor
10.3 Name three applications for pressure sensors in EVs
10.4 List four applications of digital cameras in driver assist systems
10.5 Describe the operation of solenoid valves in EV applications
10.6 List four applications of temperature sensors in EV power trains
10.7 List the three basic steps for troubleshooting sensors and actuators

11 Communication & Control System

11.1 Explain the purpose of a communications bus
11.2 Describe the purpose of a gateway in a communication system
11.3 List five types of communication protocols used in EVs
11.4 Explain the main difference between CAN and CAN FD
11.5 Name four benefits of automotive Ethernet
11.6 Compare three of the most common communication conductors in EVs
11.7 Describe the basic operating principles of MCUs
11.8 Explain the difference between a VCU and ECU

12 Safety, Maintenance and Repair

12.1 Differentiate between active safety and passive safety
12.2 List seven safety features found in EVs
12.3 Describe the two main safety risks associated with ADAS
12.4 Distinguish between an arc flash and an arc blast
12.5 Differentiate between an active and passive discharge system
12.6 Compare a battery protection unit and battery management system
12.7 Distinguish the maintenance procedures for high voltage vehicles
12.8 Name five types of sensors in an EV charging station
12.9 Describe a typical EV maintenance schedule
12.10 Differentiate between PIDs and DTCs
12.11 List five types of essential PPE for troubleshooting HV systems
12.12 Apply safe troubleshooting practices to HV systems

AFM-212 Electric Vehicles (EV)

List of Practical's:

1. Identify the electric vehicles major parts(on-vehicle) and prepare a layout.
2. Identify the location of motors
3. Identify and sketch hybrid electric power trains and their different modes of operations.
4. Identify hybrid vehicle components & systems (on-vehicle) and prepare a layout.
5. Identify plug-in hybrid EVAP system(on-vehicle) and prepare a layout.
6. Analyze the Device Characteristics, linear and switching operations.
7. Study and analyze the Protection circuits for EVs.
8. Make Step up and step down converter for low voltage EV loops
9. Make Half and full bridge converter and find role of control signals for DC motor.
10. Study of Motor Control system for Current/Voltage loop control of a DC motor.
11. Study and demonstration of Induction motor Control system
12. Study and demonstration of BLDC /PMSM /SRM motor system
13. Demonstration of control signals for three phase induction motor
14. Inspection and condition monitoring of Electric Vehicle batteries.
15. Diagnose and repair traction motor speed control systems in Electric Vehicles.
16. Diagnose and repair high voltage traction motors in Electric Vehicles.
17. Diagnose and repair DC to DC converters in Electric Vehicles.
18. Visit a dealership workshop and demonstrate service and maintenance of Electric & Hybrid Vehicles and submit the findings.

AFM-223 SUSPENSION, STEERING & BRAKES

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

Pre-requisite: Workshop Practice-I

LEARNING OUTCOMES:

1. Overhaul, service, repair and maintain the automotive springs, suspension, shock absorbers and steering system.
2. Diagnose steering and suspension troubles and their remedies.
4. Understand the various types of automotive brakes.
5. Diagnose the troubles of brake system and techniques of rectification.
6. Develop skill in static and dynamic balancing of wheels.
7. Know the Electronically controlled brake assist systems.

Detail of Contents:

1 Function, importance , construction, types, working, fault diagnosing, leveling and servicing of vehicle suspension system. 16 Hours

1.1 Suspension system
1.2 Elements of suspension system
1.3 Types of suspension systems
1.4 Independent and Non-independent Suspension system
1.5 Components of suspension system
- 1.5.1 Control arm
- 1.5.2 Steering knuckle
- 1.5.3 Ball Joint
- 1.5.4 Springs (coil and leaf)
- 1.5.5 Stabilizer bar/Sway Bar/Anti Roll Bar
- 1.5.6 Shock Absorber
- 1.5.7 Control arm bushing

1.6 Types of Springs used in suspension system
- 1.6.1 Leaf Springs
- 1.6.2 Coil Springs
- 1.6.3 Torsion bar
- 1.6.4 Air Spring

1.7 Performance of all suspension system springs.
1.8 Purpose of Shock Absorber.
1.9 Construction, types and working principle of Shock absorber

1.10 Faults in shock absorber
- 1.10.1 Worn Out
- 1.10.2 Damaged
- 1.10.3 Oil leakage, Air leakage and Gas leakage
- 1.10.4 Bended /deflected

1.11 Remedies for the faults in springs (Fatigue, Overloading and Corrosion)
1.12 Difference between curb weight and curb height of a vehicle.
1.13 Types of Front Suspension System
- 1.13.1 Independent Front Suspension System
  - 1.13.1.1 Long and Short arm suspension System
  - 1.13.1.2 Macpherson strut Suspension system
- 1.13.2 Non-Independent Front Suspension System
  - 1.13.2.1 Front Axle Suspension with Leaf Springs.

1.14 Types of Rear Suspension system
- 1.14.1 Independent Rear Suspension System
  - 1.14.1.1 Trailing Arm Suspension System
  - 1.14.1.2 Multilink Suspension System
- 1.14.2 Non-Independent Rear Suspension system.
  - 1.14.2.1 Dead axle (Leaf spring suspension system and Coil spring suspension system)
- 1.14.3 Semi- independent Suspension system

1.15 Function and Working of electronically controlled vehicle modulated suspension system
1.16 Purpose of vehicle suspension system Leveling
1.17 Manual and automatic leveling system
1.18 Servicing and replacement of Ball joints
1.19 Problems of Suspension systems

2 Construction , types , working , fault diagnosing, maintenance and overhauling of vehicle steering system. 16 Hours

2.1 Purpose of steering system
2.2 Types of steering system
2.3 Components of steering system (steering wheel, steering rod, steering column, steering gear box, steering linkage, ball joints, and Tie-rod ends)
2.4 Purpose of steering lock
2.5 Energy absorbing steering column
2.6 Different types of energy absorbing steering column
2.7 Rigid and collapsible steering column/energy absorbing steering column
2.8 Gear-ratio of steering gear box

2.9 Types of steering gear box i.e. recirculating ball, rack & pinion, worm & sector, worm and roller, worm and cam.
2.10 Purpose of steering linkage.
2.11 Steering linkage arrangements i.e. pitman arm, Centre link (relay rod), idler arm, tie rod, and steering knuckle
2.12 Function of power steering
2.13 Function of manual gear box type steering system.
2.14 Pascal's Law
2.15 Main components of power steering system
2.16 Construction and working of following types of power steering Systems
2.16.1 Hydraulic Steering System
2.16.1.1 Rack and Pinion type power steering system
2.16.1.2 Integral power steering system
2.16.1.3 External piston linkage type power steering system
2.16.2 Electric Power Steering System (EPS)
2.16.3 Electronically Controlled Type Power Steering System
2.17 Characteristics of fluid used in power steering System
2.18 Faults and their remedies of power steering System
2.19 State the purpose of steering geometry
2.20 Steering geometry angles (Caster, Camber, King Pin Inclination, Toe-in, Toe-out)
2.21 Effects of minor change in steering geometry angles on vehicle
2.22 Pre-alignment visual inspection and road test i.e.(Curb Height, Tire Condition, Steering system inspection, Vehicle track, General Vehicle appearance, Pulling, Excessive Noise and Vibration, Hard Steering)
2.23 Procedure for the computerized wheel alignment of vehicle.
2.24 Causes and remedies of following problems (Tramp, shimmy, Bubbling, Poor Return, Excessive Wheel Play, Pulling or Drifting, Hard Steering, Wandering of Steering system)

BRAKE SYSTEM

3 Purpose, construction, working, fault diagnosing and maintenance of brake system
16 Hours

3.1 Purpose of brake system
3.2 Construction, working principle, and working of each component of following types of brake systems
3.2.1 Mechanical Brake System
3.2.2 Hydraulic Brake System (Disk and Drum type)
3.2.3 Hydraulic Type (Vacuum Assisted) Power Brake System
3.2.4 Pneumatic Brake System
3.2.5 Hydro Pneumatic Brake System
3.2.6 Electric Brake System

3.3 Construction and working of parking brake system (Mechanical and Electric Type)
3.4 Effectiveness of brake depends upon area of brake lining, amount of pressure applied, radius of brake drum, co-efficient of friction, radius of car wheel
3.5 Factors involved in effectiveness of brake system (Friction, Brake Force, Effect of Weight, Brake System Temperature and Speed on Braking Distance)
3.6 Function and working of following types of vehicle electronically controlled assisted brake systems
- 3.6.1 Anti-Lock Braking System (ABS System)
- 3.6.2 Electronic brake Force Distribution system (EBD System)
- 3.6.3 Vehicle Stability Control System (VSE)
- 3.6.4 Vehicle Electronically Controlled Traction Control System (VTC)

3.7 Vehicle electro-pneumatically controlled exhaust brake system
3.8 Standard procedure for vehicle brake bleeding
3.9 Properties of brake fluid.
3.10 Possible causes and their remedies of following brake system problems (Spongy paddle excessive, paddle free ply, uneven braking, brake dragging, brake noise)
3.11 Regenerative braking system and its components

WHEEL AND TYRE

4 Purpose, construction, types & working of wheel and tire 12 Hours

4.1 Purpose of Wheels
4.2 Construction and types of wheels
4.3 Causes of wheel unbalancing
4.4 Importance of wheel balancing
4.5 Types of wheel balancing methods
4.6 Mechanical method of wheel balancing
4.7 Computerized method of wheel balancing
4.8 Purpose of tire
4.9 Types of tires (Tube and Tubeless tire)
4.10 Construction of following types of tire
- 4.10.1 Bias Type Tire
- 4.10.2 Belted Bias Tire
- 4.10.3 Radial Ply Tire

4.11 Ply Rating
4.12 Terminology of Tire
(Tire Size, Tire Maximum Load Rating, Tire Maximum Inflation Pressure, Tread Ply, Tread Pattern, Aspect Ratio, Dot No, Tire Grade, Tire Wear, Tire Traction, Tire Temperature Resistance)
4.13 Purpose of tube
4.14 Material, valve stem, cap and care of tube valve
4.15 Vulcanizing
4.16 Equipment needed for vulcanizing

4.17 Material and steps to be taken for vulcanizing
4.18 Tire retreading
4.19 Procedure for tire inflation
4.20 Checking of tire pressure
4.21 Importance of tire rotation & rotation pattern
4.22 Effect of tire over inflation, under inflation, toe-in, toe-out, camber, cornering, wear & unbalanced tire and rim
4.23 Tire pressure electronically monitoring system
4.24 Wheels (Rim) and its types

SUPPLEMENTAL RESTRAINT SYSTEMS (SRS)

5 Purpose , construction and working of supplemental restraint systems (SRS) air bag control system. 4 Hours

5.1 Purpose of air bag control system.
5.2 Components of air bag control system.
5.3 Construction and working of air bag control system.

Recommended Textbooks:

1. Suspension & steering system by Clifton Owen.
2. Modern Automotive Mechanics by James E. Duffy.
3. Automotive Technology A System Approach by Jack Erjavec.

AFM-223 SUSPENSION, STEERING & BRAKES

Instructional Objectives:

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

SUSPENSION

1 Understand the function, importance , construction, types, working, fault diagnosing, leveling and servicing of vehicle suspension system.

1.1 Define the suspension system.
1.2 Enlist the main elements of suspension system.
1.3 Enlist the types of suspension systems.
1.4 Describe the Independent and Non-independent suspension system.
1.5 Identify the Components of suspension system.
- 1.5.1 Control arm
- 1.5.2 Steering knuckle.
- 1.5.3 Ball Joint.
- 1.5.4 Springs (coil and leaf)
- 1.5.5 Stabilizer bar/Sway Bar/Anti Roll Bar
- 1.5.6 Shock Absorber.
- 1.5.7 Control arm bushing.

1.6 Describe the types of springs used in suspension system.
- 1.6.1 Leaf Springs
- 1.6.2 Coil Springs
- 1.6.3 Torsion bar
- 1.6.4 Air Spring

1.7 Compare the performance of all suspension system springs.
1.8 State the Purpose of shock absorber.
1.9 Explain construction, types and working principle of shock absorber.
1.10 Describe remedies for following faults in shock absorber
- 1.10.1 Worn Out.
- 1.10.2 Damaged.
- 1.10.3 Oil leakage, Air leakage and Gas leakage.
- 1.10.4 Bended /deflected.

1.11 Describe Remedies for the faults in springs (Fatigue. Overloading and Corrosion)
1.12 Describe the difference between curb weight and curb height.
1.13 Explain the Types of front Suspension System.
- 1.13.1 Independent Front Suspension System
  - 1.13.1.1 Long and Short arm suspension System
  - 1.13.1.2 Macpherson strut Suspension system

1.13.2 Non-Independent Front Suspension System

1.13.2.1 Front Axle Suspension with Leaf Springs.

1.14 Explain the types of Rear Suspension system.
1.14.1 Independent Rear Suspension System

1.14.1.1 Trailing Arm Suspension System
1.14.1.2 Multilink Suspension System

1.14.2 Non-Independent Rear Suspension system.

1.14.2.1 Dead axle (Leaf spring suspension system and Coil spring suspension system)

1.14.3 Semi- Independent Suspension system

1.15 Function and Working of electronically controlled vehicle modulated suspension system
1.16 Purpose of vehicle suspension system Leveling
1.17 Manual and automatic leveling system
1.18 Servicing and replacement of Ball joints
1.19 Explain the problems of Suspension systems

STEERING SYSTEM

2 Understand the construction, types, working, fault diagnosing, servicing and overhauling, of vehicle steering system.

2.1 State the purpose of Steering System.
2.2 State the types of steering system.
2.3 Identify the components of Steering System (Steering Wheel, Steering rod, steering column, Steering gear box, Steering Linkage, Ball Joints and Tie-Rod Ends).
2.4 State the purpose of Steering lock.
2.5 Define energy absorbing steering column.
2.6 Describe different types of energy absorbing steering column.
2.7 Compare rigid and collapsible steering column / energy absorbing, Steering column.
2.8 Describe gear-ratio of steering gear box.
2.9 Explain the types of Steering gear box i.e. recirculating ball, rack & pinion, worm and sector, worm and roller and worm and cam.
2.10 State the purpose of Steering linkage.
2.11 Describe the Steering linkage arrangements i.e. Pitman arm, Centre link (relay rod), idler arm, tie rod, and steering knuckle.
2.12 Describe the procedure for servicing the manual gear box type steering system.
2.13 State the function of Power Steering.
2.14 Define the “Pascal’s Law”.
2.15 Enlist the Main components of Power steering System.
2.16 Describe the Construction and working of following types of Power Steering Systems
2.16.1 Hydraulic Steering System

2.16.1.1 Rack & Pinion type power Steering system
2.16.1.2 Integral Power steering system
2.16.1.3 External Piston Linkage type Power steering system

2.16.2 Electric Power Steering System (EPS)
2.16.3 Electronically Controlled Type Power Steering System

2.17 State the characteristics of fluid used in Power steering System.
2.18 Describe the faults and their remedies of Power steering System.
2.19 State the purpose of steering geometry.
2.20 Describe the Steering Geometry angles (Caster, Camber, King pin Inclination, Toe-in, Toe-out).
2.21 Describe the effects of minor change in steering geometry angles on vehicle.
2.22 Describe the pre-alignment visual inspection and road test i.e.
(Curb Height, Tire Condition, Steering system inspection, Vehicle track, General vehicle appearance, Pulling, Excessive noise and Vibration, Hard Steering).
2.23 Describe the procedure for the computerized wheel Alignment of vehicle.
2.24 Describe the causes and remedies of following problems. i.e.
(Tramp, shimmy, Bubbling, Poor return, excessive wheel play, pulling or drifting, Hard Steering, wandering of steering system).

BRAKE SYSTEM

3 Understand the purpose, construction, working, fault diagnosing, and servicing of brake system.

3.1 State the purpose of brake system.
3.2 Describe the construction, working principle, and working of each Component of following types of brake systems.
3.2.1 Mechanical Brake System.
3.2.2 Hydraulic Brake System (Disk and Drum type).
3.2.3 Hydraulic Type (vacuum assisted) Power Brake System.
3.2.4 Pneumatic Brake System.
3.2.5 Hydro Pneumatic Brake.
3.2.6 Electric Brake System.

3.3 Describe the construction and working of parking brake system (Mechanical and Electric type).
3.4 Explain how does brake effectiveness depend upon (Area of Brake Lining, amount of pressure applied, radius of brake drum, co-efficient of friction, radius of car wheel).
3.5 Describe factors involved in effectiveness of brake system(friction, brake Force, effect of weight, brake system temperature and speed on braking distance)
3.6 Describe the function and working of following types of vehicle
3.6.1 Electronically controlled assisted brake systems.
3.6.2 Anti-Lock Braking System (ABS System).
3.6.3 Electronic Brake Force Distribution system (EBD System).

3.6.4 Vehicle Stability Control System (VSE).

3.6.5 Vehicle Electronically Controlled Traction Control System (VTC).

3.7 Describe vehicle electro-pneumatically controlled exhaust brake system.

3.8 Describe the standard procedure for vehicle brake bleeding.

3.9 Describe the properties of brake fluid.

3.10 Describe the possible causes and their remedies of following brake system problems. (Spongy paddle excessive, paddle free ply, uneven braking, brake dragging, brake noise).

3.11 State the purpose of regenerative brake system and its components

WHEEL AND TYRE

4 Understand the purpose, construction, types & working of wheel and tire.

4.1 State the Purpose of Wheels.

4.2 Describe the construction and types of wheels.

4.3 Describe the Causes of wheel unbalancing.

4.4 Describe the importance of Wheel balancing.

4.5 Describe the following types of wheel balancing methods.

4.6 Mechanical method of wheel balancing (Static and Dynamic methods).

4.7 Computerized method of wheel balancing.

4.8 State the Purpose of tire.

4.9 Describe the types of tires (tube & tubeless tire).

4.10 Describe the construction of following types of tire.

4.10.1 Bias type tire.

4.10.2 Belted Bias Tire.

4.10.3 Radial Ply Tire.

4.11 Define Ply rating.

4.12 Describe the following terminology of tire. (Tire size, Tire maximum load rating, Tire maximum inflation pressure, Tread ply, tread pattern, aspect ratio, Dot No, tire grade, Tire wear, tire traction, tire temperature resistance).

4.13 State the Purpose of tube.

4.14 Describe tube material, valve stem, cap and care of tube valve.

4.15 Define vulcanizing.

4.16 Enlist equipment needed for vulcanizing.

4.17 Describe the materials and steps to be taken for vulcanizing.

4.18 Describe tire retreading

4.19 State procedure for tire inflation.

4.20 Describe checking of tire pressure.

4.21 Describe the importance of tire rotation & rotation pattern.

4.22 Describe the effect of tire over inflation ,under inflation, toe-in, toe-out, camber, cornering, wear & unbalanced tire and rim on the vehicle performance.

4.23 Describe the tire pressure electronically monitoring system.

4.24 Describe the wheels (rim) and its types.

SUPPLEMENTARY RESTRAINED SYSTEMS (SRS)

5 Understand the purpose , construction and working of supplementary restrained systems (SRS) air bag control system.

5.1 State the purpose of Air Bag Control System.
5.2 Enlist the Components of Air Bag Control system.
5.3 Describe the construction & Working of Air Bag Control System.

AFM-223 SUSPENSION, STEERING & BRAKES

List of Practicals:

1. Draw the Lay-out of Suspension System.
2. Remove leaf springs from the frame, dismantle, check and reassemble.
3. Remove coil springs from front suspension, check and refit.
4. Dismantle shock absorber, inspect, service and refit.
5. Perform complete overhauling of independent front suspension and refit it.
6. Perform Removal of steering gearbox, servicing and refitting.
7. Perform Removal of Hydraulic Steering system, servicing and refitting
8. Perform Removal of Electrical Steering System, servicing and refitting
9. Perform Removal of Electronic Steering System, servicing and refitting
10. Inspect the steering wheel free play and report the angle of play.
11. Check camber angle, and toe-in by using wheel alignment equipment.
12. Perform wheel Balancing (static and dynamic) on computerize wheel balancing machine.
13. Draw the sketch of Hydraulic Brake System.
14. Disassemble and assemble the brake master cylinder, wheel cylinder and brake shoes mechanism.
15. Perform bleeding of hydraulic brakes system.
16. Adjust the free play of brake pedal.
17. Perform ~~to~~ the brake shoes adjustment.
18. Dismantle, inspect, refill and assemble the telescopic shock absorber.
19. Physical test and check the working of shock absorber without removing from vehicle.
20. Inspection of suspension, steering and brake system and report brake-fluid level & leakage, brake disc wear, disc-pad health, steering pressure and any other physical damages etc.
21. Visually inspect the regenerative brake system and report any physical damages.
22. Visual inspection of vehicle tire and wheel and report manufacturing date, tire wear, size and physical damages etc.
23. Perform removing wheel from the vehicle, tire from the rim by using tire changer Machine & vulcanize it, refit, and reinstall.
24. Prepare a project (sectional/working model) relevant to Steering, Braking and Suspension.
25. Visit at Modern Automotive workshop and prepare a report relating to Computerize wheel alignment and computerize wheel balancing.

AFM-233 WORKSHOP PRACTICE-II

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

Pre-requisite: I.C. Engines and Workshop Practice-I

LEARNING OUTCOMES.

1. Understand the use of different tools, instruments, equipment for disassembly, assembly and testing of an engine.
2. Show skill in locating the faults of the engines.
3. Show skill in using lubrication equipment.
4. Understand periodic classes of lubrication.

Details of Contents:

1 Use of automotive hand tools **8 Hours**

1.1 Screw driver (Flat, Philips, impact)
1.2 Tap & Die Set
1.3 Hammers
1.4 Pliers
1.5 Lock Pliers.
1.6 Spanners & Wrenches Set (Open end, Box type, Combination, Off set, Tubing)
1.7 Socket set (with all accessories).
1.8 Torque wrench
1.9 Pullers (Gears, Bearing, Pulleys, Steering).
1.10 Oil Seal extractors and installers.
1.11 Tube bender , Tube cutter and Flaring tool.
1.12 Strap Wrench (Oil Filter wrench)
1.13 automotive stethoscope
1.14 Valve Spring Compressor.
1.15 Piston Ring Compressor.
1.16 Piston Ring Expander.
1.17 Grease Gun
1.18 Flexible wire magnet.
1.19 Pop Rivet Plier.

1.20 Tin Snips.
1.21 Hack Saw.
1.22 Punches & Chisels.
1.23 Hollow punch set.
1.24 Spark plug spanner.
1.25 Allen Keys.

2 Use of automotive measuring tools. 4 Hours

2.1 Steel Foot rule.
2.2 Spring Scale.
2.3 Venire Caliper.
2.4 Micrometer (inside & outside).
2.5 Dial Gauge.
2.6 Depth gauge.
2.7 Thickness / Feeler gauge.
2.8 Thread pitch gauge
2.9 Wire gauge.
2.10 Belt tension gauge.
2.11 Telescoping gauge.
2.12 Endoscope.
2.13 Tire Pressure gauge.

3 Purpose, types and use of automotive equipment 8 Hours

3.1 Chain Pulley Block.
3.2 Car Lift (Post Lift, Scissor Lift, Hydraulic lift)
3.3 Nut Splitter
3.4 Crane (hydraulic, pneumatic).
3.5 Spark Plug Cleaner Machine.
3.6 Automotive Tire changer.
3.7 Electronic Injector Testing Machine.
3.8 Heavy Duty Digital Tire inflator.
3.9 Engine repairing stand and repair trolley.
3.10 Compressor and pneumatic tool.
3.11 Ramp & Pits.
3.12 Waste Oil Receptacle.
3.13 Hydraulic press.
3.14 Mechanical Arbor press.
3.15 Drill Machine (Bench & Portable).
3.16 Grinder (Bench & Portable)
3.17 Radiator Pressure Cap tester.
3.18 Stud extractor.

3.19 Conveyers.
3.20 Jack (mechanical, hydraulic).
3.21 Safety stands (Floor stands).
3.22 Creeper.
3.23 Valve Grinding and Refacing Machine.
3.24 Cleaning Tank.

4 Function, types and construction of fasteners. 4 Hours

4.1 Purpose of Fasteners.
4.2 Fasteners and their types.
4.3 Fasteners threads, pitch, and size.
4.4 Nuts and Lock washers and its types.
4.5 Purpose of Snap ring and its types.
4.6 Purpose of Rivet and its types
4.7 Fasteners thread Lubrication.

5 Purpose and use of automotive testing instruments. 6 Hours

5.1 Tachometer.
5.2 Compression Gauge.
5.3 Vacuum Gauge.
5.4 Engine Leakage Tester.
5.5 Ignition Timing Gun.

6 Purpose and use of automotive diagnostic techniques. 4 Hours

6.1 Describe the basic rules (steps) of diagnosing troubles.
6.2 Enlist troubles of vehicles in the light of driver complaints.
6.3 Identification of engine noises, their causes and their possible remedies
6.4 Identification of engine faults, their causes and their possible remedies.

7 Use of engine analyzer, engine diagnostic scanner,dynamometer and exhaust gas analyzer. 6 Hours

7.1 Engine Analyzer.
7.2 Types (Handy and portable computerized) and use of engine analyzer
7.3 Oscilloscope and its uses.
7.4 Ignition pattern formation on oscilloscope
7.5 Purpose of Automotive Diagnostic Scanner and its use.
7.6 Purpose of Dynamometer.
7.7 Types (Electrical and Hydraulic type), and use of Dynamometer for testing Brake power and fuel consumption of anengine.
7.8 Describe the use of Universal Automotive Diagnostic Scanner/OBD-III

7.9 State the Purpose of Exhaust Gas Analyzer.
7.10 Describe the types (2,4,& 5-gas Analyzer) and use of exhaust Gas analyzer.
7.11 Describe the Safety Precautions for Tools and equipment.

8 Importance and use of automotive lubricants. 2 Hours

8.1 Purpose and importance of Lubricants(Oils).
8.2 Viscosity and Viscosity index.
8.3 Additives in Lubricating oils.
8.4 Parts of engine where Lubrication is necessary.

9 Classification and application of lubricants. 2 Hours

9.1 Characteristics of various Lubricants.
9.2 Functions of various lubricants.
9.3 Selection of proper Lubricant
9.4 Introduction to Greases.

10 Materials and application of seals and gaskets. 2 Hours

10.1 Purpose and importance of Seals.
10.2 Material, types, and application of seals.
10.3 Purpose and importance of Gaskets.
10.4 Material, types, and application of Gaskets.
10.5 Causes and remedies of Seals and Gaskets Failure.

11 Types, materials and application of bearing. 2 Hours

11.1 Purpose of Bearings.
11.2 Material, types (Friction & Antifriction), size, and application of Bearings.
11.3 Antifriction bearings in vehicles with special reference (load and size).
11.4 Inspection of antifriction Bearing.
11.5 Methods of removing and installing of bearing.

12 Importance and use of automotive lubricants. 3 Hours

12.1 Crank shaft grinding.
12.2 Engine cylinder sleeving, boring and honing.
12.3 Valve grinding, refacing and lapping.
12.4 Engine cylinder head & cylinder block facing

13 Standards and their certification. 1 Hour

13.1 Quality Control Standards for following
- 13.1.1 Workers timing.
- 13.1.2 Just in time (J.I.T)
- 13.1.3 Brain Storming.
- 13.1.4 Data Collection.
- 13.1.5 Quality Control and their Systematic application.

14 Quality and its measures. 2 Hours

14.1 Characteristics of quality in materials, performance and reliability of the product.
14.2 Quality w.r.t design, conformance, performance and Services.
14.3 Quality control and quality assurance.
14.4 Total quality management.
14.5 ISO-9000 and its application.
14.6 ISO-14000 and its application.
14.7 ISO-45000 and Its Application

15 Introduction to metallurgy. 3 Hours

15.1 Define (Metal, Non Metal, Alloy, Ferrous Metal, Non Ferrous metal, Metalloids)
15.2 Metallurgy.
15.3 Classification of metallurgy.
15.4 Importance of Metallurgy in industry.

16 Introduction To Sheet Metal Machines 2 Hours

16.1 Sheet bending machines
16.2 Beading and grooving machines
16.3 Light gauge shearing machines
16.4 Pulmax machines introduction and different operations done on the machines

17 Coating Of Metals 2 Hours

17.1 Galvanizing
17.2 Tin Coating
17.3 Electroplating
17.4 Phosphating
17.5 Anodizing
17.6 Nitriding

18 Mechanical deformation (working) processes 3 Hours

18.1 Mechanical properties (Stress, Strain, Ductility, Malleability, Hardness, Brittleness)
18.2 Cold working
18.3 Hot working
18.4 Rolling.
  18.4.1 Types of Rolling Mills (Two high, three high, four high)
  18.4.2 Rolling Products.

18.5 Extrusion
  18.5.1 Types of extrusion (Direct extrusion, In-direct extrusion)
  18.5.2 Extrusion products.

18.6 Drawing
  18.6.1 Wire drawing.
  18.6.2 Deep drawing

18.7 Spinning process.
18.8 Blanking and Piercing.

Recommended Textbooks:

1. Automotive Excellence (Volume 1 & 2) by McGRAW Hill International
2. Modern Automotive Mechanics by James E. Duffy.
3. Automotive Technology A System Approach by Jack Erjavec
4. Casting and Forming Process in Manufacturing by James S.Campbell, Jr. McGraw Hill Book Co.
5. Elementary Metallurgy and Metallography by M. Sharagen.

AFM-233 **WORKSHOP PRACTICE-II**

INSTRUCTIONAL OBJECTIVES:

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

1 Understand the use of automotive hand tools

Describe the function, types, and use of following automotive hand tools.

1.1 Screw driver (Flat, Philips, impact)
1.2 Tap & Die Set
1.3 Hammers
1.4 Pliers
1.5 Lock Pliers.
1.6 Spanners & Wrenches Set (Open end, Box type, Combination, Off set, Tubing)
1.7 Socket set (with all accessories).
1.8 Torque wrench
1.9 Pullers (Gears, Bearing, Pulleys, Steering).
1.10 Oil Seal extractors and installers.
1.11 Tube bender, Tube cutter and Flaring tool.
1.12 Strap Wrench (Oil Filter wrench)
1.13 automotive stethoscope
1.14 Valve Spring Compressor.
1.15 Piston Ring Compressor.
1.16 Piston Ring Expander.
1.17 Grease Gun
1.18 Flexible wire magnet.
1.19 Pop Rivet Plier.
1.20 Tin Snips.
1.21 Hack Saw.
1.22 Punches & Chisels.
1.23 Hollow punch set.
1.24 Spark plug spanner.
1.25 Allen Key

2 Understand the use of automotive measuring tools.

Describe the function, types and use of following automotive measuring tools.

2.1 Steel Foot rule.
2.2 Spring Scale.
2.3 Vernier Caliper.
2.4 Micrometer (inside & outside).
2.5 Dial Gauge.
2.6 Depth gauge.
2.7 Thickness / Feeler gauge.

2.8 Thread pitch gauge
2.9 Wire gauge.
2.10 Belt tension gauge.
2.11 Endo scope.
2.12 Telescoping gauge.
2.13 Tire Pressure gauge

3 Understand the purpose, types and use of automotive equipment.

Describe the purpose, types, and use of following automotive equipment.

3.1 Chain Pulley Block.
3.2 Car Lift (Post Lift, Scissor Lift, Hydraulic lift)
3.3 Crane (hydraulic, pneumatic).
3.4 Nut Splitter.
3.5 Spark Plug Cleaner Machine.
3.6 Automotive Tire changer.
3.7 Electronic Injector Testing Machine.
3.8 Heavy Duty Digital Tire inflator.
3.9 Engine repairing stand and repair trolley.
3.10 Compressor and pneumatic tool.
3.11 Ramp & Pits.
3.12 Waste Oil Receptacle .
3.13 Hydraulic press.
3.14 Mechanical Arbor press.
3.15 Drill Machine (Bench & Portable).
3.16 Grinder (Bench & Portable)
3.17 Radiator Pressure Cap tester.
3.18 Stud extractor.
3.19 Conveyers.
3.20 Jack (mechanical, hydraulic)
3.21 Safety stands (Floor stands).
3.22 Creeper.
3.23 Valve Grinding and Refacing Machine.
3.24 Cleaning Tank.

4 Understand the function, types and construction of fasteners.

4.1 Describe the Purpose of Fasteners.
4.2 Describe Fasteners and its types.
4.3 Describe Fasteners threads, pitch, and size.
4.4 Describe Nuts and Lock washers and its types.
4.5 Describe the Purpose of Snap ring and its types.
4.6 Describe the Purpose of Rivet and its types
4.7 Describe Fasteners thread Lubrication.

5 Understand the purpose and use of automotive testing instruments.

5.1 Describe the function, and use of following instruments on engine.
- 5.1.1 Tachometer.
- 5.1.2 Compression Gauge.
- 5.1.3 Vacuum Gauge.
- 5.1.4 Engine Leakage Tester.
- 5.1.5 Ignition Timing Gun.

6 Understand the purpose and use of automotive diagnostic techniques.

6.1 State the Purpose of Automotive Diagnosing Techniques.
- 6.1.1 Describe the basic rules (steps) of diagnosing of troubles.
- 6.1.2 Enlist troubles of vehicle in the light of driver complaints.
- 6.1.3 Identification of engine noises , their causes and their possible remedies.
- 6.1.4 Identification of engine faults , their causes and their possible remedies.

7 Understand the purpose , use of engine analyzer, engine diagnostic scanner, dynamometer and exhaust gas analyzer.

7.1 State the Purpose of Engine Analyzer.
7.2 Describe the types (Handy and portable computerized) and use of engine analyzer.
7.3 Describe Oscilloscope and its uses.
7.4 Demonstrate ignition pattern formation on oscilloscope
7.5 State the purpose of Automotive Diagnostic Scanner and its use.
7.6 State Purpose of Dynamometer.
7.7 Describe the types (Electrical and Hydraulic type), and use of Dynamometer for testing Brake power and fuel consumption of anengine.
7.8 Describe the use of Universal Automotive Diagnostic Scanner/OBD-III
7.9 State the Purpose of Exhaust Gas Analyzer.
7.10 Describe the types (2,4,& 5-gas Analyzer) and use of exhaust Gas analyzer
7.11 Describe the Safety Precautions for Tools and equipment.

8 Understand purpose , importance of automotive lubricants.

8.1 Describe the Purpose and importance of Lubricants (Oils).
8.2 Describe Viscosity and Viscosity index.
8.3 Explain Oil additives in Lubricating oils.
8.4 Identify the different points of Vehicle where Lubrication is necessary.

9 Classification and application of lubricants.

9.1 Describe the Characteristics of Lubricants.

9.2 State the function of various lubricants.
9.3 State the Selection of proper lubricant.
9.4 Describe the introduction of greases.

10 Understand the purpose, types, materials and application of seals and gaskets.

10.1 State Purpose and importance of Seals.
10.2 Describe the Material, types and application of seals.
10.3 State Purpose and importance of Gaskets .
10.4 Describe the Material, types and application of Gaskets.
10.5 Describe the Causes and remedies of Seals and Gaskets Failure

11 Understand the purpose, types, materials and application of bearing.

11.1 State the Purpose of Bearings.
11.2 Describe the material, types (Friction & Antifriction), size, and application of Bearings.
11.3 Use of antifriction bearings in vehicles with special reference (load and size).
11.4 Describe the inspection of antifriction Bearing.
11.5 Describe the methods of removing and installing of bearing.

12 Understand purpose, types, importance and use of automotive lubricants.

12.1 Describe the crank shaft grinding.
12.2 Describe engine cylinder sleeve fitting, boring and honing.
12.3 Describe valve grinding, refacing and lapping.
12.4 Describe the Engine cylinder head & cylinder block facing.

13 Understand the quality control standards and their certification.

13.1 Describe the Quality Control Standards for followings.
13.1.1 Worker's timing.
13.1.2 Just in time (J.I.T)
13.1.3 Brainstorming.
13.1.4 Data Collection.
13.1.5 Quality Control and their Systematic application.

14 Understand the quality and its measures.

14.1 State the characteristics of quality in materials,performance and reliability of the product.
14.2 Quality w.r.t design, conformance, performance and Services.
14.3 Quality control and quality assurance.
14.4 Describe total quality Management.
14.5 Describe ISO-9000 and its application.

14.6 Describe ISO-14000 and its application.
14.7 Describe theISO-45000 and Its Application

15 Know about basic terminology of metallurgy.

15.1 Define the following (Metal, Non Metal, Alloy, Ferrous Metal, Non Ferrous metal, Metalloids)
15.2 Define Metallurgy.
15.3 State classification of metallurgy.
15.4 Enlist Importance of Metallurgy in industry.

16 Understand Working Of Sheet Metal Machines

16.1 State working of Sheet bending machines
16.2 State working of Beading and grooving machines
16.3 State working of Light gauge shearing machines
16.4 Describe different working operations performed by Pulmax machines

17 Know About Coating Of Metals

17.1 Describe Galvanizing
17.2 Describe Tin Coating
17.3 Describe Electroplating
17.4 Describe Phosphating
17.5 Describe Anodizing
17.6 Describe Nitriding

18 Mechanical Deformation (Working) Processes

18.1 Define the Mechanical properties (Stress, Strain, Ductility, Malleability, Hardness, Brittleness)
18.2 Define Cold working
18.3 Define the Hot working
18.4 Define the Rolling.
  18.4.1 State types of Rolling Mills (Two high, three high, four high)
  18.4.2 Describe the Rolling Products.

18.5 Define the Extrusion
  18.5.1 Define the types of extrusion (Direct extrusion, In-direct extrusion)
  18.5.2 State the Extrusion products.

18.6 Describe the Drawing
  18.6.1 Define the Wire drawing.
  18.6.2 Define the Deep drawing

18.7 Describe the Spinning process.
18.8 State the Blanking and Piercing.

AFM-233 WORKSHOP PRACTICE-II

List of Practicals:

1. Identification of basic hand tool
2. Practice to use Valve spring Compressor.
3. Practice to use Oil Filter wrenches.
4. Practice to bend, cut and Flare the tube.
5. Practice to change the tire by using the Jack properly .
6. Practice the proper use of Pullers for the removal of Gears and Bearings,
7. Check the Ovality and taperness of engine cylinder by using Dial Gauge.
8. Practice of Tap & Die Set.
9. Find the compression pressure of an engine Using Compression Gauge.
10. Find the vacuum pressure of intake manifold Using Vacuum Gauge.
11. find the Leakage of compression pressure by Using Cylinder Leakage Tester.
12. Check and Adjust the ignition timing by using Ignition Timing Gun.
13. Identify the different engine noises by using Stethoscope.
14. Prepare Gas kit from given on a Sheet.
15. Change Engine Head Gasket.
16. Practice to use different kinds of Fire Extinguisher .
17. Use of engine analyzer to check and rectify faults in ignition system of S.I. engine.
18. Prepare a project (model relevant to the subject.
19. Visit at Modern Automotive workshop to observe proper use of different kinds of tools, instruments and equipment.

AFM-242 APPLIED THERMODYNAMICS

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

Pre-Requisite N/A

LEARNING OUTCOMES:

To transfer the knowledge of

1. Fundamentals of thermodynamics,
2. Laws and properties of gases,
3. Thermodynamic processes and cycles,
4. Formation and properties of steam,
5. Steam boilers and their performance,
6. Steam and gas turbines,
7. I.C. engines,
8. Air compressors and their performance engines,
9. Air compressors and their performance, etc.

Details of Contents:

1 Fundamentals of thermodynamics. 3 Hours

1.1 Fundamentals of thermodynamics.
1.2 Units and Systems of Units.
1.3 Thermodynamic systems and its types.
1.4 Heat.
1.5 Mass & Weight.
1.6 Force.
1.7 Work done.
1.8 Power
1.9 Describe the following.
1.10 Temperature.
1.11 Absolute temperature.
1.12 Temperature Scales.
1.13 Normal temperature & Pressure.
1.14 Describe the following.
1.15 Pressure & Absolute pressure.
1.16 Gauge pressure & Vacuum pressure.
1.17 State the following.
1.18 Energy, Potential energy, Kinetic energy,
1.19 Chemical energy, Thermal/Heat energy.
1.20 Internal energy of the Gas.

1.21 The working Fluid.
1.22 Liquid, Vapor & Gas.
1.23 Laws of thermodynamics
1.24 Zeroth Law of Thermodynamics
1.25 1st law of Thermodynamics
1.26 2nd Law of Thermodynamics.
1.27 3rd Law of Thermodynamics.
1.28 Law of conservation of energy.

2 Laws and properties of perfect gases 3 Hours

2.1 Perfect gas and its properties.
2.2 Derive the mathematical relations.
- 2.2.1 Boyle's law.
- 2.2.2 Charles's law
- 2.2.3 Joule's law
- 2.2.4 Gay Loussac Law

2.3 Mathematical relations.
2.4 General gas equation
2.5 Characteristic Gas equation
2.6 Universal Gas equation
2.7 The two specific heats of a gas and derive its mathematical relations.
2.8 Enthalpy of a Gas

3 Thermodynamics Processes 4 Hours

3.1 Thermodynamic process.
3.2 Classification\Types of thermodynamic processes
3.3 The Non-flow-Reversible & Irreversible processes with the help of P-V diagram.
3.4 The constant volume process with the help of P-V diagram; also derive its mathematical relations for work done during expansion.
3.5 The constant pressure process with the help of P-V diagram; also derive its mathematical relations for work done during expansion.
3.6 The constant temperature process with the help of P-V diagram, also derive its mathematical relation for work done during expansion.
3.7 The adiabatic process with the help of P-V diagram; also derive its mathematical relations for work done during expansion.
3.8 The polytrophic process with the help of P-V diagram also derive its mathematical relations for work done during expansion.

4 Thermodynamic Cycles 4 Hours

4.1 Describe the following.
- 4.1.1 Thermodynamic cycle with the help of P-V diagram.
- 4.1.2 Types of thermodynamic cycles.

4.1.3 Reversible & Irreversible cycles with help of PV diagram

4.2 Explain the following.

4.2.1 CARNOT CYCLE with the help of P-V diagram; also derive its mathematical relations for Air Standard Efficiency during the cycle of operation.

4.2.2 OTTO CYCLE with the help of P-V diagram; also derive its mathematical relations for Air Standard Efficiency during the cycle of operation.

4.2.3 DIESEL CYCLE with the help of P-V diagram; also derive its mathematical relations for Air Standard Efficiency during the cycle of operation.

4.2.4 Joule's Cycle with the help of P-V diagram, also derive its mathematical relations for air standard efficiency during cycle of operation.

4.2.5 DUAL COMBUSTION CYCLE with the help of P-V diagram; also derive its mathematical relations for Air Standard Efficiency during the cycle of operation.

5 Formation and properties of Steam. 2 Hours

5.1 Steam formation and its properties
5.2 Important terms used for steam

6 Steam Boilers & its performance. 4 Hours

6.1 Working and general construction of a boiler
6.2 Classification of boilers
6.3 Important terms used for steam boilers
6.4 The construction and working of Simple Vertical Boiler with the help of neat sketch
6.5 The construction and working of COCHRAN Boiler (Multi tubular boiler) with the help of neat sketch.
6.6 The construction and working of Babcock and Wilcox Boiler with the help of neat sketch
6.7 Describe The Boiler Mountings & accessories.
6.8 Comparison between Water tube and Fire tube boilers
6.9 Efficiency of boiler

7 Steam and Gas Turbines. 3 Hours

7.1 Classification of turbines
7.2 De-Level Impulse turbine with the help of neat sketch.
7.3 PARSON'S Reaction turbine with the helping neat sketch.
7.4 Gas Turbines.

8 Internal Combustion Engines. 4 Hours

8.1 Torque, and its unit in SI system.
8.2 Mean effective pressure.
8.3 Indicated power and its formula.
8.4 Brake Horse power and its formula.
8.5 Measurement of Brake Horse power.
8.6 Friction Horse power.
8.7 Mechanical efficiency.
8.8 Thermal efficiency.
8.9 Volumetric efficiency.

9 Air Compressors and their performance (Reciprocating & Rotary). 5 Hours

9.1 Introduction of Air Compressors
9.2 Types of Air Compressors (Reciprocating & Rotary)
9.3 Terms used for Air Compressors
9.4 Single stage reciprocating Air Compressor with the help of PV diagram and sketch.
9.5 Uses of Air Compressors
9.6 Multistage compression and its advantages.
9.7 Reciprocating and rotary air compressors

Recommended Textbooks:

1. Applied Thermodynamics T.D Eastop, A. Mcconkey
2. Mechanical Technology (Thermal Engineering) By R.S Khurmi
3. Text Book of Applied Thermodynamics Developed By Academics wing Technical Education & Vocational Training Authority, (Punjab) Pakistan.

AFM-242 APPLIED THERMODYNAMICS

Instructional Objectives:

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

1 Understand the fundamentals of thermodynamics.

1.1 State the following
- 1.1.1 Fundamentals of thermodynamics.
- 1.1.2 Units and Systems of Units.

1.2 Describe the thermodynamic systems and its types.

1.3 State the following .
- 1.3.1 Heat.
- 1.3.2 Mass & Weight.
- 1.3.3 Force.
- 1.3.4 Work done.
- 1.3.5 Power

1.4 Describe the following.
- 1.4.1 Temperature.
- 1.4.2 Absolute temperature.
- 1.4.3 Temperature Scales.
- 1.4.4 Normal temperature & Pressure.

1.5 Describe the following.
- 1.5.1 Pressure & Absolute pressure.
- 1.5.2 Gauge pressure & Vacuum pressure.

1.6 State the following.
- 1.6.1 Energy
- 1.6.2 Potential energy
- 1.6.3 Kinetic energy,
- 1.6.4 Chemical energy
- 1.6.5 Thermal/Heat energy.
- 1.6.6 Internal energy of the Gas.
- 1.6.7 The working Fluid.
- 1.6.8 Liquid, Vapor & Gas.

1.7 Describe the following Laws of thermodynamics.
- 1.7.1 Zeroth Law of Thermodynamics.
- 1.7.2 1st Law of thermodynamics.
- 1.7.3 2nd Law of Thermodynamics.

1.7.4 3rd Law of Thermodynamics.
1.7.5 Law of conservation of energy.

2 Understand the laws and properties of perfect gases

2.1 State the perfect gas and its properties.
2.2 Describe the following and derive its mathematical relations.
2.2.1 Boyle's law.
2.2.2 Charles's law
2.2.3 Joule's law
2.2.4 Gay Lussac Law

2.3 Describe the following; also derive its mathematical relations.
2.3.1 General gas equation
2.3.2 Characteristic Gas equation
2.3.3 Universal Gas equation

2.4 Describe the following.
2.4.1 The two specific heats of a gas and derive its mathematical relations.

2.5 State the following.
2.5.1 Enthalpy of a Gas

3 Understand the Thermodynamics Processes

3.1 State the thermodynamic process.
3.2 State Classification /Types of thermodynamic processes
3.3 Describe the following.
3.3.1 The Non-flow-Reversible & Irreversible processes with the help of P-V diagram.
3.3.2 The constant volume process with the help of P-V diagram; also derive its mathematical relations for work done during expansion.
3.3.3 The constant pressure process with the help of P-V diagram; also derive its mathematical relations for work done during expansion.
3.3.4 The constant temperature process with the help of P-V diagram, also derive its mathematical relation for work done during expansion.
3.3.5 The adiabatic process with the help of P-V diagram; also derive its mathematical relations for work done during expansion
3.3.6 The polytrophic process with the help of P-V diagram also derive its mathematical relations for work done during expansion

4 Thermodynamics Cycles

4.1 Describe the following.
4.1.1 Thermodynamic cycle with the help of P-V diagram.
4.1.2 Types of thermodynamic cycles.

4.2 Describe the Reversible & Irreversible cycles with help of PV diagram
4.3 Explain the following.
4.4 CARNOT CYCLE with the help of P-V diagram; also derive its mathematical relations for Air Standard Efficiency during the cycle of operation.
4.5 OTTO CYCLE with the help of P-V diagram; also derive its mathematical relations for Air Standard Efficiency during the cycle of operation.
4.6 DIESEL CYCLE with the help of P-V diagram; also derive its mathematical relations for Air Standard Efficiency during the cycle of operation.
4.7 Joule's Cycle with the help of P-V diagram, also derive its mathematical relations for air standard efficiency during cycle of operation
4.8 DUAL COMBUSTION CYCLE with the help of P-V diagram; also derive its mathematical relations for Air Standard Efficiency during the cycle of operation.

5 Understand the Formation and properties of Steam.

5.1 Describe the steam formation and its properties
5.2 State the important terms used for steam

6 Understand the Steam Boilers& its performance .

6.1 Describe the working and general construction of a boiler
6.2 Describe the classification of boilers
6.3 Describe the important terms used for steam boilers
6.4 Explain the Following:
6.4.1 The construction and working of Simple Vertical Boiler with the help of neat sketch
6.4.2 The construction and working of COCHRAN Boiler (Multi tubular boiler) with the help of neat sketch
6.4.3 The construction and working of Babcock and Wilcox Boiler with the help of neat sketch
6.5 Describe the Boiler Mounting & accessories.
6.6 Make a Comparison between Water tube and Fire tube boilers
6.7 Efficiency of boiler

7 Understand the Steam and Gas Turbines.

7.1 State the introduction and classification of turbines
7.2 Explain construction and working of De-Level Impulse turbine with the help of neat sketch .
7.3 Explain the construction and working of PARSON'S Reaction turbine with the helping neat sketch.
7.4 Describe the introduction of Gas Turbines.

8 Understand the Internal Combustion Engines.

8.1 State the following.

8.1.1 Torque, and it's unit in SI system.
8.1.2 Mean effective pressure.
8.1.3 Indicated power and its formula..
8.1.4 Brake Horse power and its formula.
8.1.5 Measurement of Brake Horse power.
8.1.6 Friction Horse power.
8.1.7 Mechanical efficiency.
8.1.8 Thermal efficiency.
8.1.9 Volumetric efficiency.

9 Understand the Air Compressors and their performance(Reciprocating & Rotary).

9.1 State the introduction of Air Compressors
9.2 Describe the types of Air Compressors(Reciprocating & Rotary)
9.3 State the terms used for Air Compressors
9.4 State the Use of compressed Air
9.5 Describe the construction and working of single stage reciprocating Air Compressor with the help of PV diagram and sketch.
9.6 Describe the multistage compression and its advantages.
9.7 Describe the Reciprocating and rotary Air Compressor.

AFM-242 APPLIED THERMODYNAMICS

List of Practicals:

1. Pressure measurement by barometer.
2. Solve problems based on laws of perfect gases.
3. Solve problems Based on heating and expansion of gases.
4. Solve problems based on air cycles.
5. Measurement of Efficiency of a Boiler.
6. Measurement of Indicated Horse power of I.C Engine.
7. Calculate Work done by a Rotary Air Compressor.
8. Performance test of reciprocating air compressor.
9. To determine the area of an irregularly shaped figure using a planimeter and verify the accuracy of the results by comparing them with the calculated area using graph paper.
10. Visit the thermal power plant and compile report regarding

    10.1 Thermal efficiency
    10.2 draw the process flow diagram
    10.3 safety precaution on site.

AFM-251 OCCUPATIONAL HEALTH & SAFETY ENVIRONMENT

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

Pre-requisite: None

LEARNING OUTCOMES

1. Describe the importance of safety.
2. State safety rules.
3. Explain safety procedures in workshop.
4. Explain safety procedures in Industries.
5. Identify hazards in shops / industries.
6. State the cost of accidents.
7. State the rules in maintaining cleanliness and order lines of working area.

Details of Contents:

1 Introduction and importance of safety. 2 Hours

1.1 Introduction
1.2 Importance institute shops
1.3 Importance in Industry
1.4 Accident cost

2 Accidents in the chemical industry 1 Hour

2.1 Accidents in petroleum industry
2.2 Accidents in paint shop/industry
2.3 Explosive vapors and gases
2.4 Accident in fertilizers and others chemical industry

3 Personal protective equipment 3 Hours

3.1 What is PPE
3.2 Types of PPEs
3.3 Description and detail of PPEs usage
3.4 Safety Equipment at Plant Site
3.5 Safety Suit Purpose & Usage
3.6 Fire Suppression System

4 Method and importance of personal protective device. 3 Hours

4.1 Protective devices
4.2 List personal protective devices
4.3 Importance of personal protective devices
4.4 Protective devices for protecting hands and faces
4.5 Protective devices for protecting human body
4.6 Protective devices for protection from chemical gases

5 Employees training 3 Hours

5.1 Training of employees
5.2 Importance of training.
5.3 Introduction to international safety courses.
5.4 What is Permit to work?

6 Accident investigation record and report 2 Hours

6.1 Accident Investigation terminology and record keeping.
6.2 Sample of Incident Report
6.3 Six Significant Disasters

7 Industrial noise and control 1 Hour

7.1 Industrial noise and control.

8 Accidents in mechanical industry. 2 Hours

8.1 Material handling and transportation.
8.2 Accidents due to hand tools.
8.3 Accidents in machines shop.
8.4 Accidents in Metal work shop.
8.5 Accidents in wood working shop.
8.6 Accident in Foundry, welding, and forging shop.
8.7 Preventive measures

9 Accidents in production industry. 2 Hours

9.1 Accidents in Textile mills.
9.2 Accidents in paper mills.
9.3 Accidents in Food industry.

10 Accidents in other industries. 2 Hours

10.1 Accidents in mines.
10.2 Accidents in leather industries.
10.3 Accidents in power plant.
10.4 Accidents in printing industry.

11 Environmental effect on accidents. 1 Hour

11.1 Industrial ventilation.
11.2 Exhaust systems.
11.3 Illumination for safety and comfort.
11.4 Industrial hygiene and plant sanitation.

12 Safety on plant. 1 Hour

12.1 Plant lay out for safety.
12.2 Housekeeping for safety.
12.3 Lay out for safety.

13 Fire accidents. 2 Hours

13.1 Fire hazard.
13.2 Types of fires and their respective fire extinguishers
13.3 Causes.
13.4 Firefighting equipment.
13.5 Plant lay out for fire safety.

14 Analyzing causes of accidents. 2 Hours

14.1 Accident prevention fundamentals.
14.2 Plan inspections.
14.3 Safety inventory.
14.4 Accidents investigation.
14.5 Records and reports.

15 First aid. 2 Hours

15.1 Importance.
15.2 Procedure.
15.3 Extended medical services and CPR training.

16 Promoting safety. 2 Hours

16.1 Employees training.
16.2 Display of safety signs.
16.3 Guidance.

17 Safety laws. 1 Hour

17.1 Pakistan factory act (laws concerning to safety).
17.2 Workman compensation act.
17.3 Industrial insurance.

Recommended Textbooks:

1. Heinrich, H. W. (Herbert William), 1886-1962. Industrial Accident Prevention; a Scientific Approach. New York ; London :McGraw-Hill book company, inc., 2007.
2. The Occupational Environment Its Evaluation and Control. 2nd Ed. Dinardi, Salvatore. Fairfax, VA: American Industrial Hygiene Association, 2003.
3. Fundamentals of Industrial Hygiene. 5th Ed. Plog, Barbara and Patricia Quinlain. Chicago, IL: National Safety Council, 2001.

AFM-251 Occupational Health & Safety Environment (OHSE)

Instructional Objectives:

1 Know importance of safety practices and its necessity in the industry.

1.1 Describe safety
1.2 Describe the importance of safety practices in Institute work shop and industry
1.3 Define accident cost
1.4 Describe the factors related to accident cost

2 Know causes and preventions of accident in chemical based industry.

2.1 Describe the type of accidents in petroleum fertilizer, paint and chemical based industry
2.2 Stat the methods of prevention, for chemical based industry
2.3 Describe effects of chemical explosive, gases and vapors
2.4 Explain the list preventive measures for chemical explosive gases and vapors

3 Personal protective equipment

3.1 What is PPE
3.2 Explain the types of PPEs
3.3 Explain the description and detail of PPEs usage
3.4 Explain the Safety Equipment at Plant Site
3.5 Explain the Safety Suit Purpose & Usage
3.6 Explain the Fire Suppression System

4 Method and importance of personal protective device

4.1 Define Protective devices
4.2 Explain the List personal protective devices
4.3 Explain Importance of personal protective devices
4.4 Describe Protective devices for protecting hands and faces
4.5 Describe Protective devices for protecting human body
4.6 Protective devices for protection from chemical gases

5 Employees training

5.1 Define Training of employees
5.2 Explain the Importance of training
5.3 Describe the Introduction to international safety courses
5.4 Explain What is Permit to work?

6 Accident investigation record and report

6.1 Describe the Accident Investigation terminology and record keeping.
6.2 Explain the Sample of Incident Report
6.3 Explain the Six Significant Disasters

7 Industrial noise and control

7.1 Describe the Industrial noise and control.

8 Accidents in mechanical industry

8.1 State the Material handling and transportation.
8.2 Explain the Accidents due to hand tools.
8.3 Explain the Accidents in machines shop.
8.4 Explain the Accidents in Metal work shop.
8.5 Explain the Accidents in wood working shop.
8.6 Explain the Accident in Foundry, welding, and forging shop.
8.7 Explain the Preventive measures

9 Accidents in flow production industry

9.1 Explain the Accidents in Textile mills.
9.2 Explain the Accidents in paper mills
9.3 Explain the Accidents in Food industry

10 Accidents in other industries

10.1 Explain the Accidents in mines.
10.2 Explain the Accidents in leather industries.
10.3 Explain the Accidents in power plant.
10.4 Explain the Accidents in printing industry

11 Environmental effects on accidents

11.1 Explain the Industrial ventilation.
11.2 Explain the Exhaust systems.
11.3 Explain the Illumination for safety and comfort.
11.4 Explain the Industrial hygiene and plant sanitation

12 Safety on plant

12.1 Explain the Plant lay out for safety.
12.2 Explain the Housekeeping for safety.
12.3 Explain the Lay out for safety.

13 Fire accidents

13.1 Explain the Fire hazard.
13.2 Describe the types of fires and their respective fire extinguishers
13.3 Explain the Causes of fire.
13.4 State the purpose of Firefighting equipment.
13.5 Describe the Plant lay out for fire safety.

14 Analyzing causes of accidents.

14.1 Explain the Accident prevention fundamentals.
14.2 Explain the Plan inspections.
14.3 Describe the Safety inventory.
14.4 Explain the Accidents investigation.
14.5 Explain the Records and reports.

15 First aid.

15.1 Explain the Importance of first aid.
15.2 Explain the procedure of first aid.
15.3 State the purpose of Extended medical services and CPR training.

16 Promoting safety

16.1 Explain the Employees training.
16.2 Explain Displays of safety related text/ banners.
16.3 Explain the Guidance.

17 Safety laws

17.1 Explain the Pakistan factory act (laws concerning to safety).
17.2 Explain the Workman compensation act.
17.3 Explain the Industrial insurance.

AFM-263 SOIL, CROP AND FERTILIZERS

Total contact Hours

		T	P	C
Theory:	64 Hours			
Practical:	96 Hours	2	3	3

Pre-requisite: None

LEARNING OUTCOMES:

1. Understand the science of Geology with emphasis on Agriculture
2. Understand the soil and its formation
3. Understand the physical properties of soil
4. Understand the water logging and land drainage
5. Understand the agriculture, its origin and importance of the crop husbandry.
6. Understand the general features of the province like area, Population, Mountains, forests and climates etc.
7. Understand the importance, objects, system of irrigation sources and measurements of water.
8. Understand the botanical knowledge of different crops, habitats, main parts of crop and other cultural practices.
9. Understand the manures
10. Understand the inorganic manures or artificial fertilizers and organic Manures
11. Understand the fertility of soil

COURSE CONTENTS:

1 AGRICULTURAL GEOLOGY — 2 Hours

1.1 Introduction of Geology
1.2 Origin of earth
1.3 Composition of Earth's crust
1.4 Minerals
1.5 Common minerals
1.6 Groups of minerals
1.7 Rocks
1.8 Classification of rocks

2 SOIL AND ITS FORMATION — 3 Hours

2.1 Weathering
2.2 Weathering agencies
2.3 Classification of weathering agencies
2.4 Soil
2.5 Sub-soil
2.6 Difference between soil & sub-soil
2.7 Functions of soil

3 PHYSICAL PROPERTIES OF SOIL **7 Hours**

3.1 Texture of soil
3.2 Structure of soil
3.3 Specific gravity of soil
3.4 Pore space
3.5 Types of pore space
3.6 Cohesion
3.7 Plasticity
3.8 Shrinkage
3.9 Soil moisture
3.10 Forms of soil water
3.11 Wilting point
3.12 Wilting co-efficient
3.13 Water requirements of crops
3.14 Factors of water requirements of crops

4 WATER LOGGING AND LAND DRAINAGE **5 Hours**

4.1 Water logging
4.2 ILL effects of water-logging
4.3 Areas affected by water logging
4.4 Control of water logging
4.5 Remedial measure of water logging
4.6 Land drainage
4.7 Benefits of drainage
4.8 Type of Drainage
4.9 Factors of depth and size of drains
4.10 Care of drains

5 THE SCIENCE OF AGRICULTURE **2 Hours**

5.1 History of agriculture .
5.2 Importance of agriculture.
5.3 Different branches of agriculture.
5.4 Sciences allied to agriculture.

6 AGRICULTURAL METEROLOGY **3 Hours**

6.1 Agricultural meteorology and state its importance
6.2 Effect of temperature and humidity on agriculture.
6.3 Classification of climate.
6.4 Factors on which weather and climates depend.
6.5 Weather forecasting & its importance
6.6 Use of barometer & rain gauges

7 IRRIGATION AND ITS ROLE IN AGRICULTURE 4 Hours

7.1 Irrigation in agriculture and state its importance.
7.2 Conditions for artificial irrigation.
7.3 Objectives and sources of irrigation.
7.4 Duty of water and factors on which duty of water depends.
7.5 Various systems of irrigation.
7.6 Objectives of pressurized irrigation system and its types.
7.7 Components & working of Drip irrigation system
7.8 Components & working of sprinkler irrigation .
7.9 Factors on which irrigation depends
7.10 Water Management Techniques.
7.11 Irrigation scheduling, Field Capacity and Depletion of moisture.

8 CROP ROTATION AND FALLOWING 2 Hours

8.1 Crop rotation and state its advantages
8.2 Scientific, exhaustive and restorative crop rotation
8.3 Cropping intensity and its economic importance to Agriculture
8.4 Following of land and its advantages

9 Weeds and identification of plants 2 Hours

9.1 Weeds in Rabi & kharif and identify losses caused by weeds
9.2 Dissemination of weed seeds
9.3 Classification of weeds and eradication of weeds
9.4 Identification of weeds plants
9.5 Classification of production of field crops.

10 CULTIVATION OF SUGAR CROPS AND FIBER CROPS. 2 Hours

10.1 Cultivation of Sugar- cane and its importance, Locality and soil, Land preparation, growing season, Seed rate, method of sowing, manuring , irrigation, interculture, yield and harvesting.
10.2 Cultivation of cotton and its importance locality and soil, land preparation manuring, growing season, seed rate, sowing method, irrigation, harvesting/picking and field.

11 CULTIVATION OF GRAIN CROPS. 3 Hours

11.1 Cultivation of Rice and its importance, Locality and soil, land preparation, manuring, Growing season, seed rate and sowing method, puddling, irrigation harvesting/threshing and yield.
11.2 Cultivation of Maize and its importance, Locality and soil, land preparation, manuring, Growing season, seed rate and sowing method, irrigation interculture, harvesting/threshing and yield.

11.3 Cultivation of Wheat and its importance, Locality and soil, land preparation, manuring, Growing season, seed rate and sowing method, irrigation harvesting/threshing and yield.

12 CULTIVATION OF FODDER CROPS. 2 Hours

12.1 Cultivation of berseem and its importance, Locality and soil, land preparation manuring, Growing season, seed rate and sowing method, irrigation interculture, harvesting and yield.
12.2 Cultivation of jowar and its importance, Locality and soil, land preparation manuring, Growing season, seed rate and sowing method, irrigation ,harvesting and yield.

13 THE OIL SEED CROPS. 2 Hours

13.1 Cultivation of Sun flower and its importance, Locality and soil, Land preparation, growing season, Seed rate, method of sowing, manuring , irrigation, yield and harvesting.
13.2 Cultivation of canola and its importance, Locality and soil, Land preparation, growing season, Seed rate, method of sowing, manuring , irrigation, yield and harvesting

14 TUNNEL FARMING & KITCHEN GARDENING. 3 Hours

14.1 Purpose & importance of tunnel farming
14.2 Types of tunnels (Low, High & Walk in tunnel)
14.3 Vegetables and crop nursery farming under tunnels
14.4 Greenhouse effect and environment controlling under tunnel
14.5 Advantages & Methods of Kitchen gardening
14.6 Crop Dieses and their remedies under tunnel
14.7 Introduction of Hybrid plants

15 CULTIVATION OF ROOT AND VEGETABLE CROPS. 3 Hours

15.1 Classification of Root crops
15.2 Cultivation of potatoes its importance, locality, soil, land preparation, growing season, seed rate, sowing method, irrigation and harvesting.
15.3 Classification of vegetable crops according to season and nature
15.4 Cultivation of Onion with respect to its importance, locality and soil, land preparation, growing season, seed rate and sowing method, irrigation and harvesting.

16 THE GRAIN PRESERVATION AND PROCESS 2 Hours

16.1 Grain Preservation its types and importance
16.2 Methods of Grain Preservation
16.3 Processes in grain preservation

17 PUMPS, TUBEWELL AND TURBINES 2 Hours

17.1 Describe irrigation pump and tube well.
17.2 Enlist components of pump and tube well.
17.3 Introduction to solar pumping, components and design.
17.4 Describe the components of well turbine and its types.
17.5 Explain the troubleshooting and their remedies of Tube well and well Turbine.

18 MANURES 5 Hours

18.1 Definition of manure
18.2 Classification of manures
18.3 Effect of manures on soil
18.4 Major plant food elements
18.5 Role of main plant food elements in plant life
18.6 Minor or trace plant food elements
18.7 Classification of organic manures
18.8 Farm yard manures
18.9 Factors of composition of F.Y.M
18.10 Composite manure
18.11 Green manure
18.12 Miscellaneous organic manures
18.13 Bio Fertilizers

19 INORGANIC MANURES OR ARTIFICIAL FERTILIZERS 7 Hours

19.1 Inorganic manures or artificial fertilizes
19.2 Main artificial fertilizers
19.3 Importance of Nitrogenous fertilizers
19.4 Manufacture of nitrogenous fertilizers
19.5 Methods of application of nitrogenous fertilizers
19.6 Importance of phosphatic fertilizers
19.7 Manufacture of phosphatic fertilizers
19.8 Methods of application of phosphatic fertilizer
19.9 Importance of photassic fertilizers
19.10 Manufacture of photassic fertilizers
19.11 Methods of application of photassic fertilizers.
19.12 Complete fertilizer
19.13 Preparation of complete fertilizer
19.14 Unit value of manures

20 SOIL FERTILITY **3 Hours**

20.1 Soil fertility
20.2 Fertility evaluation
20.3 Effects of fertility on crops
20.4 Improvement of soil fertility

BOOKS RECOMMENDED

1. M. Ibrahim Bajwa, A Textbook of Agriculture
2. Henry D. Forth, Fundamentals of soil Science
3. A Text Book of Agriculture Vol. I&II - By: Muhammad Ibrahim Bajwa.
4. Agriculture - By: Khuda Bux Bucha Crops and fodder - By: Khuda Bux Bucha

AFM-263 INSTRUCTIONAL OBJECTIVES:

On the completion of this course, the student will be able to:-

1 UNDERSTAND AGRICULTURAL GEOLOGY.

1.1 Define geology
1.2 Explain the origin of earth
1.3 State the composition of earth crust.
1.4 Define mineral
1.5 Enlist common minerals
1.6 Describe the grouping of minerals
1.7 Define rocks
1.8 Classify rocks.

2 UNDERSTAND SOIL AND ITS FORMATION

2.1 Define the term weathering
2.2 Describe the weathering agencies.
2.3 Explain the classes of weathering agencies.
2.4 Describe soil
2.5 Describe rub-soil
2.6 Differentiate between soil and sub-soil
2.7 State the functions of soil

3 UNDERSTAND PHYSICAL PROPERTIES.

3.1 Describe the texture of soil
3.2 Explain the structure of soil
3.3 Describe the specific gravity of soil
3.4 Define pore space
3.5 Explain the types of pore space.
3.6 Define the term cohesion
3.7 Define the term plasticity
3.8 Define the term shrinkage
3.9 Describe the purpose of soil moisture
3.10 Explain the forms of soil water
3.11 Define the wilting point
3.12 Describe the term wilting co-efficient
3.13 Explain Describe the water requirements of soil
3.14 Describe the factors influencing water requirements of crops.

4 UNDERSTAND WATER LOGGING AND LAND DRAINAGE

4.1 Define water logging
4.2 State the ill effects of water logging
4.3 Describe the areas affected by water logging
4.4 Explain the methods to control water logging
4.5 Describe the remedial measures of water logging
4.6 Describe land drainage
4.7 State the benefits of drainage.
4.8 Explain the types of drainage
4.9 Describe the factors on which depth and size of drain depend.
4.10 Describe the care of drains.

5 UNDERSTAND THE SCIENCE OF AGRICULTURE

5.1 State the history of agriculture and its origin.
5.2 Describe The importance of agriculture.
5.3 Explain different branches of agriculture.
5.4 Describe the sciences allied to agriculture.

6 UNDERSTAND AGRICULTURAL METEROLOGY

6.1 Define agricultural meteorology and state its importance
6.2 Describe the effect of temperature and humidity on agriculture.
6.3 Give classification of climate.
6.4 Describe the factors on which weather and climates depend.
6.5 Describe Weather forecasting & its importance
6.6 Describe Use of barometer & rain gauges

7 UNDERSTAND IRRIGATION AND ITS ROLE IN AGRICULTURE

7.1 Define irrigation in agriculture and state its importance.
7.2 Describe the conditions for artificial irrigation.
7.3 Describe the objectives and sources of irrigation.
7.4 Describe duty of water and factors on which duty of water depends.
7.5 Describe the various systems of irrigation.
- 7.5.1 Border irrigation,
- 7.5.2 Basin irrigation,
- 7.5.3 Furrow irrigation,
- 7.5.4 Syphon irrigation,
- 7.5.5 Pressurized Irrigation

7.6 Define the objectives of pressurized irrigation system and its types

7.6.1 TrickleIrrigation,
7.6.2 Sprinkler & rain guns

7.7 Enlist the components & working of Drip irrigation system
7.8 Enlist the components & working of sprinkler irrigation
7.8.1 Fixed,
7.8.2 Moveable,
7.8.3 Solid,
7.8.4 Side roll,
7.8.5 Central Pivot,
7.8.6 Rain Gun

7.9 Enlist the factors on which irrigation depends
7.10 Describe Water Management Techniques, Water resources and Watermeasurement methods (Techniques & Devices)
7.11 Describe irrigation scheduling, Field Capacity and Depletion of moisture,

8 UNDERSTAND CROP ROTATION AND FALLOWING

8.1 Define crop rotation and state its advantages
8.2 Describe the scientific, exhaustive and restorative crop rotation
8.3 Describe the cropping intensity and its economic importance to Agriculture
8.4 Describe the Following of land and its advantages

9 UNDERSTAND WEEDS AND IDENTIFICATION OF PLANTS

9.1 Enlist weeds in rabi & kharif and identify losses caused by weeds
9.2 Describe the dissemination of weed seeds
9.3 Describe the classification of weeds and eradication of weeds
9.4 Describe the identification of weeds Plants
9.5 Give classification of Field crops according to,
9.5.1 Season,
9.5.2 Duration of life cycle,
9.5.3 Nature of cultivation and use.

10 UNDERSTAND CULTIVATION OF SUGAR CROPS AND FIBER CROPS.

10.1 Describe cultivation of Sugar- cane and its importance, Locality and soil, Land preparation, growing season, Seed rate, method of sowing, manuring, irrigation, interculture, yield and harvesting.
10.2 Describe cultivation of cotton and its importance locality and soil, land preparationmanuring, growing season, seed rate, sowing method, irrigation, harvesting/pickingand field.

11 UNDERSTAND CULTIVATION OF GRAIN CROPS.

11.1 Describe cultivation of Rice and its importance, Locality and soil, land preparationand manuring, Growing season, seed rate and sowing method, puddling, irrigation harvesting/threshing and yield.
11.2 Describe cultivation of Maize and its importance, Locality and soil, land preparationand manuring, growing season, seed rate and sowing method, irrigation interculture, harvesting/threshing and yield.
11.3 Describe cultivation of Wheat and its importance, Locality and soil, land preparationand manuring, Growing season, seed rate and sowing method, irrigation harvesting/threshing and yield.

12 UNDERSTAND CULTIVATION OF FODDER CROPS.

12.1 Describe cultivation of berseem and its importance, Locality and soil, land preparation and manuring, Growing season, seed rate and sowing method, irrigationinterculture, harvesting and yield.
12.2 Describe cultivation of jowar and its importance, Locality and soil, land preparationand manuring, Growing season, seed rate and sowing method, irrigation, harvestingand yield.

13 UNDERSTAND THE OIL SEED CROPS.

13.1 Describe cultivation of Sun flower and its importance, Locality and soil, Land preparation, growing season, Seed rate, method of sowing, manuring, irrigation, yield and harvesting.
13.2 Cultivation of canola and its importance, Locality and soil, Land preparation, growingseason, Seed rate, method of sowing, manuring , irrigation, yield and harvesting

14 TUNNEL FARMING & KITCHEN GARDENING.

14.1 Describe Purpose & importance of tunnel farming
14.2 Describe Types of tunnels (Low, High & Walk in tunnel)
14.3 Describe vegetables and crop nursery farming under tunnels
14.4 Describe Greenhouse effect and environment controlling under tunnel
14.5 Describe Advantages & Methods of Kitchen gardening
14.6 Describe Crop Dieses and their remedies under tunnel
14.7 Introduction of Hybrid plants

15 UNDERSTAND CULTIVATION OF ROOT AND VEGETABLE CROPS.

15.1 Give classification of Root crops
15.2 Describe cultivation of potatoes with respect to its importance, locality and soil, land1preparation, growing season, seed rate and sowing method, irrigation and harvesting.
15.3 Give classification of vegetable crops according to season and nature

15.4 Describe cultivation of Onion with respect to its importance, locality and soil, landpreparation, growing season, seed rate and sowing method, irrigation and harvesting.

16 UNDERSTAND THE GRAIN PRESERVATION AND PROCESS

16.1 Describe Grain Preservation its types and importance
16.2 Describe the Methods of Grain Preservation
16.3 Enlist the processes in grain preservation

17 UNDERSTAND PUMPS, TUBEWELL AND TURBINES

17.1 Describe irrigation pump and tube well.
17.2 Enlist components of pump and tube well.
17.3 Describe the components of well turbine and its types.
17.4 Introduction to solar pumping, components and design.
17.5 Explain the troubleshooting and their Remedies of Tube well and wellTurbine.

18 UNDERSTAND MANURES.

18.1 Define manure.
18.2 Classification of manures
18.3 Describe the effect of manures on soil
18.4 List the major plant food elements
18.5 Describe the role of main plant food elements in plant life.
18.6 Enlist the minor plant food elements
18.7 Classify of organic manures
18.8 Explain the farm yard manure
18.9 Describe the factors of composition of F.Y.M.
18.10 Explain the purpose and method of preparing compost manure
18.11 Describe the green manure
18.12 Explain miscellaneous organic manures
18.13 Describe the function of bio fertilizer
18.14 Explain the method of preparing bio fertilizer
18.15 Explain the benefits of bio fertilizers

19 UNDERSTAND INORGANIC MANURES OR ARTIFICIAL FERTILIZERS.

19.1 Describe the inorganic manures or artificial fertilizer
19.2 Enlist the main artificial fertilizers
19.3 Describe the importance of nitrogenous fertilizers
19.4 Explain the method of manufacturing of nitrogenous fertilizers application of
19.5 Explain the methods of application of nitrogenous fertilizers
19.6 Describe the importance of phosphatic fertilizers.
19.7 Explain the methods of manufacturing of phosphatic fertilizers.
19.8 Explain the methods of application of phosphatic fertilizers

19.9 Describe the importance potassic fertilizers
19.10 Explain the method of manufacture of potassic fertilizers.
19.11 Explain the methods of application of potassic fertilizers
19.12 Explain complete fertilizers
19.13 Explain the method of preparation of complete fertilizer
19.14 Explain the method of calculating the unit value of manures.

20 UNDERSTAND SOIL FERTILITY

20.1 Describe the soil fertility
20.2 Explain the evaluation of fertility of soil
20.3 Enlist the effects of fertility on crops
20.4 Explain the methods of improvement of soil fertility

AFM-263 LIST OF PRACTICALS

1. Collect soil samples of different soils by soil sampler or soil auger
2. Identify the different fertilizers physically
3. Practice in using the fertilizers by different methods.
4. Practice to plan the lay out for various crops
5. Prepare a Tunnel in the Field and grow crop in tunnel farming
6. Practice to sowing of various vegetable crops in open field.
7. Collect and record Rabi and Kharif weeds during season
8. Practice to grow vegetable in kitchen gardening
9. Preparation of different manures.
10. Visit to progressive Modern Agriculture Farm and submit a report.
11. Visit to agricultural research station and submit a report.
12. Visit of irrigation techniques at modern farm and submit a report.
13. Visit of grain processing industry (Punjab Seed Corporation) and submit a report.
14. Visit of metrological station and submit a report.
15. Visit to bio gas plant and submit a report.
16. Visit to any one fertilizer manufacturing factory(like fauji fertilizer, Pak arab , Dawood Hercules, Angro fertilizer etc.). and submit a report.
17. Visit to Agricultural Research Station for different crops like sugarcane, cotton, maize wheat & rice and submit a report.

2014.1

اسلامیات/مطالعہ پاکستان

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GEN 301

نصاب سال سوئم

حصہ اول اسلامیات

حصہ دوئم مطالعہ پاکستان

کل وقت 20 گھنٹے

موضوعات:

1۔ قرآن مجید:

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

2۔ دس منتخب احادیث کا ترجمہ (تشریح)

() بنی الا سلام علی خمس شهادت انا الا اله الا لمر اقلم الصلوته و ایتا الزکوة و حج البیت و صوم رمضان

() الدین النصیحته

() المنشاء موتمن

() للمومن علی المومن سنت خصال یعود ماذا مرض و تژهده اذا مات و یحیبه اذا دعا

() لیسلم علیه اذا لقیه و لیثمته اذا عطس و فصیحله اذا غاب او شهد

() لا تخن من خانک

() لا یدخل الجنته قاتع

() ان الله حرم علیکم عقوق المهات و اضاعته المال

() لیسر اولا تعسر اولا تنفر

() ذاق طعم الایمان من مرضی بالله و با الا سلام دینابمجمدنبیا

() افضل الذکر لا اله الا الله

3۔ حقوق وفرائض:

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

4۔ اسلام کی اخلاقی اقدار:

صبر واستقلال، عفو ودرگزر، ایفائے عہد، اخوت، ایثار وقربانی۔

سال سوئم

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 لکرسی، سورۃ بقرہ کی آخری آیات ازمن الرسول سے اور سورۃ اخلاق کا ترجمہ وتشریح 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 جا سکتی
- () 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 وفرائض:

عمومی مقاصد:

() اسلامی معاشرے کا ایک اچھا فرد بن سکے

خصوصی مقاصد:

() والدین کے حقوق وفرائض بیان کر سکے

() ہمسائیوں کے حقوق بیان کر سکے

() بچوں کے حقوق بیان کر سکے

() عورتوں کے حقوق کی پاسداری کر سکے

() بزرگ شہریوں کے حقوق کا خیال رکھ سکے

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

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

اسلامی اقدار:

عمومی مقاصد:

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

خصوصی مقاصد:

() اخلاق کے معنی ومفہوم کو بیان کر سکے

() اسلام میں حسن واخلاق کی اہمیت بیان کر سکے

() قرآن وسنت کی روشنی میں صبر واستقلال کی اہمیت بیان کر سکے

() ایفائے عہد کی اہمیت بیان کر سکے

() اخوت کے معنی ومفہوم بیان کر سکے

() اخوت اسلامی کی اہمیت بیان کر سکے

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

نصاب (سال سوئم)

GEN 301

مطالعہ پاکستان

ٹی	پی	سی
1	0	1

کل وقت 12 گھنٹے

حصہ دوئم

موضوعات:

() قیام پاکستان
() باؤنڈری کمیشن
() ریڈکلف ایوارڈ
() تقسیم بنگال
() تقسیم پنجاب
() مسئلہ مہاجرین
() ریاست کا الحاق
() ریاست جموں کشمیر
() نہری پانی کا تنازعہ
() قرارداد پاکستان
() علماء کے بائیس نکات
() 1956-1962۔اور 1973 کے دساتیر کی اسلامی/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

تدریس مقاصد:

عمومی مقاصد:

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

خصوصی مقاصد:

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

() ریڈکلف 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

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 وفرائض:

عمومی مقاصد:

() اسلامی معاشرے کا ایک اچھا فرد بن سکے

خصوصی مقاصد:

() والدین کے حقوق وفرائض بیان کر سکے

() ہمسائیوں کے حقوق بیان کر سکے

() بچوں کے حقوق بیان کر سکے

() عورتوں کے حقوق کی پاسداری کر سکے

() بزرگ شہریوں کے حقوق کا خیال رکھ سکے

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

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

اسلامی اقدار:

عمومی مقاصد:

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

خصوصی مقاصد:

() اخلاق کے معنی ومفہوم کو بیان کر سکے

() اسلام میں حسن واخلاق کی اہمیت بیان کر سکے

() قرآن وسنت کی روشنی میں صبر واستقلال کی اہمیت بیان کر سکے

() ایفائے عہد کی اہمیت بیان کر سکے

() اخوت کے معنی ومفہوم بیان کر سکے

() اخوت اسلامی کی اہمیت بیان کر سکے

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

نصاب (سال سوئم)

GEN 301

مطالعہ پاکستان

ٹی	پی	سی
1	0	1

کل وقت 12 گھنٹے

حصہ دوئم

موضوعات:

() قیام پاکستان
() باؤنڈری کمیشن
() ریڈکلف ایوارڈ
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() تقسیم پنجاب
() مسئلہ مہاجرین
() ریاست کا الحاق
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() قرارداد پاکستان
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() قدرتی وسائل (تیل، گیس، کوئلہ)

غیر مسلم طلباء کے لیے
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 جان سکے اور ان کے حقوق کی پاسداری کر کے انہیں معاشرے کا ایک مفید فرد بنایا جا سکے

MGM-332 - Entrepreneurship and Freelancing

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

Pre-requisite: Computer Application

LEARNING OUTCOMES:

This course equips Auto related technology students with

1. The knowledge and skills to navigate the exciting worlds of entrepreneurship and freelancing
2. The role of entrepreneurs in economic development
3. Business steps and business opportunities
4. The process of business registration
5. Comprehensive business plan
6. Creating an effective freelancing profile
7. Managing freelancing projects

COURSE CONTENTS

1 INTRODUCTION TO ENTREPRENEURSHIP 4 Hours

1.1 Introduction of entrepreneurship
1.2 Qualities of entrepreneur

2 ENTREPRENEURSHIP FOR TECHNOLOGISTS 2 Hours

2.1 Overview of the Industry.
2.2 Opportunities for DAE Professionals.
2.3 Expertise and adoptability as an entrepreneur

3 Entrepreneurship Process or steps 2 Hours

3.1 Business plan
3.2 Financial Projections
3.3 Customer discovery
3.4 Customer development

4 Business Opportunities 3 Hours

4.1 Production businesses
4.2 Specialty businesses
4.3 Service businesses

5 Quality Control **2 Hours**

5.1 Concept and advantages
5.2 Methods

6 Business registration Process in Pakistan **2 Hours**

6.1 Registration process
6.2 Legal formalities
6.3 Importance of registration

7 Study of Pre-feasibilities **2 Hours**

7.1 Pre-feasibilities

8 Entrepreneurship projects **2 Hours**

8.1 Development of comprehensive business plan
8.2 AI and its applications

9 Introduction to Freelancing **4 Hours**

9.1 What is Freelancing?
9.2 Benefits and Challenges of Freelancing
9.3 Popular Freelancing Platforms (e.g., Upwork, Fiverr, Freelancer)
9.4 Freelancing vs. Traditional Jobs

10 Developing Marketable Skills **3 Hours**

10.1 Identifying High-Demand Skills in Freelancing
10.2 Technical Skills (e.g., Graphic Design, Web Development, Content Writing)
10.3 Soft Skills (e.g., Communication, Time Management, Negotiation)
10.4 Continuous Learning and Skill Enhancement

11 Creating an Effective Freelancing Profile **2 Hours**

11.1 Crafting a Professional Profile Bio
11.2 Portfolio Building: Showcasing Your Work
11.3 Setting Up Competitive Pricing and Packages
11.4 Writing Proposals That Get Noticed

12 Managing Freelancing Projects **2 Hours**

12.1 Effective Communication with Clients
12.2 Understanding and Meeting Client Requirements
12.3 Time Management and Meeting Deadlines
12.4 Handling Revisions and Feedback

13 Growing and Sustaining a Freelance Career **2 Hours**

13.1 Building a Personal Brand
13.2 Networking and Expanding Your Client Base
13.3 Handling Payments, Taxes, and Contracts
13.4 Dealing with Challenges: Difficult Clients and Downtime

Recommended Books

1. Burns, P., Hurst, J.D., (1996). Small Business and Entrepreneurship. Red Globe Press
2. Blank, S., (2013). The Four Steps to the Epiphany
3. Osterwalder, A., Pigneur, Y., (2010). Business Model Generation. John Wiley and Sons
4. Singh ,P.N., (1986). Developing Entrepreneurship for Economic Growth. New Delhi: Vikas publications.
5. Drucker, P.F., (2006). Innovation and Entrepreneurship. Harper Business
6. Miner, J.B., (1996).The 4 Routes to Entrepreneurial Success. Berrett-Koehler Publishers
7. Pre-Feasibility Study of different businesses by Small and Medium Enterprises Development Authority (SMEDA), Ministry of Industries and Production, Government of Pakistan.
8. The Gig Is Up: Thrive in the Gig Economy, Where Old Jobs Are Obsolete and Freelancing Is the Future by Olga Mizrahi

MGM-332 INSTRUCTIONAL OBJECTIVES

1 Introduction to entrepreneurship

1.1 Definition and Scope of Entrepreneurship
1.2 Importance of Entrepreneurship in Economic Development
1.3 What is entrepreneurship and who is an entrepreneur
1.4 Pros and Cons of an entrepreneurship
1.5 Skills and characteristics of an entrepreneur

2 Entrepreneurship for Technologists

2.1 Overview of the Industry
2.2 Role of DAE Professionals in Business
2.3 Technical Expertise and Innovation
2.4 Adaptability to Technological Changes

3 Entrepreneurship Process or steps

3.1 Components of a Business Plan
3.2 Importance of Goal Setting and Strategy
3.3 Developing Financial Projections
3.4 Customer Understanding Market Knowledge
3.5 Customer Validation

4 Business Opportunities

4.1 Production and Manufacturing Ventures
4.2 Specialty and Niche Markets
4.3 Opportunities in Service Sector

5 Quality Control

5.1 Define quality control
5.2 State the advantages of quality control
5.3 Explain methods of quality control

6 Business registration Process in Pakistan

6.1 Introduction to Business Registration
6.2 Significance of Legal Registration
6.3 Legal Structures for Businesses in Pakistan

6.4 Importance of Compliance

7 Study of Pre-feasibilities

7.1 Study of SMEDA (Small and Medium Enterprises Development Authority, Govt. of Pakistan) pre-feasibilities

8 Entrepreneurship projects

8.1 Application of the entrepreneurship knowledge to develop business idea considering the following aspects:
- 8.1.1 Idea and its potential
- 8.1.2 potential customers
- 8.1.3 Financial plan
- 8.1.4 Marketing Plan
- 8.1.5 Comparison of Your Idea with Competitors

8.2 Describe AI and its applications.

9 Introduction to Freelancing

9.1 What is Freelancing?
9.2 Benefits and Challenges of Freelancing
9.3 Popular Freelancing Platforms (e.g., Upwork, Fiverr, Freelancer)
9.4 Freelancing vs. Traditional Jobs

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12.2 Understanding and Meeting Client Requirements
12.3 Time Management and Meeting Deadlines
12.4 Handling Revisions and Feedback

13 Growing and Sustaining a Freelance Career

13.1 Building a Personal Brand
13.2 Networking and Expanding Your Client Base
13.3 Handling Payments, Taxes, and Contracts
13.4 Dealing with Challenges: Difficult Clients and Downtime

MGM-332 List of Practicals:

1. Understand Entrepreneurship and Freelancing by exploring several entrepreneurial examples and Auto related Technology industry landscape.

2. Identify a niche and develop Portfolio by conducting market research and competitor analysis. Additionally build online portfolio on a suitable platform.

3. Students brainstorm and generate ideas for potential Auto related Technology startups or freelancing ventures and give presentation.

4. Conduct market research to validate the feasibility of selected business ideas and submit report.
    - Gather data on target market demographics, competitors, and industry trends.
    - Analyze market demand and potential customer needs for Auto related Technology products or services.

5. Identify customer segments, value propositions, revenue streams, and key resources required.

6. Develop prototypes or minimum viable products (MVPs) for Auto related Technology startup ideas.
    - Utilize Auto related Technology skills to build functional prototypes or proof-of-concept models.
    - Test and iterate prototypes based on user feedback and market validation.

7. Create financial projections and budgets for Auto related Technology startups or freelancing ventures.
    - Calculate startup costs, operating expenses, and revenue forecasts.
    - Explore funding options such as bootstrapping, crowdfunding, or seeking investment.
8. Provide constructive feedback and peer evaluation to enhance presentation skills.

9. Explore legal requirements and considerations for starting Auto related Technology businesses.
    - Discuss intellectual property protection strategies for inventions, designs, and innovations.
    - Review sample contracts, agreements, and terms of service relevant to Auto related Technology entrepreneurship.

10. Develop marketing plans and branding strategies for Auto related Technology startups or freelancing ventures.
    - Create promotional materials, such as logos, websites, and social media profiles.
    - Explore digital marketing techniques, content creation, and online advertising platforms.

11. Simulate sales scenarios and customer interactions relevant to Auto related Technology products or services.
    - Role-play sales pitches, negotiation tactics, and objection handling techniques.

12. Manage projects and tasks related to Auto related Technology entrepreneurship effectively.
    - Utilize project management tools and techniques to plan, organize, and track progress.
    - Prioritize activities, set deadlines, and allocate resources efficiently.

13. Organize networking events or industry talks with successful Auto related Technology entrepreneurs and professionals.
    - Facilitate opportunities for students to connect, collaborate, and learn from experienced practitioners.
    - Encourage active participation in entrepreneurship communities and startup ecosystems.

14. Provide peer feedback and constructive criticism to support continuous improvement.
    - Encourage students to critically evaluate their entrepreneurial mindset and readiness for future endeavors.

15. On boarding sessions on popular freelancing platforms, providing step-by-step guidance for creating account and searching for the suitable project and submit report.

16. Learn to write project pitch/gig for applying on freelance project.

AFM-312 MOTOR VEHICLE INSPECTION

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

Pre-requisite: I.C. Engines, Suspension steering and Brakes and Workshop Practice-II

LEARNING OUTCOMES.

1. Understand the motor vehicle inspection
2. Understand the inspecting vehicle license, registration, and insurance.
3. Understand the tire and wheel, suspension system, steering system, front end alignment, brakes, lighting and electrical system.
4. Understand the inspection vehicle glazing, vehicle body and accessories, fuel system, exhaust system, automotive emission control.
5. Understand the inspection of Heavy Duty Vehicles like Buses, Trucks with respect to tires, wheels, suspension, steering, brakes, lighting body and engine systems.

Detail of Contents:

PART 1: INSPECTION OF PASSENGER CARS AND LIGHT TRUCKS

1 Motor vehicle inspection and accidents. 2 Hours

1.1 Procedure of motor vehicle inspection
1.2 Road condition.
1.3 Driver condition.
1.4 Vehicle condition.
1.5 Basic types of vehicles inspection programs.

2 Introduction of vehicle inspection. 2 Hours

2.1 Safety measures taken during inspection.
2.2 Inspection procedure covers.
2.3 Typical inspection stations.
2.4 Two bay inspection stations.
2.5 Single bay inspection station.
2.6 Through type inspection stations.

3 Inspection of vehicle license, registration and insurance. 3 Hours

3.1 Explain the certificate of title.
3.2 Define vehicle identification Number (VIN).
3.3 Define engine identification Number (EIN).

3.4 Define transmission identification Number (TIN).
3.5 State the importance of proof of insurance.
3.6 State agreement on legal papers.

4 Tire and wheel inspection. 2 Hours

4.1 Tire inflation and tire wear.
4.2 Method of checking of tire pressure and inflation.
4.3 Method of tire and tube inspection.
4.4 Tire and wheel inspection procedure.

5 Inspection of vehicle suspension system. 4 Hours

5.1 Spring, shock-absorber and tracking inspection.
5.2 Inspection procedure for spring, shock-absorber and tracking.
5.3 Method of inspection of the electronic controls of transmission system.
5.4 Method of inspection of the electronic controls of suspension system.

6 Inspection of vehicle steering system. 3 Hours

6.1 Steering system, steering column, front wheel bearing, ball steering gear and linkage inspection.
6.2 Method of the power steering inspection.
6.3 Method of inspection of steering linkage for looseness.
6.4 Method of inspection of the electronic controls of steering system.

7 Front-end linkage and brake inspection of vehicles. 3 Hours

7.1 Frond-end alignment inspection procedure.
7.2 Typical alignment procedure.
7.3 Brakes inspection procedure.
7.4 Brake test at inspection station.
7.5 Method of performing the visual inspection of Hydraulic brake system.
7.6 Method of inspection of vacuum brake system.
7.7 Method of operating inspection of hydraulic system.
7.8 Method of inspection of the electronic controls of brake system.

8 Inspection of vehicle lighting and electric system. 1 Hour

8.1 Method of inspection of vehicle lighting and electric system.
8.2 Preparation for head light inspection.
8.3 Method of headlight aiming with mechanical aimer.
8.4 Method of inspection of other lights.
8.5 Safety starting switch inspection.

9 Inspection of vehicle glazing . 1 Hour

9.1 Development of laminated wind shields.
9.2 Automotive safety glazing.
9.3 Types of safety glass.
9.4 Inspecting vehicle glazing.
9.5 Reasons for rejecting vehicle.

10 Inspection of vehicle body and accessories. 2 Hours

10.1 Body sheet metal, Fenders, Doors, Hoods, Floor pan and energy-Absorbing Bumpers.
10.2 Method of inspection of Bumpers, Seats, Seat-Belts and Sun visor.
10.3 Method of inspection of outside Mirrors, Interior Mirrors, wind- Shield wiper, Windshield-washer and Defroster.
10.4 Method of inspection of the electronic controls of vehicle body accessories system.

11 Inspection of vehicle fuel exhaust and emission control system. 1 Hour

11.1 Method of inspection of fuel system.
11.2 Method of inspection of the exhaust smoke.
11.3 Method of inspection of vapor-recovery system, Air-injection system and positive Crankcase Ventilation System.(PCV)
11.4 Method of inspection of the Exhaust-Gas Recirculation (EGR) and ignition System.
11.5 Method of inspection of the electronic controls of fuel system.

PART 2: INSPECTIONS OF HEAVY-DUTY MOTOR VEHICLES

12 Tires, wheel, steering, alignment and suspension system trucks and buses 3 Hours

12.1 Trucks, Pick-ups, Vans, Utility Vehicles, Tractors, Trailers and Buses.
12.2 Special problems in the inspection of Heavy duty Vehicles.
12.3 Method of inspection of Tires and Wheels, Front suspension of Bus and trucks.
12.4 Method of inspection Lash, travel and column of steering system.
12.5 Method of inspection under vehicle linkage and leaf spring.
12.6 Method of inspection steering linkage and Kingpin play.
12.7 Method of inspection Front Alignment and Tracking.
12.8 Method of inspection of the air suspension, air suspension-retractable Axle with independent suspension.
12.9 Method of inspection of the electronic controls of heavy duty vehicle steering and suspension systems.

13 Brakes, lighting and electric system of heavy motor vehicle. 2 Hours

13.1 Performance inspection checks.
13.2 Method of inspection of hydraulic, mechanical and emergency brake system.
13.3 Inspection features of air-system, vacuum system and parking Brakes.
13.4 Procedure for emergency-brake inspection.
13.5 Procedure of the trailer emergency brakes and electric-brake in trailers.
13.6 Inspection of bus air brake parking and emergency preparation for headlight inspection and Neutral safety starting switch inspection.
13.7 Method of inspection of the electronic controls of heavy duty vehicle brake and lighting system

14 Inspection of heavy duty vehicles body and engine system. 1 Hour

14.1 Inspection of vehicle glazing and body and accessories.
14.2 Inspection procedure of interior and exterior rearview mirrors.
14.3 Inspection procedure of floor pan, body and sheet metal fire extinguisher and first aid kit.
14.4 Inspection of seat belts, visors, energy absorbing bumpers, wind shield wiper and washer.
14.5 Inspection of fuel exhaust and emission control system.
14.6 Method of inspection of the electronic controls of heavy duty vehicle body and engine systems.

PART 3: INSPECTIONS OF SCHOOL BUSES

15 Inspection of body and accessories of school-bus. 2 Hours

15.1 Special school bus checks and preventive maintenance program.
15.2 Inspection of school-bus-glazing, lighting and electric system.
15.3 Inspection of brakes, body and accessories of school-bus.
15.4 Inspection of Fuel, Exhaust and Emission Control System.
15.5 Inspection of wheels and tires, Steering Alignment and Suspension.

Recommended Textbooks:

1. Motor Vehicle Inspection by W. H. Crouse & D. L. Anglin
2. A Practical Approach to Motor Vehicle Engineering & maintenance by Allan Bonnick

AFM-312 MOTOR VEHICLE INSPECTION

Instructional Objectives:

On the completion of this course, the student will be able to

PART 1: INSPECTION OF PASSENGER CARS AND LIGHT TRUCKS

1. Know motor vehicle inspection and accidents

1.1. State the procedure of motor vehicle inspection
1.2. State road condition.
1.3. State driver condition.
1.4. State vehicle condition.
1.5. Explain basic types of vehicles inspection programs.

2. Understand introduction of vehicle inspection.

2.1. State the safety measures taken during inspection.
2.2. Explain the inspection procedure covers.
2.3. Enlist the typical inspection stations.
2.4. Explain the two bay inspection stations.
2.5. Explain the single bay inspection station.
2.6. Explain drive through type inspection stations.

3. Know inspection of vehicle license, registration and insurance

3.1. Explain the certificate of title.
3.2. Define vehicle identification Number (VIN).
3.3. Define engine identification Number (EIN).
3.4. Define transmission identification Number (TIN).
3.5. State the importance of proof of insurance.
3.6. State agreement on legal papers.

4. Understand tire and wheel inspection.

4.1. Define the term tire inflation and tire wear.
4.2. State the method of checking of tire pressure and inflation tires.
4.3. Explain the method of tire and tube inspection.
4.4. Discuss the tire and wheel inspection procedure.

5. Understand the inspection of vehicle suspension system

5.1. Explain spring, shock-absorber and tracking inspection.
5.2. Explain the inspection procedure for spring, shock-absorber and tracking.
5.3. State the method of inspection of the electronic controls of transmission system.

5.4. State the method of inspection of the electronic controls of suspension system.

6. Understand the inspection of vehicle steering system.

6.1. Explain steering system, steering column, front wheel bearing, ball joint, steering gear and linkage inspection.
6.2. Explain method of the power steering inspection.
6.3. State the method of inspection of steering linkage for looseness.
6.4. State the method of inspection of the electronic controls of steering system.

7. Understand the front-end linkage and brake inspection of vehicles.

7.1. Explain the frond-end alignment inspection procedure.
7.2. Explain the typical alignment Procedure.
7.3. Discuss the brakes inspection Procedure.
7.4. Discuss brake test at inspection station.
7.5. Explain the method of performing the visual inspection of hydraulic brake system.
7.6. Explain the method of inspection of vacuum brake system.
7.7. Explain the method of operating inspection of hydraulic system.
7.8. State the method of inspection of the electronic controls of brake system.

8. Understand the inspection of vehicle lighting and electric system

8.1. State the method inspection of vehicle lighting and electric system.
8.2. Discuss preparation for head light inspection.
8.3. Explain the method of Headlight aiming with Mechanical Aimer.
8.4. Explain method of inspection of other lights.
8.5. Describe the safety starting switch inspection.

9. Understand the inspection of vehicle glazing

9.1. Discuss development of laminated wind shields.
9.2. Define automotive safety glazing.
9.3. Explain types of safety glass.
9.4. Explain inspecting vehicle glazing.
9.5. Discuss reasons for rejecting vehicle.

10. Understand the inspection of vehicle body and accessories

10.1. Describe body sheet metal, Fenders, Doors, Hoods, Floor pan and energy-Absorbing Bumpers.
10.2. Explain the method inspection of Bumpers, Seats, Seat-Belts and Sun visor.
10.3. Explain the method inspection of outside Mirrors, Interior Mirrors, Wind- Shield wiper, Windshield-washer and Defroster.
10.4. State the method of inspection of the electronic controls of vehicle body accessories system.

11. Understand the inspection of vehicle fuel exhaust and emission control system

11.1. State the method of inspection of fuel system.
11.2. State the method of inspection of the Exhaust smoke.
11.3. Explain the method of inspection of Vapor-Recovery system, Air-injection system and positive Crankcase Ventilation System.(PCV)
11.4. Explain the method of inspection of the Exhaust-Gas Recirculation (EGR) and ignition System.
11.5. State the method of inspection of the electronic controls of fuel system.

PART 2: INSPECTIONS OF HEAVY-DUTY MOTOR VEHICLES

12. Understand the inspection of tires, wheel, steering, alignment and suspension system of trucks and buses

12.1. Define Trucks, Pick-ups, Vans, Utility Vehicles, Tractors, Trailers and Buses.
12.2. Identify special problems in the inspection of Heavy duty Vehicles.
12.3. Explain the method of inspection of Tires and Wheels, Front suspension of Bus and trucks.
12.4. Explain the method of inspection Lash, travel and column of steering system.
12.5. Explain the method of inspection under vehicle linkage and leaf spring.
12.6. Explain the method of inspecting steering linkage and Kingpin play.
12.7. Explain the method of inspection Front Alignment and Tracking.
12.8. Explain the method of inspection of the air suspension, air suspension-retractable Axle with independent suspension.
12.9. State the method of inspection of the electronic controls of heavy duty vehicle steering and suspension systems.

13. Understand the inspection of brakes, lighting and electric system of heavy motor vehicle

13.1. Discuss performance inspection checks.
13.2. Explain the method of inspection of hydraulic, mechanical and emergency brake system.
13.3. Discuss inspection features of air-system vacuum system and parking brakes in trailers..
13.4. Explain procedure for emergency-brake inspection.
13.5. Explain inspection procedure of the trailer emergency brakes and electric-brake in trailers.
13.6. Explain inspection of bus air brake parking and emergency.
13.7. Explain preparation for headlight inspection and Neutral safety starting switch inspection.
13.8. State the method of inspection of the electronic controls of heavy duty vehicle brake and lighting system

14. Understand inspecting heavy duty vehicles body and engine system

14.1. Explain inspection of vehicle glazing body and accessories.
14.2. Explain inspection procedure of interior and exterior rearview mirrors.
14.3. Explain inspection procedure of floor pan, body and sheet metal fire extinguisher and first aid kit.
14.4. Explain inspection of seat belts, visors, energy absorbing bumpers, wind shield wiper and washer.
14.5. Explain inspection of fuel exhaust and emission control system.
14.6. State the method of inspection of the electronic controls of heavy duty vehicle body and engine systems.

PART 3: INSPECTIONS OF SCHOOL BUSES

15. Understand the inspection of body and accessories of school-bus

15.1. Enlist special school bus checks and preventive maintenance program.
15.2. Discuss the inspection of school-bus-glazing, lighting and electric system.
15.3. Discuss inspection of brakes, body and accessories of school-bus.
15.4. Explain inspection of Fuel, Exhaust and Emission Control System.
15.5. Explain inspection of wheels and tires, Steering Alignment and Suspension.

AFM-312 MOTOR VEHICLE INSPECTION

List of Practicals:

Part - I

1. Inspect vehicle tires and wheels
2. Inspect Vehicle tracking.
3. Inspect vehicle shock absorber visually, on the vehicle & off the vehicle.
4. Inspect Vehicle Suspension system and, Front-End Alignment
5. Inspect the Vehicle steering system.
6. Inspect vehicle Brake System.
7. Inspect Vehicle lighting and electric system
8. Inspect Vehicle Glazing and Fuel System.
9. Inspect Vehicle Body and Accessories.
10. Inspect Exhaust system of Vehicle.
11. Inspect Vehicle emission controls.

Part - II

12. Inspect Tire and wheels of Heavy Duty Vehicles.
13. Inspect Vehicle tracking.
14. Inspect suspension and steering system of Heavy Duty Vehicles.
15. Inspect Brakes System of Heavy Duty Vehicles.
16. Inspect lighting and Electric System of Heavy Duty Vehicles.
17. Inspect Heavy Duty Vehicle Body and Engine Systems.
18. Inspect Preventive- Maintenance Program.
19. Prepare Comprehensive Vehicle Inspection Report.
20. Prepare Certificate of registration.
21. Prepare Certificate of Title for a Vehicle.
22. Visit at Local office of Motor Vehicle Examiner/VICS STATION for the demonstration of inspection of Light & Heavy duty Vehicles.

AFM-323 FUEL INJECTION & CARBURETION

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

Pre-requisite: IC ENGINES

LEARNING OUTCOMES.

1. Understand the construction and working of Intake and Exhaust system.
2. Understand the construction and working of carburetor Fuel supply system.
3. Understand the construction and working of LPG Fuel supply system.
4. Understand the construction and working of CNG Fuel supply system.
5. Understand the construction and working of EFI Fuel supply system.
6. Show skill in maintenance and repair of fuel injection pumps & governors.
7. Understand the construction and working of Variable valve timing.
8. Understand the construction and working of Vehicle cruisetronic system.
9. Understand the basis working of Locomotive engine.

Detail of Contents:

PART-I

1 Fuel and its types use in automobile. 4 Hours

1.1 Fuel and its basic properties.
1.2 Fuel rating factors.
1.2.1 Octane Rating.
1.2.2 Cetane Rating.

1.3 Types of fuels and their chemical formulae , use in automobiles.
1.4 Extraction of crude oil and its fractionating process.

2 Air/fuel ratio. 3 Hours

2.1 Composition of Air.
2.2 Atmospheric pressure.
2.3 Ideal Air / Fuel ratio .
2.4 Ideal Air / Fuel ratio for Petrol & Diesel engine, by chemical equation.
2.5 Air / Fuel ratio for different speeds of an engine.

3 Various intake system for IC engines. 4 Hours

3.1 Purpose of intake system of I.C engines.
3.2 Various type of intake system of I.C engines.
3.3 Air capacity
3.4 Features of intake manifold.
3.5 Purpose of air cleaner.

3.6 Working of different types of air cleaner.
3.7 Positive crank case ventilation system (PCV System),

4 Engine exhaust system components. 6 Hours

4.1 Purpose of engine exhaust system.
4.2 Components of engine exhaust system
4.3 Purpose of Muffler/Silencer.
4.4 Exhaust Gas Recirculating system (EGR System),
4.5 Working of different types of engine exhaust systems.
4.6 Purpose of Catalytic Convertor.
4.7 Working principle of different types of Catalytic Convertor.
4.8 Main features of exhaust manifold.
4.9 Exhaust manifold Heat Shield.
4.10 Back Pressure of engine exhaust system.
4.11 Back pressure effects on engine Performance.

5 Working of turbocharger . 4 Hours

5.1 Volumetric efficiency of I.C engine.
5.2 Factors effecting Volumetric efficiency of IC engine.
5.3 Purpose of turbocharger.
5.4 Construction and working of turbocharger.
5.5 Turbo-lag
5.6 Operation of Waste Gate control valve.
5.7 Purpose and working of intercooler.
5.8 Turbocharger and supercharger.

6 Various fuel supply systems of I.C engine. 4 Hours

6.1 Various fuel supply system.
6.2 Construction of fuel tank .
6.3 Purpose of fuel gauge.
6.4 Construction and working of fuel gauge circuit.
6.5 Construction and working of evaporative fuel emission control system.
6.6 Function and types of fuel filter.

7 Different types of fuel pumps. 3 Hours

7.1 Function of fuel pump.
7.2 Types of fuel pump.
7.3 Construction and working of mechanical/diaphragm type fuel pump.
7.4 Construction and working of electric type fuel pump.

8 Purpose, construction, working, and adjustment of carburetor. 7 Hours

8.1 Atomization, vaporization & carburetion.
8.2 Atmospheric pressure, gauge pressure and absolute pressure.

8.3 Air-fuel ratio for different engine working conditions.
8.4 Purpose of Carburetor.
8.5 Venturi effect.
8.6 Carburetor Circuits/Systems.
8.7 working of Carburetor following circuits/systems.
- 8.7.1 Float Circuit.
- 8.7.2 Idle Circuit.
- 8.7.3 High speed Circuit.
- 8.7.4 Power Circuit.
- 8.7.5 Accelerator Pump Circuit.
- 8.7.6 Choke circuit (Mechanical/electric choke).

8.8 Air-fuel mixture adjustment at idle speed.
8.9 Carburetor types w.r.t No of barrels, No of venturis, Air draft.

9 Construction and working of LPG fuel supply system. 3 Hours

9.1 Liquefied petroleum Gas (LPG) fuel.
9.2 Components of LPG fuel supply system.
9.3 Electronically controlled LPG fuel supply system.
9.4 Advantages and disadvantages of LPG fuel system with gasoline fuel system.

10 Construction and working of CNG fuel supply system. 3 Hours

10.1 Compressed Natural Gas (CNG) fuel.
10.2 Components of CNG fuel supply system.
10.3 Component of electronically controlled CNG fuel supply system.
10.4 Working of electronically controlled LNG fuel supply system.
10.5 Advantages and disadvantages of CNG/LNG fuel system with gasoline fuel system.

PART-II

11 Electronically controlled Gasoline fuel injection system. (EFI System) 6 Hours

11.1 Advantages and disadvantages of electronically controlled gasoline fuel injection system (EFI System)
11.2 Sub-systems of EFI System.
11.3 Fuel delivery & Air induction sub-systems of EFI System.
11.4 Function, construction, circuit & working of following sensors.
- 11.4.1 Air Flow meter
- 11.4.2 Map sensor ,
- 11.4.3 Air temperature sensor,
- 11.4.4 Water temperature sensor,
- 11.4.5 Throttle position sensor

11.4.6 Knock sensor,
11.4.7 RPM sensor,
11.4.8 Oxygen sensor.

11.5 Function, construction and circuit working of following actuators.
11.5.1 Injectors,
11.5.2 Ignition system igniter,
11.5.3 Idle speed control valve.

11.6 Purpose of Microcomputer/Electronic Control Unit (ECU).
11.7 Working of EFI Systems w.r.t
11.7.1 D-Jetronics system,
11.7.2 L-Jetronics system,
11.7.3 K/KE-Jetronics system.

11.8 Construction and working of EFI Systems w.r.t
11.8.1 Multiport Fuel Injection system(MPFI system)
11.8.2 Throttle Body Fuel injection system(TBI system).

11.9 Working of drive by wire system(DBW).

12 Working of diesel engine. 10 Hours

12.1 Properties of diesel fuel.
12.2 Working principle of four strokes diesel engine.
12.3 Main Components of diesel fuel supply system
12.4 Purpose of diesel fuel filter.
12.5 Construction and working of diesel fuel filter.
12.6 Purpose of diesel water sedimentor.
12.7 Construction and working of diesel water sedimentor.
12.8 Purpose of primer/lifty pump.
12.9 Construction and working of primer/lifty pump.
12.10 Function of diesel fuel feed pump.
12.11 Construction and working of Distributor type (rotary) Diesel Fuel injection Pump.
12.12 Construction and working of In-Line type Diesel Fuel injection Pump.
12.13 Function of Governor.
12.14 Types and working of Governors.
12.15 Phasing and calibration.
12.16 Procedure of phasing and calibration of diesel fuel injection pumps.
12.17 Procedure of setting of timing of diesel fuel injection pump.
12.18 Function of diesel fuel injector.
12.19 Types and working of diesel fuel injectors.
12.20 Purpose of high pressure lines.
12.21 Purpose of diesel engine glow plugs.
12.22 Construction and working of diesel engine glow plugs.
12.23 Electronically controlled Diesel Fuel Injection System.

12.24 Electronically controlled Diesel Fuel Injection System& Common Rail direct injection (CRDI).

13 Working of vehicle cruisetronics control system. 1 Hour

13.1 Purpose of Vehicle Cruisetronics Control System.
13.2 Components of Vehicle Cruisetronics Control System.
13.3 Working principle of Vehicle Cruisetronics Control System.

14 Construction and working principal of variable valve timing control system. 2 Hours

14.1 Purpose of Variable valve timing control systems (VVT-i/ i-VTec / VANOS/VCT).
14.2 Components of Variable valve timing control systems (VVT-i/ i-VTec / VANOS/VCT).
14.3 Working principles of Variable valve timing control systems (VVT-i/ i-VTec / VANOS/VCT).

15 Construction and working principle of Locomotive engine. 2 Hours

15.1 Main components of Locomotive Engine.
15.2 Basic working principle of Locomotive Engine.

16 Basic working principle of jet engine. 2 Hours

16.1 Main components of jet engine.
16.2 Working principle of jet engine.

Recommended Textbooks:

1. Modern Automotive Mechanics by James E. Duffy.
2. Automotive Technology A System Approach by Jack Erjavec
3. Automotive Electricity, Electronics & Computer Controls by Barry Hollembeak

AFM-323 FUEL INJECTION & CARBURATION

INSTRUCTIONAL OBJECTIVES:

PART-I

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

1 Understand the fuel and its types use in automobile.

1.1 Define fuel and its basic properties.
1.2 Describe the following Fuel rating factors.
1.2.1 Octane Rating.
1.2.2 Cetane Rating.
1.3 Describe different types of fuels and their chemical formulae , use in automobiles.
1.4 Briefly describe the extraction of crude oil and its fractionating process.

2 Understand the air / fuel ratio.

2.1 Describe the composition of Air.
2.2 Define Atmospheric pressure.
2.3 Describe Ideal Air / Fuel ratio .
2.4 Calculate the ideal Air / Fuel ratio for Petrol & Diesel engine, by chemical equation.
2.5 Describe the Air / Fuel ratio for different speeds of an engine.

3 Understand working of various intake system for IC engines.

3.1 State the Purpose of intake system of I.C engines.
3.2 List the components of various type of intake system of I.C engines.
3.3 Define air capacity
3.4 Describe main features of intake manifold.
3.5 State purpose of air cleaner.
3.6 Describe the working of different types of air cleaner.
3.7 Describe the purpose, construction and working of positive crank case ventilation system (PCV System),

4 Understand working of engine exhaust system components.

4.1 State the purpose of engine exhaust system.
4.2 Enllist the components of engine exhaust system
4.3 State purpose of Muffler/Silencer.
4.4 Describe the purpose, construction and working of Exhaust Gas
4.5 Recirculating system (EGR System),
4.6 Describe the working of different types of engine exhaust systems.
4.7 Describe the purpose of Catalytic Convertor.
4.8 Describe the working principle of different types Catalytic Convertor.
4.9 Explain the main features of exhaust manifold.

4.10 State the function of exhaust manifold Heat Shield.
4.11 Define the Back Pressure of engine exhaust system.
4.12 Describe the back pressure effects on engine Performance.

5 Understand the working of turbocharger .

5.1 Define Volumetric efficiency of I.C engine.
5.2 Describe factors effecting on Volumetric efficiency of an IC engine.
5.3 State purpose of turbocharger.
5.4 Describe the construction and working of turbocharger.
5.5 Define turbo-lag
5.6 Describe operation of Waste Gate control valve.
5.7 Describe purpose and working of intercooler.
5.8 Differentiate between turbocharger and supercharger.

6 Understand working of an various fuel supply systems of I.C engine.

6.1 Enlist components of various fuel supply system.
6.2 Describe construction of fuel tank .
6.3 State purpose of fuel gauge.
6.4 Describe construction and working of fuel gauge circuit(balancing coil and themister type).
6.5 Describe construction and working of evaporative fuel emission control system.
6.6 State function and types of fuel filter.

7 Understand working of different types of fuel pumps.

7.1 State the function of fuel pump.
7.2 Enlist the types of fuel pump.
7.3 Describe construction and working of mechanical/diaphragm type fuel pump.
7.4 Describe the construction and working of electric type fuel pump.

8 Understand Purpose, construction, working, and adjustment of carburetor.

8.1 Define atomization, vaporization & carburetion.
8.2 Differentiate between atmospheric pressure, gauge pressure and absolute pressure.
8.3 Describe air-fuel ratio for different engine working conditions.
8.4 State purpose of Carburetor.
8.5 Describe venturi effect.
8.6 Enlist name of Carburetor Circuits/Systems.
8.7 Describe the construction and working of Carburetor following circuits/systems.
- 8.7.1 Float Circuit.
- 8.7.2 Idle Circuit.
- 8.7.3 High speed Circuit.
- 8.7.4 Power Circuit.
- 8.7.5 Accelerator Pump Circuit.
- 8.7.6 Choke circuit (Mechanical/electric choke).

8.8 Describe air-fuel mixture adjustment at idle speed.
8.9 Describe carburetor types w.r.t
8.9.1 No of barrels,
8.9.2 No of venturies
8.9.3 Air draft

9 Understand the construction and working of LPG fuel supply system.

9.1 Define Liquefied petroleum Gas (LPG) fuel.
9.2 Enlist components of LPG fuel supply system.
9.3 Explain the working of each component of electronically controlled LPG fuel supply system.
9.4 Compare advantages and disadvantages of LPG fuel system with gasoline fuel system.

10 Understand the construction and working of CNG fuel supply system.

10.1 Define Compressed Natural Gas (CNG) fuel.
10.2 Enlist components of CNG fuel supply system.
10.3 Explain the working of each component of electronically controlled CNG fuel supply system.
10.4 Describe the construction and working of electronically controlled LNG fuel supply system.
10.5 Compare advantages and disadvantages of CNG/LNG fuel system with gasoline fuel system.

PART-II

11 Understand electronically controlled Gasoline fuel injection system.(EFI system).

11.1 State the advantages and disadvantages of electronically controlled gasoline fuel injection system (EFI System
11.2 Enlist the sub-systems of EFI System.
11.3 Describe the construction and working of sub-systems of EFI System.
11.3.1 Fuel delivery
11.3.2 Air induction

11.4 Describe the function, construction, circuit & working of following sensors
11.4.1 Air Flow meter
11.4.2 Map sensor
11.4.3 Air temperature sensor,
11.4.4 Water
11.4.5 Temperature sensor,
11.4.6 Throttle position sensor, ,
11.4.7 Knock sensor,
11.4.8 RPM sensor,
11.4.9 Oxygen sensor).

11.5 Describe the function, construction and circuit working of following actuators.
11.5.1 Injectors, Ignition system igniter,

11.5.2 Idle speed control valve.

11.6 State the purpose of Microcomputer/Electronic Control Unit (ECU).
11.7 Describe the working of EFI Systems w.r.t
11.7.1 D-Jetronics system,
11.7.2 L-Jetronics system,
11.7.3 K/KE-Jetronics system.

11.8 Describe the construction and working of EFI Systems w.r.t
11.8.1 Multiport
11.8.2 Fuel Injection system(MPFI system) and
11.8.3 Throttle Body Fuel injection system(TBI system).

11.9 Describe the working of drive by wire system(DBW).

12 Understand the working of diesel engine.

State the properties of diesel fuel.

12.1 Describe the working principle of four strokes diesel engine.
12.2 Enlist the main Components of diesel fuel supply system
12.3 State the purpose of diesel fuel filter.
12.4 Describe the construction and working of diesel fuel filter.
12.5 State the purpose of diesel water sedimentor.
12.6 Describe the construction and working of diesel water sedimentor.
12.7 State the purpose of primer/lifty pump.
12.8 Describe the construction and working of primer/lifty pump.
12.9 State function of diesel fuel feed pump.
12.10 Describe the types and working of diesel fuel feed pumps.
12.11 Describe the construction and working of Distributor type (rotary)
12.12 Describe the construction and working of In-Line type Diesel Fuel injection Pump.
12.13 State the function of Governor.
12.14 Describe the types and working of Governors.
12.15 Define phasing and calibration.
12.16 Explain the procedure of phasing and calibration of diesel fuel injection pumps.
12.17 Explain the procedure of setting of timing of diesel fuel injection pump.
12.18 State the function of diesel fuel injector.
12.19 Describe the types and working of diesel fuel injectors.
12.20 State the purpose of high pressure lines.
12.21 State the purpose of diesel engine glow plugs.
12.22 Describe the construction and working of diesel engine glow plugs.
12.23 Enlist the components of Electronically controlled Diesel Fuel Injection System.
12.24 Describe the construction and working of each components of Electronically controlled Diesel Fuel Injection System& Common Rail direct injection(CRDI).

13 Understand the working of vehicle cruisetronics control system.

13.1 State the Purpose of Vehicle Cruisetronics Control System.

13.2 Enlist the components of Vehicle Cruisetronics Control System.
13.3 Describe the working principle of Vehicle Cruisetronics Control System.

14 Understand the basic construction and working principle of variable valve timing control system.

14.1 State the Purpose of Variable valve timing control systems (VVT-i/ i-VTec / VANOS/VCT).
14.2 Enlist the components of Variable valve timing control systems (VVT-i/ i-VTec / VANOS/VCT).
14.3 Describe the working principles of Variable valve timing control systems (VVT-i/ i-VTec / VANOS/VCT).

15 Understand the basic construction and working principal of Locomotive Engine.

15.1 Enlist Main components of Locomotive Engine.
15.2 Describe basic working principle of Locomotive Engine.

16 Understand the basic working principle of jet engine.

16.1 Enlist the Main components of jet engine.
16.2 Describe the basic working principle of jet engine.

AFM-323 FUEL INJECTION & CARBURETION

List of Practicals:

1. Identify the components of Air intake system.
2. Dismantle dry type air cleaner assembly & replace its filter element and re-assemble it.
3. Dismantle service and assemble oil bath type air cleaner.
4. Identify the parts of turbo charger & service it.
5. Identify the components of exhaust system.
6. Practice to replace and service the muffler.
7. Practice to remove & reinstall fuel tank after cleaning.
8. Remove and reinstall electric fuel pump from the fuel tank.
9. Dismantle a carburetor, clean parts, trace out various circuits ,and carry out adjustments.
10. Dismantle LPG regulator kit, clean parts and trace out various circuits.
11. Dismantle CNG regulator kit , clean parts and trace out various circuits.
12. Identify the components of EFI system
13. Practice of fault finding by Automotive Diagnostic Scanner.
14. Identify components of diesel fuel supply system.
15. Dismantle, service, assemble , testing and readjusting pressure of the injector.
16. Dismantle and assemble the distributor type diesel fuel injection pump.
17. Dismantle and assemble the in- line type diesel fuel injection pump.
18. Carryout phasing of diesel fuel injection pumps on the test bed .
19. Carryout calibration of diesel fuel injection pumps on the test bed
20. Carryout setting of timing of diesel fuel injection pump on engine.
21. Identify components of Vehicle variable valve timing control system.
22. Identify components of Vehicle Cruisetronic control system.
23. Prepare a project (sectional/working model) relevant to the subject.(this activity may be performed in a group of students).
24. Practice to use Automotive Diagnostic Scanner for Fault finding of Vehicle
25. Practice to use of Exhaust Gas Analyzer to check exhaust emission
26. Test exhaust emissions by using of exhaust gas analyzer.
27. Identify main components of Electric Vehicle.
28. Visit at railway workshops for the demonstration to Identify the main components of Locomotive engine.
29. Visit at Modern automotive workshop for the demonstration of the use of an automotive equipment.
30. Practice of Endoscope in Chamber of Vehicles.

AFM-333 AUTOMOTIVE TRANSMISSION

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

Pre-requisite: IC ENGINE + WORKSHOP PRACTICE-I

LEARNING OUTCOMES.

1. Understand the working of mechanical transmission system
2. Repair and maintain conventional transmission from clutch and gear box to final drive unit.
3. Understand the working of automatic and hydraulic transmission.
4. Develop skill in servicing, repair of Electronically controlled automatic transmission systems.
5. Understand gear ratio and working of epicyclic gear train.

Detail of Contents:

PART-I

1 Purpose & terminology of automotive transmission system. 4 Hours

1.1 Purpose of Automotive Transmission System.
1.2 Terminology.
- 1.2.1 Torque,
- 1.2.2 Velocity,
- 1.2.3 Tractive effort,
- 1.2.4 Air Resistance,
- 1.2.5 Gradient Resistance,
- 1.2.6 Rolling Resistance,
- 1.2.7 Maximum vehicle speed,
- 1.2.8 Constant velocity.

2 Automotive transmission system Lay-out. 4 Hours

2.1 Power Train.
2.2 Main Components of Automotive Transmission System.
2.3 Automotive Transmission Lay-outs, types, and their advantages.
- 2.3.1 2-Wheeler drive.
- 2.3.2 Front engine front wheel drive.
- 2.3.3 Rear engine rear wheel drive.
- 2.3.4 Front engine rear wheel drive.
- 2.3.5 4-Wheel drive.

2.3.6 AWD

3 Purpose, types, and working of gears. 6 Hours

3.1 Purpose of Gear.
3.2 Basic Configuration of Gear.
3.3 Different types of gears and their working.
3.4 Gear train Terminology
- 3.4.1 Simple Gear Train
- 3.4.2 Compound Gear Train.
- 3.4.3 Reverse Gear Train.
- 3.4.4 Gear Ratio,
- 3.4.5 Torque Ratio,
- 3.4.6 Velocity Ratio.

4 Purpose, types, construction and working of clutch. 6 Hours

4.1 Function of Clutch.
4.2 Main parts of clutch.
4.3 Various types of Clutches used in automotive.
- 4.3.1 Single Plate Clutch.
- 4.3.2 Multi Plate Clutch.
- 4.3.3 Dry and Wet type Clutch.
- 4.3.4 Diaphragm type Clutch.
- 4.3.5 Dual clutch
- 4.3.6 Electromagnetic clutch

4.4 Material used for Clutch Lining
4.5 Cable operated Clutch mechanism (Mechanical linkage).
4.6 Hydraulically operated Clutch mechanism.
4.7 Construction and working principle of Fluid Coupling.
4.8 Causes and remedies of clutch faults.

5 Working of manual transmission and transaxle. 12 Hours

5.1 Importance of Gear Box.
5.2 Types, Construction and working of following types of mechanical Gear Boxes.
- 5.2.1 Sliding Mesh type Gear Box.
- 5.2.2 Constant Mesh type (Synchromesh) Gear Box.

5.3 Positions and working of Gear Shift Mechanism.
5.4 Free Wheeling.
5.5 Purpose, Construction, and working of Overdrive Mechanism.
5.6 Purpose, Construction, and working of transaxle Gear Box.
5.7 Gear Ratio of manual gear box in 1st gear, 2nd gear, 3rd gear, 4th gear, 5th Gear , 6th Gear and in reverse gear.

5.8 Properties of Gear Box oil.
5.9 Problems, causes and possible remedies of Manual type gear boxes.
5.10 Purpose of the 4-Wheel Drive mechanism.
5.11 Construction and working of 4-Wheel Drive Mechanism.

PART-II

6 Purpose, construction, types and working of propeller shaft. 4 Hours

6.1 Purpose of Propeller Shaft.
6.2 Working of each component of propeller shaft.
- 6.2.1 Universal joint
- 6.2.2 Slip Joint.
- 6.2.3 Constant Velocity Joint.
- 6.2.4 Hotchkiss drive
- 6.2.5 Torque tube type drive.

6.3 Faults, Causes and possible remedies of Propeller Shaft.

7 Purpose, construction, and working of differential gear box. 4 Hours

7.1 Purpose of Differential Gear Box.
7.2 Components of Differential Gear Box.
7.3 Construction and Working of Differential Gear Box.
7.4 Gear Ratio of Differential Gear Box.
7.5 Properties of Differential Gear Box oil.
7.6 Purpose and working of Limited Slip Differential (LSD).
7.7 Problems, Causes and possible remedies of Differential Gear Box.
7.8 Locked differential
7.9 Torque vectoring differential
7.10 Active differential
7.11 Torsion differential

8 Purpose, construction, types and working of drive axles. 4 Hours

8.1 Purpose of drive axle.
8.2 Live axle and Dead axle.
8.3 Types of Rear Axle.
- 8.3.1 Semi floating axle.
- 8.3.2 Three quarter floating axle.
- 8.3.3 Full floating axle.

8.4 Types of Axle Housing.
- 8.4.1 Banjo type Axle Housing.
- 8.4.2 Slit type Axle Housing.

8.5 Axle to weight ratio.

8.6 Axle Hub.
8.7 Problems, Causes and possible remedies of axle faults.

9 Working of automatic transmission and transaxle. 20 Hours

9.1 Advantages and Disadvantages of Manual and Automatic Transmission.
9.2 Construction and working of each components of following types of Automatic Transmission (Gear Box).
9.2.1 Epicyclic or Planetary Gear train type
9.2.2 Electronically Controlled Automatic Transmission (ECT).
9.2.3 Progressive Shift Schedule Management Technology (Prosmatic Transmission Gear Box).
9.2.4 Continuously Variable Transmission (CVT).
9.3 4-Wheel Drive Electronically controlled transaxle (4-W ECT).
9.4 Properties of Automatic Transmission Fluid.
9.5 Advantages and Disadvantages of Manual and Automatic Transmission.
9.6 Problems, Causes and possible remedies of automatic transmission

Recommended Textbooks:

1. Automotive Excellence (Volume 1 & 2) by McGRAW Hill International
2. Automotive Mechanics (Volume 1 & 2) by Ed May
3. Automotive Technology A System Approach by Jack Erjavec
4. Modern Automotive Mechanics by James E. Duffy.

AFM-333 AUTOMOTIVE TRANSMISSION

INSTRUCTIONAL OBJECTIVES:

PART-I

1 Understand the purpose & terminology of automotive transmission system.

1.1 Purpose of Automotive Transmission System.
1.2 Terminology.
- 1.2.1 Torque,
- 1.2.2 Velocity,
- 1.2.3 Tractive effort,
- 1.2.4 Air Resistance,
- 1.2.5 Gradient Resistance,
- 1.2.6 Rolling Resistance,
- 1.2.7 Maximum vehicle speed,
- 1.2.8 Constant velocity.

2 Understand the automotive transmission system Lay-out.

2.1 Power Train.
2.2 Main Components of Automotive Transmission System.
2.3 Automotive Transmission Lay-outs, types, and their advantages.
- 2.3.1 2-Wheeler drive.
- 2.3.2 Front engine front wheel drive.
- 2.3.3 Rear engine rear wheel drive.
- 2.3.4 Front engine rear wheel drive.
- 2.3.5 4-Wheel drive.
- 2.3.6 AWD

3 Understand the purpose, types, and working of gear

3.1 Define Gear Ratio,
- 3.1.1 Torque Ratio,
- 3.1.2 Velocity Ratio.
- 3.1.3 Purpose of Gear.

3.2 Basic Configuration of Gear.
3.3 Different types of gears and their working.
3.4 Gear train Terminology
- 3.4.1 Simple Gear Train
- 3.4.2 Compound Gear Train.

3.4.3 Reverse Gear Train.
3.4.4 Gear Ratio,
3.4.5 Torque Ratio,
3.4.6 Velocity Ratio.

4 Understand the purpose, types, construction and working of clutch.

4.1 State the Function of Clutch.
4.2 Enlist the main parts of clutch.
4.3 Describe Various types of Clutches used in automotive.
4.3.1 Single Plate Clutch.
4.3.2 Multi Plate Clutch.
4.3.3 Dry and wet type Clutch.
4.3.4 Diaphragm type Clutch.
4.3.5 Centrifugal clutch.
4.3.6 Dual clutch
4.3.7 Electromagnetic clutch
4.4 Describe the material use for Clutch Lining
4.5 Describe Cable operated Clutch mechanism (Mechanical linkage).
4.6 Describe the Hydraulically operated Clutch mechanism.
4.7 Explain the construction and working principle of Fluid Coupling.
4.8 Describe the causes and remedies of clutch faults.

5 Understand the construction , types and working of manual Transmission and transaxle.

5.1 Describe the importance of Gear Box.
5.2 Describe the types, Construction and working of following types of Mechanical Gear Boxes.
5.2.1 Sliding Mesh type Gear Box.
5.2.2 Constant Mesh type (Synchromesh)Gear Box.
5.3 Explain the positions and working of Gear Shift Mechanism.
5.4 Describe Free Wheeling.
5.5 Describe purpose, Construction, and working of Overdrive Mechanism.
5.6 Describe purpose, Construction, and working of transaxle Gear Box.
5.7 Find out the Gear Ratio of manual gear box in 1st gear, 2nd gear, 3rd gear, 4th gear, 5th Gear, 6th Gear and in reverse gear.
5.8 Describe Properties of Gear Box oil.
5.9 Describe problems, causes and possible remedies of Manual type Gear Boxes.
5.10 State the purpose of the 4-Wheel Drive mechanism.
5.11 Describe the construction and working of 4-Wheel Drive Mechanism.

PART-II

6 Understand the purpose, construction, types and working of propeller shaft.

6.1 State Purpose of Propeller Shaft.
6.2 Describe construction and working of each component of propeller shaft.
- 6.2.1 Universal joint and Slip Joint.
- 6.2.2 Constant Velocity Joint.
- 6.2.3 Hotchkiss drive
- 6.2.4 Torque tube type drive.

6.3 Describe the faults, Causes and possible remedies of Propeller Shaft.

7 Understand the purpose, construction, and working of differential gear box.

7.1 State the Purpose of Differential Gear Box.
7.2 Enlist Components of Differential Gear Box.
7.3 Explain the Construction and Working of Differential Gear Box.
7.4 Find out the Gear Ratio of Differential Gear Box.
7.5 Describe Properties of Differential Gear Box oil.
7.6 Describe the purpose and working of Limited Slip Differential (LSD).
7.7 Describe the problems, Causes and possible remedies of Differential Gear Box.
7.8 Locked differential
7.9 Torque vectoring differential
7.10 Active differential
7.11 Torsion differential

8 Understand the purpose, construction, types and working of drive axles.

8.1 State the Purpose of drive axle.
8.2 Differentiate between the Live axle and Dead axle.
8.3 Describe the types of Rear Axle.
- 8.3.1 Semi floating axle.
- 8.3.2 Three quarter floating axle.
- 8.3.3 Full floating axle.

8.4 Describe Types of Axle Housing.
- 8.4.1 Banjo type Axle Housing.
- 8.4.2 Slit type Axle Housing.

8.5 Describe axle to weight ratio.
8.6 Describe Axle Hub.
8.7 Describe the problems, Causes and possible remedies of axle faults.

9 Understand the construction, types and working of automatic Transmission and transaxle.

9.1 Describe the Advantages and Disadvantages of Manual and Automatic Transmission.
9.2 Describe the construction and working of each components of following types of Automatic Transmission (Gear Box).
- 9.2.1 Epicyclic or Planetary Gear train type Electronically Controlled
- 9.2.2 Automatic Transmission (ECT).
- 9.2.3 Progressive Shift Schedule Management Technology
- 9.2.4 Prosmatic Transmission Gear Box.
- 9.2.5 Continuously Variable Transmission (CVT).
- 9.2.6 Wheel Drive Electronically controlled transaxle (4-W ECT).

9.3 Describe Properties of Automatic Transmission Fluid.
9.4 Describe the Advantages and Disadvantages of Manual Automatic Transmission.
9.5 Describe problems, Causes and possible remedies of Automatic Transmission.

AFM-333 AUTOMOTIVE TRANSMISSION

List of Practical:

1. Draw various Vehicle Layouts for 2-wheeler, 3-wheeler, and 4-wheeler and compare them.
2. Identify the main units of automotive Transmission system.
3. Identify different types of Gears.
4. Remove and reinstall Clutch assembly.
5. Re-align the Clutch Plate.
6. Adjust the Clutch Pedal free play.
7. Identify the Problems of Clutch Plate and Pressure plate assembly.
8. Remove and reinstall the transmission gear box on the vehicle.
9. Dismantle and assemble the Synchromesh type gear box, identify, clean and inspect the parts, and also calculate the gear ration in 1st, 2nd, 3rd, 4th and reverse gear.
10. Study the working of gear shift mechanism.
11. Study the transfer case working.
12. Identify the parts of synchronizing unit.
13. Disassemble and identify the main parts of overdrive mechanism.
14. Remove, inspect and reinstall the propeller shaft.
15. Dismantle, inspect and reassemble the universal and Slip joints parts.
16. Check play and noise in constant velocity joint.
17. Remove rear axle, inspect and re-install it.
18. Remove and inspect gear box bearings oil seal, and reinstall them.
19. Disassemble, inspect and reassemble the Planetary gear train type electronically controlled automatic transmission (ECT) and identify all the components.
20. Visit at modern automotive workshop for the demonstration of disassembling, inspection, identification of parts and reassembling of (Prosmatic transmission gear box & continuously variable transmission (CVT) gear box.
21. Diagnose the troubles of automatic transmission using automotive diagnostic Scanner and rectify them.

AFM-343 CAD and Robotics

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

Pre-requisite: Computer Science Fundamentals.

LEARNING OUTCOMES.
After completion of this course, the students will be able to:

1. Understand the importance of computer application in preparing drawing with the help of Auto CAD software and organizing automation
2. Apply CAD commands to draw geometrical figures
3. Prepare drawing of Auto components by using Auto CAD software
4. Use CAD to make three dimensional simple views (3D view)
5. Know basic principles of computer applications in Automation (CAM)
6. Understand the basics of robotics and its importance

Details of Contents:

1 CAD (Computer Aided Design/Drawing) 4 Hours

1.1 CAD Introduction
1.2 CAD History
1.3 2D and 3D CAD
1.4 AutoCAD and other designing software
1.5 AutoCAD installation

2 Interfacing with AutoCAD 4 Hours

2.1 Beginning AutoCAD
2.2 Navigating the Graphical User Interface (GUI)
2.3 Picking/ Choosing Commands
2.4 Opening Drawings, Beginning New Drawings/files, ClosingDrawings/files and AutoCAD
2.5 Saving files in other location, renaming files/folder

3 Using Accurate Drawing Techniques 5 Hours

3.1 Picking Points with the help of Osnap
3.2 Using Object Snaps; Object Snap settings
3.3 Inputting Coordinates
3.4 Using Dynamic Input
3.5 Typing Numbers
3.6 Aligning Points with Object Snap Tracking
3.7 Obtaining distances with distance command

4 Displaying Areas of a Drawing 2 Hours

4.1 Viewing the Entire Drawing
4.2 Enlarging or Reducing the Image on the Screen
4.3 Viewing Adjacent Areas
4.4 Using command Zoom (All options)

5 Working with Object Properties 3 Hours

5.1 Using the Properties Tool Palette
5.2 Creating and Assigning Layers
5.3 Working With Colors, Line types and Line weights
5.4 Use of ORTHO, SNAP and Grid in Auto CAD

6 Creating and Editing Shapes 9 Hours

6.1 Erasing and deleting Objects
6.2 Drawing Lines using coordinate systems, Circle, Polygons and Rectangles
6.3 Moving and Copying Objects
6.4 Adding Fillets and Chamfers
6.5 Trimming and Extending Objects (with options)
6.6 Joining Objects
6.7 Offsetting Objects
6.8 Stretching Objects
6.9 Mirroring Objects
6.10 Creating Patterns with Array (polar and rectangular options)
6.11 Scaling and Rotating Objects
6.12 Using Blocks from Design Center and Tool Palette
6.13 Filling Areas with a Pattern (Hatch), types of Hatch, options of Hatch

7 Adding Text and Dimensions 5 Hours

7.1 Choosing an Annotation Scale
7.2 Adding a Note Using Multiline Text and single line text
7.3 Creating linear, Aligned and Angular Dimensions
7.4 Adding Diameter and Radius Dimensions, use of dimensioncontinue and Base line
7.5 Creating Multiline Leaders, applying tolerances

8 Printing 3 Hours

8.1 Choosing the Plotter print/Printer, Area, Paper Size, Orientation and Color
8.2 Adding a Sheet Format (Layout)
8.3 Setting the Drawing Scale

9 Modeling in 3D **9 Hours**

9.1 3D viewing techniques
9.2 Working with simple and composite solids
9.3 Creating complex solids and surfaces
9.4 Modifying objects in 3D space/ editing solids
9.5 Converting 3D objects/ Setting up a rendering withmaterials and lights
9.6 Working with the User Coordinate System

10 Drawing of Auto Mobile Components **6 Hours**

10.1 Simple parts in detail
10.2 Components as assembly (only two component assemblies)
10.3 Introduction of 3 Dimension in pictorial, oblique and isometric

11 Automation (CAM) **6 Hours**

11.1 Importance of CAM in production
11.2 Concept of 3-axes movements of machine table, spindle andtools by computer.
11.3 Changing of tools at sequence
11.4 CAM programming

12 ROBOTICS **4 Hours**

12.1 What is robot and its importance in production?
12.2 Principle of robotics
12.3 Mechanical methods and components used in robotics
12.4 Idea of computer programming for operation of robots
12.5 Types of operations/processes which can be done by robot e.g.assembling, fitting of engine parts, chassis and body of vehicle.
12.6 Welding techniques in vehicle body building with use of robots.
12.7 Robotic inspection of vehicle

13 Robot Control Systems **4 Hours**

13.1 Robot control mechanism
13.2 Robot motion control types
13.3 Point to point control.
13.4 Continuous path control
13.5 Controlled path control
13.6 Stop to stop control.
13.7 Robot control methods
13.8 Manual control
13.9 Wireless control
13.10 Fully autonomous control.

Recommended Textbooks:

1. Auto CAD-2012 for Engineers & Designers by Professor Smam Tichro.

2. Masering Auto CAD 2008 and Auto CAD LT 2008 by George Omura.
3. Introduction to Robotics by J.J Craig
4. Fundamentals of robotics engineering by Harry H. Pool

AFM-343 INSTRUCTIONAL OBJECTIVES:

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

1 Understand CAD (Computer Aided Design/Drawing) Basics

1.1 Define Auto CAD and describe its uses, purpose, advantages and importance in industry
1.2 Discuss the history of CAD
1.3 Describe 2D and 3D CAD
1.4 Describe AutoCAD and other designing software
1.5 Explain AutoCAD installation

2 Understand Interfacing with AutoCAD

2.1 Describe Beginning of AutoCAD
2.2 Describe Navigating the Graphical User Interface (GUI)
2.3 Describe Picking/ Choosing Commands
2.4 Explain opening drawings, beginning new drawings/files, Closing drawings/files and AutoCAD
2.5 Saving files in other location, renaming files/folder

3 Understand Using Accurate Drawing Techniques

3.1 Describe Picking Points with the help of Osnap
3.2 Explain Using Object Snaps; Object Snap settings
3.3 Describe Inputting Coordinates
3.4 Describe Using Dynamic Input
3.5 Describe Typing Numbers
3.6 Describe Aligning Points with Object Snap Tracking
3.7 Describe obtaining distances with distance command

4 Understand Displaying Areas of a Drawing

4.1 Describe Viewing the Entire Drawing
4.2 Describe Enlarging or Reducing the Image on the Screen
4.3 Describe Viewing Adjacent Areas
4.4 Explain Using command Zoom (All options)

5 Understand Working with Object Properties

5.1 Explain Using the Properties Tool Palette
5.2 Explain Creating and Assigning Layers
5.3 Discuss Working With Colors, Line types and Line weights
5.4 Explain Use of ORTHO, SNAP and Grid in Auto CAD

6 Understand Creating and Editing Shapes

6.1 Describe Erasing and deleting Objects
6.2 Explain Drawing Lines using coordinate systems, Circle, Polygons and Rectangles
6.3 Describe Moving and Copying Objects
6.4 Explain Adding Fillets and Chamfers
6.5 Explain Trimming and Extending Objects
6.6 Describe Joining Objects
6.7 Describe Offsetting Objects
6.8 Describe Stretching Objects
6.9 Describe Mirroring Objects
6.10 Describe Creating Patterns with Array (polar and rectangular options)
6.11 Describe Scaling and Rotating Objects
6.12 Explain Using Blocks from Design Center and Tool Palette
6.13 Explain Filling Areas with a Pattern (Hatch), types of Hatch, options of Hatch

7 Understand Adding Text and Dimensions

7.1 Discuss Choosing an Annotation Scale
7.2 Describe Adding a Note Using Multiline Text and single line text
7.3 Explain Creating linear, Aligned and Angular Dimensions
7.4 Explain Adding Diameter and Radius Dimensions, use of dimension continue and Base line
7.5 Explain Creating Multiline Leaders, applying tolerances

8 Understand Printing

8.1 Discuss Choosing the Plotter print/Printer, Area, Paper Size, Orientation and Color
8.2 Discuss Adding a Sheet Format (Layout)
8.3 Discuss Setting the Drawing Scale

9 Understand Modeling in 3D

9.1 Describe 3D viewing techniques
9.2 Describe Working with simple and composite solids
9.3 Describe Creating complex solids and surfaces
9.4 Explain Modifying objects in 3D space/ editing solids
9.5 Explain Converting 3D objects/ Setting up a rendering with materials and lights
9.6 Explain Working with the User Coordinate System

10 Understand Drawing of Auto Mobile Components

10.1 Explain Simple parts in detail
10.2 Explain Components as assembly (only two component assemblies)
10.3 Explain introduction of 3 Dimension in pictorial, oblique and isometric

11 Understand Automation (CAM)

11.1 Describe Importance of CAM in production
11.2 Describe Concept of 3-axes movements of machine table, spindle and tools by computer.
11.3 Describe Changing of tools at sequence
11.4 Define CAM and describe CAM programming

12 Understand Robotics

12.1 Define robot and its importance in production
12.2 Describe Principle of robotics
12.3 Describe Mechanical methods and components used in robotics
12.4 Describe Idea of computer programming for operation of robots
12.5 Describe Types of operations/processes which can be done by robot e.g. assembling,Fitting of engine Parts, chassis and body of vehicle.
12.6 Explain Welding techniques in vehicle body building with use of robots.
12.7 Explain the inspection of vehicle using robots.

13 Robot Control Systems

13.1 Understand the basic principles of robot control mechanisms, including sensors, actuators, and controllers.
13.2 Explain how point-to-point control algorithms work to move a robot from one point to another.
13.3 Identify the different types of point-to-point control algorithms and their applications.
13.4 Explain how continuous path control algorithms follow a predefined path while moving a robot.
13.5 Explain how controlled path control algorithms adjust the robot's motion based on feedback from sensors.
13.6 Explain how stop-to-stop control algorithms bring a robot to a controlled stop at a specific point.
13.7 Explain how a human operator controls a robot using joysticks, buttons, or other interfaces.
13.8 Identify the applications of manual control in different robotic tasks.
13.9 Explain how a human operator controls a robot using a remote control or other wireless interfaces.
13.10 Explain how fully autonomous control system works.

AFM-343 List of Practicals:

1- Basic requirements of PC for loading AUTO CAD software into computer memory (Installation)
2- Practice loading AUTO CAD software into computer memory
3- Practice CAD abbreviations, short cut keys for Line, Arc, Circle, Erase, etc
4- Practice to draw straight lines using polar coordinate on graph paper
5- Setup drawing area limits using CAD
6- Practice for turning grid ON /OFF, and snap ON /OFF and create drawings using snap & grid settings
7- Draw a line with Line command with DDE
8- Draw an inclined line with Line command
9- Create a Layer for title block and draw title block with line command and assign layer to it. Practice for Zoom command (all options)
10- Practice for filling title block with text command (multiline or single line)
11- Practice for plotting the drawing on Plotter or Printer
12- Create a new drawing, save it, rename it and save it in other location/drive/folder
13- Draw a circle with circle command
14- Practice with Undo and Redo commands
15- Practice for Modify commands
16- Basic drawing techniques
17- Direct distance method
18- Relative polar coordinate system
19- Relative Cartesian coordinate system
20- Absolute coordinate system
21- Draw detail of AUTO CAD screen/Graphical User Interface (GUI)
22- Practice of Key combinations and Function Key
23- Visit to a robotics factory

AFM-353 FARM MACHINERY-II

Total contact Hours:

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

Pre-requisite: Farm Machinery-I

LEARNING OUTCOMES:

1. Understand the hay and forage harvesting equipment.
2. Understand the reapers and cutter binders, their working and construction.
3. Understand the stationery thresher, their use, working and construction.
4. Understand the grain harvesting equipment, their use and working.
5. Understand the working, construction and use of specialized harvesting equipment.
6. Understand the working, construction and use of root-harvesting machines.
7. Know the use of power and machinery management and field and machine capacities.

Detail of Contents:

1 HAY AND FORAGE HARVESTING EQUIPMENT 9 Hours

1.1 Purpose of hay and forage harvesting equipment
1.2 Working of cutter bar assembly of mower
1.3 Parts of cutter bar assembly of mower
1.4 Types of mowers
1.5 Working and functions of rotary mowers
1.6 Purpose, and different types of Hay conditioners
1.7 Purpose, and types of windrowers
1.8 Purpose, working types and construction of rakes
1.9 Types working and use of loaders and stackers
1.10 Purpose, types working and use of hay balers
1.11 Purpose, types and working of forage harvesters
1.12 Function of forage harvester parts (flail types)
1.13 Factors effecting the performance of forage harvesters, mowers, rakes, balers and hay conditioners.

2 REAPERS AND CUTTER BINDERS 9 Hours

2.1 Introduction/purpose of reapers
2.2 Reapers cum cutter binders
2.3 Driving and cutting mechanisms
2.4 Plate form and elevator
2.5 Binder head and knotter head

2.6 Safety precautions for the efficient use of reaper and cutter binders

3 STATIONERY THRESHERS 9 Hours

3.1 Purpose, working and construction of stationary threshers
3.2 Setting of the Stationary thresher
3.3 Pre-checks and safety to use threshers
3.4 Lubrication, care and maintenance of threshers
3.5 Care of storing of threshers
3.6 Repair and servicing of the threshers
3.7 Operation difficulties, causes and their remedies
3.8 Over-hauling and adjustments of threshers
3.9 Field capacity & field efficiency of threshers

4 GRAIN HARVESTING EQUIPMENT 9 Hours

4.1 Purpose and use of combine harvesters
4.2 Advantages and disadvantages of combines
4.3 Types, working and function of combines
4.4 Grain losses during harvesting, causes and their remedies
4.5 Different mechanisms of combines
4.6 Operation and adjustments of a combines
4.7 Factors effecting the performance of a combines

5 SPECIALIZED HARVESTING EQUIPMENT 9 Hours

5.1 Purpose, types and working of maize harvester/corn picker
5.2 Mechanisms of maize combine harvester
5.3 Calculation of field losses in maize harvester
5.4 Safety care for use of maize harvester
5.5 Factors effecting performance of maize harvester
5.6 Cotton strippers and their types
5.7 Safety care during the operation of cotton strippers
5.8 Factors affecting the performance of cotton strippers
5.9 Cotton pickers and their types
5.10 Different mechanisms of cotton pickers
5.11 Doffing of the cotton from the spindles
5.12 Factor affecting the performance of cotton Pickers

6 ROOT HARVESTING EQUIPMENT 9 Hours

6.1 Potato diggers and their types
6.2 Mechanisms of potato harvesters
6.3 Working and safety care to use potato harvesters
6.4 Purpose and types of sugar beet harvesters
6.5 Topping, lifting and cleaning of beets
6.6 Systems of sugar beet combine

6.7 Types and operation of peanut harvesters
6.8 Factors effecting the performance of potato, sugar beet, and peanut harvester

7 POWER AND MACHINERY MANAGEMENT 10 Hours

7.1 Purpose of machinery management
7.2 Cost analysis of Different Farm machines
7.3 Factors reducing the operating cost of machinery
7.4 Factor for the selection of farm machinery
7.5 Capacity calculation for different farm implements
7.6 Field Efficiency calculation of tractor and cultivating implements
7.7 Farm Machinery Record
7.8 Agricultural Machinery Entrepreneurship

BOOKS RECOMMENDED

1. Farm Machinery and Equipment By: Harris P. Smith
2. Agricultural Power and Machinery By: Jaccob Harrel
3. Elements of Farm Machinery By: A.C. Srivastava
4. Farm Tractor By S.C Rai
5. Fundamentals of Tractor & energy conservation By Faqeer Muhammad Chaudery & Dr. Gulam Sarwar

AFM-353 INSTRUCTIONAL OBJECTIVES

On the completion of this course, the students will be able to

1 UNDERSTAND THE PURPOSE, WORKING AND USE OF HAY AND FORAGE HARVESTING EQUIPMENT

1.1 State the purpose of Hay and Forage Harvesting Equipment
1.2 Explain the working of cutter bar assembly of mower
1.3 Enlist parts of cutter bar assembly of mower
1.4 Describe different types of mowers
1.5 Explain working and functions of rotary mowers
1.6 Explain the purpose, and different types of Hay conditioners
1.7 Explain the purpose, and types of windrowers
1.8 Describe purpose, working and construction of rakes
1.9 State types, working and use of loaders and stackers
1.10 State types, working and use of Hay Balers
1.11 Explain purpose, types and working of Forage Harvesters including sillage making
1.12 Explain function of Forage Harvester parts (Flail types)
1.13 Describe factors effecting the performance of Hay and Forage Harvesters (mowers, rakes, balers and hay conditioners)

2 UNDERSTAND THE WORKING AND FUNCTIONS OF REAPERS AND CUTTER BINDERS

2.1 State the purpose of reapers
2.2 Explain reapers -cum -cutter binders
2.3 Explain driving and cutting mechanisms of cutter binder
2.4 Explain plate form and elevator of reaper-binders
2.5 Describe the binder head and knotter head
2.6 Enlist safety precautions for the efficient use of reaper and cutter binders

3 UNDERSTAND THE WORKING, CONSTRUCTION AND USE OF STATIONERY THRESHERS

3.1 Explain the purpose, working and construction of stationary threshers
3.2 Explain the setting of the stationary thresher
3.3 Enlist pre-checks and safety to be observe in the use of threshers
3.4 Explain the methods of lubrication, care and maintenance of threshers
3.5 State the precautions to be taken in the storage of threshers
3.6 Describe procedure for repair and servicing of the threshers
3.7 Describe the operation difficulties, causes and their remedies
3.8 Explain over-hauling and adjustments of threshers
3.9 Explain the functioning of multi crop threshers

4 UNDERSTAND THE FUNCTION AND WORKING OF GRAIN HARVESTING EQUIPMENT

4.1 Explain the purpose, function and use of combine harvesters
4.2 Describe advantages and disadvantages of combines
4.3 Explain types, working and functions of combines
4.4 Explain grain losses during harvesting, causes and their remedies
4.5 Describe the different mechanisms of combines
4.6 Describe the operation and adjustments of a combine
4.7 Enlist factors affecting the performance of a combine

5 UNDERSTAND VARIOUS SPECIALIZED HARVESTING EQUIPMENTS

5.1 Explain the purpose, types and working of maize harvester/corn pickers
5.2 Describe various mechanisms of maize combine harvester
5.3 Calculate the field losses in maize harvester/corn pickers
5.4 Enlist safety cares in the use of maize harvester/corn pickers
5.5 Explain factors effecting performance of maize harvester/corn picker
5.6 Explain cotton strippers and their types
5.7 Enlist the safety precautions in the operation of cotton strippers
5.8 Explain the factors affecting the performance of cotton strippers
5.9 State the cotton pickers and their types
5.10 Explain the different mechanisms of cotton pickers
5.11 Describe the doffing of the cotton from the spindles
5.12 Describe the factors effecting the performance of cotton harvesters

6 UNDERSTAND THE PURPOSE, FUNCTION, WORKING AND USE OF ROOT HARVESTING EQUIPMENT

6.1 Explain Potato diggers and their types
6.2 Explain various mechanisms of potato harvesters
6.3 Describe the working and safety care to be used in potato harvesters
6.4 Describe the purpose and types of sugar beet harvesters
6.5 Explain the topping, lifting and cleaning of beets
6.6 Describe the systems of sugar beet combine
6.7 Explain the types and operation of peanut harvesters
6.8 Describe the factors effecting the performance of potato, sugar beet, and peanut harvester

7 UNDERSTAND THE POWER AND MACHINERY MANAGEMENT

7.1 State the purpose of machinery management
7.2 Explain cost analysis of farm machines
7.3 Enlist the factors reducing the operating cost of machinery
7.4 Explain the factor involved in the selection of farm machinery
7.5 Field Capacity calculation for different farm implements
7.6 Field Efficiency calculation of Tractor and cultivating Implements
7.7 Describe Farm Machinery Record
7.8 Describe Agricultural Machinery Entrepreneurship

AFM-353 LIST OF PRACTICALS

1. Adjustment, maintain and over haul different tillage equipment in the shop like Tine Cultivator, Disc plow, Chisel plow, M.B. plow, Disc Harrow, Reaper etc
2. Perform on field adjustments on mowers
3. Service, repair and maintain mower cutter bar assembly
4. Register and align of cutter bar of mower
5. Study and identify different mechanism of hay bailers, rakes, windrowers
6. Study different hay-conditioners in the shop
7. Service changing, cutters changing, rasp bar changing in repair and maintain stationary threshers
8. Identify different mechanisms of multi crop thresher and combine harvester and make adjustment necessary to reduce operational difficulties in the shop
9. Study different mechanisms of a self -propelled combine harvester in the shop
10. Repair service and adjust a combine harvester
11. Repair and maintain potato harvester/ digger
12. Study the functions of corn and cotton harvester
13. Visit to Agricultural Engineering Workshop
14. Visit to the Farm Machinery Institute, Islamabad
15. Visit to Agricultural Mechanization Research Institute, Multan
16. Visit to center for agricultural machinery institute (CAMI)
17. Visit to farm implements manufacturing industry
18. Visit to tractor assembling industry
19. Visit to Bahawalpur engineering limited Bahawalpur
20. Visit to combine harvester repairing workshop Gujranwala

AFM-362 EARTH MOVING MACHINERY

TOTAL CONTACT HOURS

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

Pre-requisite: Applied Physics

LEARNING OUTCOMES:

1. Understand the hydraulics, reservoirs lines, fittings, accumulators, oil coolers, and actuators.
2. Understand the types, construction, and working principles of dozers, scrapers, loaders, excavators, dump trucks and material handling devices.

Details of Contents:

1 HYDRAULIC SYSTEM, RESERVOIRS, HYDRAULIC LINES AND FITTINGS 4 Hours

1.1 Hydraulic System
1.2 Components of Hydraulic system
1.3 Function of reservoirs
1.4 Fitting of reservoirs
1.5 Location of reservoir
1.6 Importance of hydraulic lines and fittings
1.7 Pipes and tubing
1.8 Pipe fittings
1.9 Hydraulic hose
1.10 Hose ends and adopters.

2 THE ACCUMULATORS AND OIL COOLERS 2 Hours

2.1 Accumulator
2.2 Design and operation of accumulators
2.3 Servicing of accumulators
2.4 Purpose and function of oil coolers

3 HYDRAULIC PUMP AND VALVE 3 Hours

3.1 Hydraulic pump
3.2 Working principle of hydraulic pumps
3.3 Parts of hydraulic pumps
3.4 Purpose and types of hydraulic pumps
3.5 Hydraulic valve
3.6 Purpose and types of hydraulic valve
3.7 Working principle of hydraulic valve

4 THE WORKING OF ACTUATORS 3 Hours

4.1 Function of actuators.
4.2 Operation of actuators
4.3 Hydraulic cylinder actuators
4.4 Single-acting cylinder actuators
4.5 Cylinder-rams
4.6 Operation of cylinder-ram
4.7 Double-acting cylinder actuator
4.8 Working and operation of telescoping actuators
4.9 Operation of telescoping actuators
4.10 Working rotary actuators
4.11 Operation of rotary actuators

5 DOZER AND BULLDOZER 2 Hours

5.1 Classification of earth moving machinery
5.2 Purpose of dozer
5.3 Construction of dozer
5.4 Application of dozer
5.5 Dozer blade
5.6 Types of dozer blades
5.7 Function of ripper
5.8 Advantages/disadvantages of wheel mounted dozer
5.9 Advantages/disadvantages of crawler mounted tractors

6 SCRAPER 2 Hours

6.1 Purpose of scrapers
6.2 Types of scrapers
6.3 Construction of scrapers
6.4 Operation of scrapers
6.5 Construction of elevating scraper

7 LOADER 2 Hours

7.1 Purpose of loader
7.2 Operation of loader
7.3 Types of loaders
7.4 Construction of loader
7.5 Application of loader
7.6 Purpose, construction and working principle of belt loade

8 EXCAVATOR AND TRENCHER. 2 Hours

8.1 Excavator
8.2 Types of excavators
8.3 Advantages and each type of excavator

8.4 Construction and working principle of hydraulic excavator
8.5 Construction and working principle of bucket wheel excavator
8.6 Construction and working principle of trencher

9 SHOVELS, HOE & DRAG LINE 2 Hours

9.1 Shovels
9.2 Types of shovels
9.3 Construction and working principle of dipper or power shovel
9.4 Power shovels applications
9.5 Construction and working principle of hoe.
9.6 Uses of hoe.
9.7 Construction and working principle of dragline.
9.8 Uses of clamshell.
9.9 Classification of buckets of clamshell.

10 CRANES 2 Hours

10.1 Uses of cranes.
10.2 Classes of cranes.
10.3 Construction and working principle of each type of crane.
10.4 Categories of cranes available in the market.
10.5 Crane capacities.

11 THE WORKING OF MOTOR GRADERS 2 Hours

11.1 Uses motor graders.
11.2 Construction motor graders.
11.3 Kinds of work for which motor graders are used.
11.4 Adjustment of blade of motor graders.
11.5 Operation of motor graders.
11.6 Special attachments of motor graders.

12 THE WORKING OF HAULIING EQUIPMENT 1 Hour

12.1 Purpose of hauling equipment.
12.2 Types of construction work of vehicles.
12.3 Types of off-highway dump trucks.
12.4 Working and uses of each type of off- highway dump trucks.
12.5 Construction of dump trucks.

13 THE WORKING OF MATERIAL HANDLING DEVICES 1 Hour

13.1 Need of material handling devices.
13.2 Uses of material handling devices.
13.3 Types of mechanical material handling devices.
13.4 Lifting and lowering devices.

14 THE PURPOSE AND WORKING OF CONVEYOR 2 Hours

14.1 Purpose of conveyor
14.2 Types of conveyors
14.3 Working belt conveyor
14.4 Advantages of conveyor belt
14.5 Components of conveyor belts
14.6 Working of types of conveyors:
14.6.1 Roller
14.6.2 Cable
14.6.3 Pipeline
14.6.4 Screw
14.6.5 Elevating conveyor

15 THE TRANSPORTING AND ROPEWAY 1 Hour

15.1 Transporting device
15.2 Purpose of aerial transport
15.3 Working of cable ways
15.4 Uses of rope ways
15.5 Types rope ways

16 INTERNATIONAL HYDRAULIC, PNEUMATIC, CODES AND SYMBOLS 1 Hour

16.1 International Hydraulic and Pneumatic Code and Symbols
16.2 International Pneumatic Code and Symbols
16.3 Application of international Hydraulic Code and Symbols
16.4 International Pneumatic Code and Symbols

AFM-362 INSTRUCTIONAL OBJECTIVES

1 UNDERSTAND THE HYDRAULIC SYSTEM, RESERVOIRS, HYDRAULIC LINES AND FITINGS

1.1 Define the Hydraulic System
1.2 Describe the components of Hydraulic system
1.3 State the function of reservoirs
1.4 Enlist of fitting of reservoirs
1.5 Identify the location of the Reservoir
1.6 State the importance of hydraulic lines and fittings
1.7 Differentiate between pipes and tubing
1.8 Describe the pipe fittings
1.9 Describe the hydraulic hose
1.10 Describe hose ends and adopters.

2 UNDERSTANDING THE ACCUMULATORS AND OIL COOLERS

2.1 State the purpose of accumulator
2.2 Describe the design and operation of accumulators
2.3 Describe the purpose and function of oil coolers
2.4 Explain the oil coolers

3 UNDERSTANDING HYDRAULIC PUMP AND VALVE

3.1 Define hydraulic pump
3.2 Explain the working of principle of hydraulic pumps
3.3 Explain parts 0f hydraulic pumps
3.4 Describe purpose and types of hydraulic pumps
3.5 Define hydraulic valve
3.6 Define purpose and types of hydraulic valve
3.7 Explain working principle of hydraulic valve

4 UNDERSTANDING THE WORKING OF ACTUATORS

4.1 State the function of actuators.
4.2 Describe the Operations of actuators
4.3 Describe the hydraulic cylinder actuators
4.4 Discuss single-acting cylinder actuators
4.5 Describe the cylinder-rams
4.6 Explain the operation of cylinder-ram
4.7 Describe the double-acting cylinder actuator
4.8 Discuss the actuators' operation
4.9 Explain the working of telescoping actuator

4.10 Explain the working rotary actuators
4.11 Discuss the operation of rotary actuators

5 UNDERSTANDING DOZER AND BULLDOZER

5.1 State the Classification of earth moving machinery
5.2 State the Purpose of dozer
5.3 Describe the application and construction of dozer
5.4 State the use of bulldozer
5.5 Describe the dozer blade
5.6 Describe the types of dozer blades
5.7 Explain the function of ripper
5.8 State the advantages of wheel mounted dozer
5.9 State the advantages of crawler mounted tractors

6 UNDERSTAND SCRAPER

6.1 State the purpose of scrapers
6.2 Explain the construction of scrapers
6.3 Describe the types of scrapers
6.4 Describe the operation of scrapers
6.5 Explain the construction of elevating scraper

7 UNDERSTAND LOADER

7.1 Describe the purpose of loader
7.2 Explain the operation of the loader
7.3 Explain the types of loaders
7.4 Describe the construction of a loader
7.5 State the application of loader
7.6 Explain the purpose, construction and working principle of belt loader

8 UNDERSTAN EXCAVATOR AND TRENCHER.

8.1 Define excavator
8.2 Enlist types of excavators
8.3 Identify the advantages and each type of excavator
8.4 Explain the construction and working principle of hydraulic excavator
8.5 Explain the construction and working principle of bucket wheel excavator
8.6 Explain the construction and working principle of trencher

9 UNDERSTAND SHOVELS

9.1 Define the shovels.
9.2 Enlist types of shovels.
9.3 Explain the construction and working principle of dipper or power shovel.

9.4 Enlist the application of power shovel.
9.5 Explain the construction and working principle of hoe.
9.6 State the uses of hoe.
9.7 Describe the types of buckets of dragline.
9.8 State the uses of clamshell.
9.9 State classification of buckets of clamshell.

10 UNDERSTAND CRANES

10.1 State the uses of cranes
10.2 State the classes of cranes.
10.3 Explain the construction and working principle of each type of crane.
10.4 Discuss the categories of cranes available in the market
10.5 Explain the crane capacities

11 UNDERSTAND THE WORKING OF MOTOR GRADERS

11.1 Describe the use of motor graders
11.2 Describe the construction of motor graders
11.3 State the types of work for which motor graders are used
11.4 Explain the adjustment of blades of graders
11.5 Explain the operation of graders
11.6 Explain the operation of special attachments of motor graders such as:
- 11.6.1 Scarier
- 11.6.2 Bulldozing
- 11.6.3 Snow clearing
- 11.6.4 Ripper
- 11.6.5 Harrow operations

12 UNDERSTANDING THE WORKING OF HAULIING EQUIPMENT

12.1 State the purpose of hauling equipment
12.2 State the types of construction work of vehicles
12.3 Enlist the types of off-highway dump trucks
12.4 Explain the working and uses of each type of off- highway dump trucks
12.5 Discuss the construction of dump trucks

13 UNDERSTANDING THE WORKING OF MATERIAL HANDLIING DEVICES

13.1 State the need of material handling devices
13.2 State the uses of material handling devices
13.3 Describe the Types of mechanical material handling devices
13.4 Enlist the lifting and lowering devices

14 UNDERSTANDING THE PURPOSE AND WORKING OF CONVEYOR

14.1 State the purpose of conveyor
14.2 Describe the types of conveyors
14.3 Explain the working of belt conveyor
14.4 State the advantages of conveyor belt
14.5 Explain the components of conveyor belts
14.6 Describe the working of the following types of conveyor:
- 14.6.1 Roller
- 14.6.2 Cable
- 14.6.3 Pipeline
- 14.6.4 Screw
- 14.6.5 Elevating conveyor

15 UNDERSTAND THE TRANSPORTING AND ROPEWAY

15.1 Enlist the transporting devices
15.2 State the purpose of aerial transport
15.3 Explain the working of cable ways
15.4 State the uses of rope ways
15.5 Describe the types of rope ways

16 Discuss international hydraulic, pneumatic, codes and symbols

16.1 Define the international Hydraulic and Pneumatic Code and Symbols
16.2 Enlist the international Hydraulic Code and Symbols
16.3 Enlist the international Pneumatic Code and Symbols
16.4 State the Application of international Hydraulic Code and Symbols

AFM-362 LIST OF PRACTICALS

1. Sketch the components of Hydraulic system
2. Practice to Drain and service the reservoir.
3. Perform the Service of hoses.
4. Practice to Service and reassemble the accumulators.
5. Practice to Service, Reassemble and install oil cooler.
6. Practice to Service actuators.
7. Prepare periodic maintenance chart for earth moving machinery.
8. Prepare the specification of dozer.
9. Prepare the specification of scrapers.
10. Enlist the factors that influence the selection of cranes.
11. Identification of various parts of motor graders.
12. Enlist the factors influence the selection of dump trucks.
13. Enlist the factors influence the selection of material handling devices.
14. Visit to local Agriculture Engineering Working.
15. Visit to different local construction projects.
16. Visit to construction Machinery Training Institute Islamabad.

AF-374 WORKSHOP PRACTICE -III

Total Credit Hours

		T	P	C
Theory:	64 Hours			
Practical:	192 Hours	2	6	4

Pre-requisite: Workshop Practice II

LEARNING OUTCOMES:

1. Understand the types of frames and bodies used in automotive.
2. Understand the tools, equipment and techniques of dent removing, shrinking, filling and painting.
3. Understand the tools, equipment and techniques of fiber glass bodies repairing, filling and painting.
4. Understand tractor hydraulic system parts.
5. Understand the engine tune up, periodical maintenance and overhauling.
6. Understand the road safety management and emergency.
7. Understand workshop documentation.
8. Understand vehicle heating and air conditioning system.

Detail of Contents:

I.AUTOMOTIVE WORKSHOP AND GARAGE

1 Lay-Out and Use of Workshop and Garage Equipment 3 Hours

1.1 Differentiate between auto workshop and garage
1.2 Types of garages (small, medium, large, service station)
1.3 Lay-out of the auto workshop and garage
1.4 List of machines, equipment's and tools for Automotive Workshop and Garage

2 Documentation of Automotive Workshop and Garage 6 Hours

2.1 Different kinds of record /documentation of auto workshop and garage
2.2 Principles of record maintenance
2.3 Workshop inventory stock register and consumption register
2.4 Procedure for reading of vehicle service manual
2.5 Procedure for reading of vehicle parts catalog manual
2.6 Job card and time Sheet
2.7 Estimate and compute repair cost of work from job card and time sheet
2.8 Documents of auto workshop and garage
- 2.8.1 Technical report writing
- 2.8.2 Customer handling skill
- 2.8.3 Warranty terms and conditions (policies)
- 2.8.4 Work shop operation
- 2.8.5 Flow of workshop
- 2.8.6 Complaint handling skills

2.8.7 Assessment of engine condition and report writing
2.8.8 Assessment sheet for engine condition and report writing

3 Working Environment of Automotive Fleet Organization 2 Hours

3.1 Organization chart relating to automotive fleet
3.2 Functions of various sections of fleet
3.3 Comparison of Metro Bus Corporation, Daewoo Corporation and LTC

4 Engine Tune Up 4 Hours

4.1 Engine tune up procedure
4.2 Importance of engine tune up procedure and car care
4.3 Method of checking and adjusting engine tuning according to the specifications
4.4 Proper tools usage

II. AUTOMOTIVE BODY BUILDING AND FINISHING

5 Frames, Body and Their Importance 2 Hours

5.1 Different types of frames
5.2 Advantages and disadvantages of different types of frames
5.3 Different types of bodies
5.4 Advantages and disadvantages of different types of bodies

6 Tools used in Auto Body Shop 2 Hours

6.1 Use of special tools such as Hand tools , Electrical tools , Pneumatic tools and Hydraulic tools.
6.2 Precautions during the use of these tools.
6.3 Different kinds of Spoons, Dollies, Hammers, Scrappers and pliers and specific use.

7 Methods of Fitting, Adjustment of Different Body Parts 3 Hours

7.1 Methods fitting, adjustments of following body parts such as Doors, Deck, Lids
7.2 Methods of removing dents by using Pull rods and slide hammers.
7.3 Misalignment causes of body panels.
7.4 Methods of sheet metal repair

8 The Use of Stationary and Portable Equipment for Frame Repair and Straightening 3 Hours

8.1 Four controlling in body and frame straightening
8.2 Methods for checking frame straightening
8.3 Use of power straightening tools
8.4 Computerized methods of frame alignment

9 Methods of Shrinking and Surface Finishing 4 Hours

9.1 Methods of shrinking
9.2 Use of different sanders such as disk sander, disk sander with vacuum attachment, feather edging with block type sander
9.3 Different types of body fillers
9.4 Different methods of dent filling
9.5 Method of using different Gauges for measurement and checking such as center gauge and strut centering gauge
9.6 Method of measuring the correct size and shape of panel
9.7 Reasons for adjusting body panels

10 Method of Preparing of Surface for Painting 4 Hours

10.1 Safety in the paint shop, list the safety cautions
10.2 Process for preparing surface for paintings
10.3 Different kinds of paints lacquer and enamels
10.4 Advantages and disadvantages of different paints, lacquer and enamels
10.5 Prepare a matching color from combination of different colors
10.6 Computerized method of accurate preparation of paint match scheme and its importance
10.7 Computerized method of automotive body spray painting and its importance

11 Methods of Painting 6 Hours

11.1 Three basic ingredients in paints
11.2 Equipment used for under coating for spray painting
11.3 Use of spray equipment in proper order
11.4 Use of spray gun and basic spray gun adjustment for better finishing
11.5 Different types of spray gun, advantages and disadvantages of different spray guns
11.6 Method of checking paint viscosity and setting the air pressure for proper spray painting
11.7 Spray gun problems
11.8 Types of spray booths and adjusting the temperature required for backing of paints
11.9 Method of using safety equipment according to the situation.
11.10 Painting problems and their remedies
11.11 Paint drying oven

12 Fiber Glass Body and Plastic Parts 4 Hours

12.1 Fiber glass bodies characteristics, their repairs and materials
12.2 Advantages and disadvantages of fiber glass bodies
12.3 Precautions during fitting and repairing fiber glass body
12.4 Calculate proper quantity of substance for preparing resin filler and putties
12.5 Techniques use for forming fiber glass
12.6 Procedure for repairing soft plastic parts

13 The Door Suction System 2 Hour

13.1 Purpose of door suction system

13.2 Parts of door suction system
13.3 Working of door suction system

14 Power Seats, Windows And Sun Roof 2 Hours

14.1 Purpose of power seats, windows and sun roof
14.2 Parts of power seats, windows and sun roof
14.3 Working power seats, windows and sun roof
14.4 Method of setting side and back view mirror manually and automatically

III- VEHICLE DRIVING

15 Road Safety Management 4 Hours

15.1 Interpret traffic symbols such as
15.1.1 Mandatory
15.1.2 Warning
15.1.3 Informative

15.2 Rules and Regulation of diving
15.3 International traffic rules

16 What to Do Before Starting and Driving Tractor and Car 5 Hours

16.1 Importance of daily inspection before starting tractor/car driving
16.2 Method of checking the specified engine oil level, brake oil, power steering oil, electrolyte level in battery, coolant level in expansion tank and radiator
16.3 Method of checking fan belt tension, A.C. belt tension and power steering belt tension
16.4 Method of checking electrical system
16.5 Method of checking clutch, brake and hand brake
16.6 Method of applying brake and clutch at proper time and proper way
16.7 Draw chart of speed and distance relationship
16.8 Factor which effect the brake efficiency

IV- AUTOMOTIVE HEAT, VENTILATING AND CONDITIONING

17 Automotive Heat Ventilation and Air Conditioning 8 Hours

17.1 Purpose of heat ventilation and air conditioning system
17.2 Enlist heat ventilation and air conditioning system components
17.3 Principle of air conditioning
17.4 Refrigeration cycle
17.5 Enlist heat ventilation and air conditioning system control methods
17.6 Heat ventilation and air conditioning system trouble

Recommended Textbooks

1. Automotive Body Work and Rust Repair by M. Joseph

2. Auto Repair & Service by Martine W.Stockal

AFM-374 INSTRUCTIONAL OBJECTIVES

On the completion of this course the student will able to

I. AUTOMOTIVE WORKSHOP AND GARAGE

1 Understand the lay-out and use of workshop & garage equipment.

1.1 Differentiate between Auto Workshop and Garage.
1.2 Describe the types of Garages (Small, Medium, Large, Service station).
1.3 Define Lay-out.
1.4 Prepare a list of machines, equipments and tools for automotive Workshop and Garage.

2 Understand the preparation of documentation of automotive workshop & garage.

2.1 Enlists different kinds of record /documentation of auto workshop and garage.
2.2 State Principles of record maintenance.
2.3 Describe Workshop inventory stock register and consumption register.
2.4 Describe the procedure for reading of Vehicle Service Manual.
2.5 Describe the procedure for reading of Vehicle Parts Catalog Manual.
2.6 Describe Job Card and Time Sheet.
2.7 Estimate and Compute repair cost of work from Job Card and time sheet.
2.8 Learn the following documents of auto workshop and garage.
- 2.8.1 Technical Report writing.
- 2.8.2 Customer handling skill.
- 2.8.3 Warranty terms & conditions (policies).
- 2.8.4 Work shop operation / Flow of workshop.
- 2.8.5 Complain Handling skills.
- 2.8.6 Assessment of Engine condition and report writing.
- 2.8.7 Assessment Sheet for engine condition and report writing.

3 Understand working environment of automotive fleet organization.

3.1 Describe Organization chart relating to automotive fleet.
3.2 State functions of various sections of fleet.
3.3 Compare among Metro Bus Corporation, Daewoo Corporation and LTC.

4 Demonstrate the engine tune up procedure.

4.1 Demonstrate the engine tune up procedure.
4.2 Explain the importance of engine tune up procedure and car care.
4.3 Explain the method of checking and adjusting engine tuning according to the specifications.

4.4 Explain the use of proper tool usage.

II. AUTOMOTIVE BODY BUILDING AND FINISHING

5 Understand the types of frames, body and their importance.

5.1 Identify different types of frames.
5.2 Discuss the advantages and disadvantages of different types of frames.
5.3 Identify different types of bodies.
5.4 Discuss the advantages and disadvantages of different types of frames.

6 UNDERSTAND THE TOOLS USED IN AUTO BODY SHOP

6.1 Describe the use of special tools such as Hand tools, Electrical tools, Pneumatic tools, Hydraulic tools.
6.2 State the precautions during the use of these tools.
6.3 Identify different kinds of Spoons, Dollies, Hammers, Scrappers and pliers and their specific use.

7 Understand the methods of fitting, adjustment of different body parts.

7.1 Demonstrate the methods fitting, adjustments of following body parts such as Doors, Deck, Lids.
7.2 State the methods of removing dents by using Pull rods, and slide hammers.
7.3 State misalignment of Body parts.
7.4 State the methods of sheet metal repair.

8 Understand the use of stationery and portable equipment for frame repair and straightening.

8.1 Describe the four controlling in body and frame straightening.
8.2 State the methods checking frame straightening.
8.3 Explain the use of power straightening tools.
8.4 Explain the computerized methods of frame alignment.

9 Understand the methods of Shrinking and Surface Finishing

9.1 Discuss the methods of shrinking
9.2 Explain the use of different sanders such as disk sander, disk sander with vacuum attachment, feather edging with block type sander
9.3 Discuss different types of body fillers
9.4 Explain different methods of dent filling
9.5 Explain method of using different Gauges for measurement and checking such as center gauge and strut centering gauge
9.6 Explain the method of measuring the correct size and shape of panel
9.7 Explain the reasons for adjusting body panels

10 UNDERSTAND THE METHOD OF PREPARING OF SURFACE FOR PAINTING

10.1 Discuss the safety in the paint shop list the safety cautions.
10.2 Explain the process for preparing surface for paintings.
10.3 Categorized different kinds of paints, lacquer and enamels.
10.4 State the advantages and disadvantages of different paints, lacquer and enamels.
10.5 Prepare a matching colour from combination of different colours.
10.6 Explain the computerized method of accurate preparation of paint match scheme and its importance.
10.7 Explain computerized method of automotive body spray painting and its importance.

11 Understand the methods of painting.

11.1 Describe the three basic ingredients in paints.
11.2 Explain equipment used for under coating for spray painting.
11.3 Explain the use of spray equipment in proper order.
11.4 State the use of spray gun and basic spray gun adjustment for batter finishing.
11.5 Explain the different types of spray guns and advantages and disadvantages of different spray guns.
11.6 Explain the method of checking paint viscosity and setting the air pressure for proper spray painting.
11.7 Explain the spray gun problems.
11.8 Explain the types of spray booths and adjusting the temperature required for backing of paints
11.9 Explain the method of using safety equipment according to the situation.
11.10 Explain the painting problems and their remedies
11.11 Describe Paint drying oven

12 Understand fiber glass body and plastic parts.

12.1 Discuss fiber glass bodies characteristics, their repairs and materials.
12.2 Explain the advantages and disadvantages of fiber glass bodies.
12.3 Explain the precautions during fitting and repairing fiber glass body.
12.4 Calculate proper quantity of substance for preparing resin filler and putties.
12.5 Explain the techniques use for forming fiber glass.
12.6 Describe the procedure for repairing soft plastic parts

13 UNDERSTAND THE DOOR SUCTION SYSTEM

13.1 Explain the purpose of door suction system.
13.2 Explain the parts of door suction system.
13.3 Explain the working of door suction system.

14 UNDERSTAND POWER SEATS, WINDOWS AND POWER SUN ROOF

14.1 Explain the purpose of power seats, windows and power sun roof.
14.2 Explain the parts of power seats, windows and power sun roof.
14.3 Explain the working power seats, windows and power sun roof.

14.4 Explain the method of setting side and back view mirror manually and automatically

III- VEHICLE DRIVING

15 Understanding the road safety management.

15.1 Discuss and Interpret traffic symbols such as
- 15.1.1 Mandatory
- 15.1.2 Warning
- 15.1.3 Informative

15.2 Explain the Rules and Regulation of diving.
15.3 Explain the International rules.

16 Understand what to do before starting and driving tractor and car.

16.1 Explain the importance of daily inspection before starting tractor/car driving.
16.2 Explain the method of checking the specified engine oil level, brake oil, power steering oil, electrolyte level in battery, coolant level in expansion tank and radiator.
16.3 Explain the method of checking fan belt tension, A.C. belt tension and power steering belt tension.
16.4 Explain the method of checking electrical system.
16.5 Explain the method of checking clutch, brake and hand brake.
16.6 Explain the method of applying brake and clutch in proper time and proper way.
16.7 Draw chart of speed and distance relationship.
16.8 Explain the factor which effect the brake efficiency

IV- AUTOMOTIVE HEAT, VENTILATING AND CONDITIONING

17 Understand the automotive heating ,ventilating and air conditioning

17.1 Purpose of heating, ventilation and air conditioning system.
17.2 Enlist heating, ventilation and air conditioning system components.
17.3 State the principal of air conditioning.
17.4 Explain refrigeration cycle.
17.5 Enlist heating, ventilation and air conditioning system control methods.
17.6 Discuss heating, ventilation and air conditioning system troubles

AFM-374 List of Practicals

1. Perform the tune up of tractor engine.
2. Perform the tune up of petrol engine.
3. Practice to identify the traffic symbols used in Pakistan and their meaning.
4. Practice to start and drive petrol engine vehicle.
5. Practice to start and drive diesel engine vehicle.
6. Practice to change tire by using mechanical and hydraulic jack.
7. Practice to drive tractor and car in open field.
8. Prepare general and periodic maintenance chart for different vehicles like car, tractor and bus.
9. Practice to use Chain Pulley Block and Shop Crane for removal of engine.
10. Perform the general overhauling of the tractor and car in the workshop.
11. Identification of all body shop hand tools, electric power tools, pneumatic tools, hydraulic tools and their specific purpose in denting.
12. Visual identification of defects in body of a vehicle, record and suggest denting repair method.
13. Panel beating and finishing by hand tools.
14. Panel beating and finishing by use of welding (gas welding).
15. Practice to use hydraulic jack in proper place and proper way for pulling, pushing door opening alignment, engine compartment and frame opening.
16. Straitening deformed frame and channel with the help of straightening hand, hydraulic jack and computerized power tools.
17. Checking body and frame by using different frame gauges.
18. Preparing fiber glass sheets, patching and filling in workshop.
19. Practice to spray painting on different body panels.
20. Identify and adjust the door panels and lids.
21. Practice to service window glass winder mechanism and changing of window glass wind screen.
22. Practice to service the tractor by changing engine oil, hydraulic oil, gear oil, oil filter, air cleaner and lubrication of other points.
23. Identify heat ventilation and air conditioning system components.
24. Practice to gas charge an air-conditioning system of a car.
25. Visit to a modern automotive workshop, prepare the layout and report functionality of at least one modern machine / tool.
26. Visit to tractor manufacturing plant (Millat tractor/Alghazi tractors) and report production flow chart.
27. Visit to car manufacturing plant and report production cycle / assembly line.
28. Visit to 3S/4S dealerships.

LIST OF AUTO & FARM TECHNOLOGY LABS/WORKSHOPS

LIST OF AUTO & FARM TECHNOLOGY LABS/WORKSHOPS

S.NO.	NAME OF LAB/WORKSHOP	Quantity
1.	ADVANCE ENGINE LAB (PETROL, DIESEL, MOTORCYCLE)	1 NO
2.	AUTOMOTIVE ELECTRICITY & ELECTRONICS DIAGNOSTIC & TESTING LAB	1 NO
3.	AUTO CAD LAB (COMPUTER LAB)	1 NO
4.	ELECTRIC VEHICLE LAB	1 NO
5.	DENTING & PAINTING, AUTOMOTIVE DETAILING LAB & SERVICE STATION	1 NO
6.	SUSPENSION, STEERING & BRAKES LAB	1 NO
7.	FARM MACHINERY ,IMPLEMENT CALIBERATION & DEMOSTRATION LAB	1 NO
8.	FIELD AREA FOR TUNNEL FARMING / PRESSURIZED IRRIGATION DRIP IRRIGATION SPRINCKLE IRRIGATION AND AGRICULTRAL PRACTICE	1 Hectare

LIST OF BASIC HAND TOOLS
(For DAE class of 50 students)

S.NO	Name of Tool	Quantity
1.	Flat Screw driver (4”, 6”, 8”, 12”)	10 each
2.	offset Screw driver (4”, 6”, 8”, 12”)	05 each
3.	Philips Screw driver (4”, 6”, 8”, 12”)	10 each
4.	Impact Screw driver set	10 set
5.	Hammers (Ball peen, Straight peen, cross peen) sledge, Brass or lead, plastic tipped, rubber mallet.	2 each
6.	Special screw drivers (stubby, scratch awl, Socket head driver, clip screw driver.	5 each
7.	Pliers(needle nose, High leverage cutter, vise grip, diagonal cutting, Battery Plier, tin snip ,snap ring, rib joint, slip joint, crimper)	5 each
8.	Adjustable Wrench (6", 12”)	5 each
9.	Pipe Wrench(8",10",12")	5 each
10.	Strap wrenches(universal, Big range/Adjustable fuel filter and oil filter)	5 each
11.	Open end spanner set (8-32 mm)	10 set
12.	Ring Spanner set (off set) 8-32mm	10 set
13.	Box end spanner set (8-32 mm)	10 set
14.	Special wrenches (sludge wrench, ratchet wrench, flex combination, half moon).	5 each
15.	Spark plug spanner.	10 No’s
16.	Torque Wrench (flex bar, dial indicator, snap or click, digital)	2 each
17.	Allen Key set (1.5- 10 mm)	10 set
18.	Socket setcomplete (8-32 mm with all accessories).	10 set
19.	Wheel spanner cross type	5 No’s
20.	Pullers (Gears, Bearings, Pulleys, Steering, slide hammer)	2 each
21.	Oil Seal extractors and installers	5 No’s
22.	Oil cane (pressure type).	10 No’s
23.	Tube bender , Tube cutter and Flaring tools set	10 set
24.	Valve Spring Compressor	5 No’s
25.	Piston Ring Compressor	10 No’s
26.	Piston Ring Expander	10 No’s
27.	Grease Gun (400cc capacity)	10 No’s
28.	Pop Rivet Plier	5 No’s
29.	Scraper (blade width 2",4",6")	15 No’s each
30.	Scissor (10")	5 No’s
31.	Centre Punch	10 No’s
32.	Punches (Hollow punch set)	10 set
33.	Adjustable Hand Hacksaw frame (300 mm)	10 No’s
34.	Bench vice (4”, 6”)	05 No’s each

35.	Anvil (40 kg)	02 No's
36.	Surface Plate	1 No's
37.	Magnetic pickup tool(prob pick up tool set)	10 set
38.	Magnifying glass	10 No's
39.	Die & tap set (2,4,6,8,10mm)	05 set each
40.	Hand brushes (wire type)	10 No's
41.	Pry bars set (20", 25", 30")	2 set
42.	File (Flat, round, triangle, square)10"	05 No's each
43.	Chisels (Flat, cross-cut, round nose)	10 No's each
44.	Calipers (Internal & external)2mm-100mm	10 set
45.	V-Blocks	1 No's
46.	S.S.T tools (for carburetor)	2 set
47.	Stud extractor set	5 set
48.	Lettering Punch set	02 No's
49.	Numbers punch set	02 No's
50.	Pneumatic Screw Gun	03 No's
51.	Electric Wrench	02 No's

LIST OF MEASURING TOOLS/EQUIPEMENTS

(For DAE class of 50 students)

S.NO	Name of Tool	Quantity
1.	Steel Foot rule.	10 No's
2.	Steel tape (50 ")	10 No's
3.	Spring Scale (5 kg)	10 No's
4.	Venire Caliper. (250mm , Least count 0.05)	10 No's
5.	Micrometer (inside) 0-25mm, 0-50mm, 0-75mm, 0-100mm	2 No's Each
6.	Micrometer (outside) 0-25mm, 0-50mm, 0-75mm, 0-100mm	2 No's Each
7.	Dial Gauge (Leas count 0.001" 0.01-10mm))	02 No's
8.	Depth gauge	02 No's
9.	Feeler gauge	05No's
10.	Thread pitch gauge	02 No's
11.	Wire gauge	02 No's
12.	Belt tension gauge	05No's
13.	Telescoping gauge	05No's
14.	Tire Pressure gauge	05No's
15.	Angle measuring gauge (combination set)	01 No's
16.	Thermometer	10 No's
17.	Tri Square	05 No's

LIST OF WORKSHOP MACHINERY / EQUIPMENTS

(For DAE class of 50 students)

S.NO	Name of Machinery /Equipments	Quantity
1.	Chain Pulley Block hoist (3-5 ton)	2No's
2.	Hydraulic Car Lift (Post Lift, Seizer Lift, Hydraulic lift)	1 No each
3.	Crane (hydraulic, pneumatic).	1 No each
4.	Spark Plug Cleaner & Tester Machine	1 No
5.	Automotive Tire changer	1 No
6.	Electronic Injector Testing Machine	1 No
7.	Heavy Duty Digital Tire inflator	1 No
8.	Tube vulcanizer	1 No
9.	Tire vulcanizer	1 No
10.	Tire tread depth measuring gauge	2 No
11.	Pneumatic Impact wrenches	5 No
12.	Pneumatic Impact sockets	5 No
13.	Waste Oil Receptacle with neck & funnel	1No's
14.	Hydraulic press with adopter (5 ton)	1 No
15.	Mechanical Arbor press (3 ton)	1 No
16.	Portable Electric Drill Machine	1 No
17.	Bench Electric Drill Machine	1 No each
18.	Buffer & Grinder (Bench & Portable) (6")	1 No each
19.	Radiator Pressure Cap tester	1 No
20.	Hydraulic Jack (3-5 ton)	3 No each
21.	Mechanical Jack (3 ton)	3 No's
22.	Service Creeper trolleys with Led lights	5 No's
23.	Creeper stool type	5 No's
24.	Air Compressor (150- 200L, 5-8 hp)	1 No
25.	Engine oil dispenser	1 No
26.	Storage bin (Metallic make)	10 No's
27.	Tool trolley	10 No's
28.	Work bench	10 No's
29.	Lockers	10 No's
30.	Cabinets	10 No's
31.	Shelf rack	10 No's
32.	Gear box repairing stand	2 No's
33.	Platform truck	2 No's
34.	Oval shape Hydrometer	10 No's
35.	Battery Post terminal cleaner	5 No's
36.	Automotive Stethoscope	5 No's
37.	Soldering gun	5 No's
38.	Battery Charger (1 -50A)	1 No
39.	Battery tester	2 No's

40.	Gas welding Plant	1 No
41.	Arc welding Plant	1 No
42.	Cleaning tank	2 No's
43.	Cylinder boring machine	1 No
44.	Valve grinding & facing machine	1 No
45.	Mini compressor with tire inflator	2 No's
46.	Ramp	2 No's
47.	Differential repair stands	2 No's
48.	Parts tray	10 No's
49.	V-blocks set	1 No's
50.	SST Board	5 No's
51.	Torch light	2 No's
52.	Test lamp	5 No's
53.	Circuit tester	5 No's
54.	Compressed air blow gun	3 No's
55.	Safety Stands	03 Set
56.	Head Light aimer (Mechanical, Optical)	01

LIST OF INSTRUMENTS/EQUIPEMENTS & AUTOMOTIVE DIAGNOSTIC TOOLS

(For DAE class of 50 students)

S.NO	Name of Machinery /Equipments	Quantity
1.	Digital tachometer and dwell tester	2 No's
2.	Compression Gauge (for petrol engine)	5 No's
3.	Compression Gauge (for diesel engine)	5 No's
4.	Vacuum Gauge	5 No's
5.	Cylinder Leakage Tester	5 No's
6.	Ignition Timing Gun(for petrol engine)	5 No's
7.	Ignition Timing Gun(for Diesel engine)	1No's
8.	Digital Multimeter	20No's
9.	Digital Clamp meter (AC/DC up to- 400A)	5 No's
10.	Analogue Multimeter	5 No's
11.	Oscilloscope	1 No
12.	Growler Tester	1 No's
13.	PC Based Automotive Diagnostic Scanner (VIM)with Lap top &multimedia	2No's
14.	Battery Health Tester	01 No
15.	Digital Meters	50 No's
16.	Automotive Peco scope (Oscilloscope)	01 No

17.	Dynamometer (Hydraulic type)	1 No
18.	Exhaust Gas Analyzer (5-Gases)	2No's
19.	Computerized Wheel balancer machine(with all accessories)	1 No
20.	Computerized Wheel alignment apparatus 3D (with all accessories)	1 No
21.	Universal Injector Cleaner kit	2No's
22.	Bench Mounted Injector Tester	1 No
23.	Universal diesel fuel Injection pump Phasing & Calibration machine.	1 No
24.	Dynamometer for testing engine power	1 No
25.	Self Starter test bench	1 No
26.	Roller Tube Brake Tester	1 No
27.	EV's repair tool kit	2 No

LIST OF AUTO BODY REPAIR TOOLS & EQUIPMENT

(For DAE class of 50 students)

S.NO	Name of Tools /Equipment	Quantity
1.	Hammers (Heavy Duty roughing, combination or pick, light dinging, combination dinging, heavy dinging, dinging hammer with short curved pick, offset dinging, Shrinking hammer, dinging hammer with long curved pick, Magnetic trim hammer nylon mallet.	2No's each type
2.	Dollies (High crown dollyblock, Low crown, heavy duty roughing, shrinking, rail type, All-purpose Heel dolly block.	2No's each type
3.	Spoons (Double-end lower back panel,Double-end door and side apron spoon, Heavy-duty drivinbg spoon, Double-end heavy duty driving and fender-beading tool,Highcrown surfacing spoon, Low crown surfacing spoon, Edging tool.	2No's each type
4.	Pick Tools (Short curved pick, Long curved pick, chisel bit pick, Deep throated pick, curved finishing punch, Hooked finishing punch,piercing punch.	2No's each type
5.	File's Holder (Adjustable file holder)	10 No's each type
6.	Files (Long Blocking file, short blocking file,Specialcontour files, Bumping or Slapping file, Grater file Blades)	10 No's each type
7.	Door hinge wrenches	2No's
8.	Reamer (hand operated)	10 No's
9.	Soldering Gun	10 No's
10.	Burr cutter	10 No's
11.	Buffing pad	10 No's
12.	Reveal molding	10 No's
13.	Door and window handle clip remover	2No's
14.	Vacuum lifter (wind sheild)	5No's
15.	Wind sheild lacing tools	5No's
16.	Blind nut installation tools	10 No's

17.	Heavy duty blind rivet window regulator installation tool	2No's
18.	Universal crease puller	2No's
19.	pneumatic panel edge roll tool	5No's
20.	Grease gun	5No's
21.	Flange tool	10 No's
22.	Bumper Bracket tool	10 No's
23.	Body pull rod	10 No's
24.	Paint spraying equipment	05No's
25.	Jigs for car frame straightening	1 No for recommended car
26.	Jigs for car straightening jacks	1 No for recommended car
27.	Safety Guard For working on machine	30 No's
28.	Axle Stand (Safety Stands)	10 No's
29.	Fire Blanket	05 No's
30.	Face shield	05 No's
31.	Tee Handle (8,10,12,14,16)	02 Each

LIST OF AUTO CAD LAB

(For DAE class of 50 students)

S.NO	Name of Machinery /Equipments	Quantity
1.	Laptop (mini 8GB RAM 256GB SSD)/Computer system complete with all accessories as per TEVTA MIS notification	50-set
2.	Computer Table	50-set
3.	Computer Chair	50No.
4.	Multimedia Projector	1-set
5.	AutoCAD 2025	50-set
6.	Microsoft Windows 10	50-set
7.	Printer	1 No.
8.	Scanner	1 No.
9.	Air Conditioner 3 TON	1NO.
10.	Computer Server with all accessories	1 Set
11.	Internet Facility	1

LIST OF AUTOMOTIVE MODELS

(For DAE class of 50 students)

S.NO	Name of Machinery /Equipments	Quantity
1.	Model of 4-stroke Petrol Engine	1 NO
2.	Model of 2-stroke Petrol Engine	1 NO
3.	Model of 4-stroke Diesel Engine	1 NO
4.	Small Chassis Model with Plexiglas EFI Petrol engine	1 NO

5.	Small Chassis Model with Plexiglas hybrid vehicle	1 NO
6.	Electric Vehicle Model	1 NO
7.	Engine Repair Model	1 NO
8.	Steam Turbine Model (Impeller & Reaction Type)	1 NO
9.	Gas Turbine Model	1 NO
10.	Fire Tube Boiler Model	1 NO
11.	Rotary Air Compressor	1 NO
12.	Petrol engine complete cut-away model	1 NO
13.	Diesel engine complete cut-away model	1 NO
14.	EFI Engine Simulator	1 NO
15.	EFI cut-away parts.	1 NO
16.	Vehicle computer controlled on board diagnose simulator	1 NO
17.	ECT transaxle Gear box Sectional model	1 NO
18.	Manual transaxle Gear box Sectional model	1 NO
19.	4x4W transmission system Cristal model	1 NO
20.	Clutch assembly cut-away model	1 NO
21.	Free wheel hub model	1 NO
22.	Propeller shaft model	1 NO
23.	VVT-I Engine sectional model	1 NO
24.	V-Tech Engine sectional model	1 NO
25.	Wankle Engine model	1 NO
26.	Differential model (Non Slip)	1 NO
27.	Valve train model (V.V.T.I)	1 NO
28.	Cylinder head sectional model	1 NO
29.	Ignition System Model (Distributor less)	1 NO
30.	Starter motor assembly cut-away model	1 NO
31.	Alternator assembly cut-away model	1 NO
32.	Lead acid battery cut-away model	1 NO
33.	Electricity Master Board with all accessories	1 NO
34.	Electromagnetism Master Board with all accessories	1 NO
35.	Relay Cut-out Master Board	1 NO
36.	Vehicle Lighting system trainer	1 NO
37.	Vehicle all electrical/electronic accessories trainer	1 NO
38.	Instruments Panel Gauges Model	1 NO
39.	Power Steering Model	1 NO
40.	Tire construction model	1 NO
41.	Complete strut type suspension system model	1 NO
42.	Wheel balance simulator model	1 NO
43.	Shock absorber cut-away model	1 NO
44.	Rack & pinion type power steering cut-away model	1 NO
45.	Anti-lock Brake system simulator	1 NO
46.	Diesel Engine Instruction Model with Turbo Charges	1 NO
47.	Distributor type diesel fuel injection pump sectional model	1 NO
48.	Inline type diesel fuel injection pump sectional model	1 NO
49.	Driving Education charts	1 NO

50.	Driving trainer	1 NO
51.	Power window trainer	1 NO
52.	Power door lock trainer	1 NO
53.	Logic circuit & logic actual IC's	1 NO
54.	Air Bag Simulator (SRS)	1 NO
55.	Electronic master Kit	1 NO
56.	Pneumatic Air Brake Simulator	1 NO
57.	Traffic Safety Cones	24 NO
58.	Model of Excavator	1 No.
59.	Model of Combine Harvester	1 No
60.	Model of Dozer	1 No
61.	Model of Motor Grader	1 No
62.	Model of Thresher	1 No
63.	Model of Hay Baler	1 No
64.	Model of Potato Digger	1 No
65.	Model of Cotton Stripper	1 No
66.	Model of Planter	1 No
67.	Model of Seed Drill	1 NO
68.	Model of Combined Harvester	1 NO
69.	Drone Spraying Model	1 NO
70.	Solar Irrigation Model	1 NO

LIST OF SAFETY & PROTECTION EQUIPEMENTS

(For DAE class of 50 students)

S.NO	Name of Machinery /Equipments	Quantity
1.	Fire Extinguishers (DCP 6-8kg, CO2 8kg)	3 No each
2.	Safety goggles	10 No's
3.	First Aid Box	10 No's
4.	Apron/ Proper uniform	55 No's
5.	Dust Mask	55 No's
6.	Safety shoes	55 No's
7.	Ear Muff	10 No's
8.	Safety Gloves set(Leather, rubber & Cotton)	55 No's
9.	Sand Storage buckets for fire fighting	10 No's
10.	Water Storage buckets for fire fighting	10 No's

LIST OF ENGINES/TRANSAXLES/VEHICLES

(For DAE class of 50 students)

S.NO	Name of Machinery /Equipments	Quantity
1.	Petrol engine(4-cylinder VVT-I &i-VTech) (Used & in Good working condition with stand)	5 NO'S
2.	Petrol engine (Multi cylinder with carburetor) (Used & in Good working condition with stand)	1 NO'S
3.	Manual transaxle(Synchromesh type)	5 NO'S
4.	ECT Automatic planetary gear transaxle	5 NO'S
5.	ECT Automatic CVT gear transaxle	5 NO'S
6.	Generator (China make 7KVA)	2 No's
7.	Petrol engine (70-80 cc) (Used & in Good working condition with stand)	2 NO'S
8.	Petrol engine (100cc, 125cc) (Used & in Good working condition with stand)	3 NO'S
9.	Diesel engine (multi cylinder with EFI) (Used & in Good working condition with stand)	5 NO'S
10.	Car equipped with manual transmission (Used in Good working condition model not old than 10 years)	1 NO
11.	Car l equipped with automatic transmission (Used in Good working condition model not old than 10 years)	1 NO
12.	Hybrid car with automatic transmission	1 NO
13.	Electric car with automatic transmission	1 NO
14.	Motorcycle (minimum 70cc) (Used in Good working condition model not old than 5 years)	1 NO
15.	Motorcycle (minimum 125cc) (Used in Good working condition model not old than 5 years)	1 NO
16.	ELECTRIC MOTORCYCLE	1 NO

LIST OF CONSUMABLE MATERIALS

(For DAE class of 50 students)

S.NO	Name of Consumable material	Quantity
1.	Engine Oil (SAE-30-50)	50 L
2.	Grease	10 kg
3.	Petrol	1000L
4.	Diesel	1000 L
5.	CNG	10 Kg
6.	LPG	10kg
7.	Sulphuric Acid	10 L
8.	Kerosene Oil	100L

9.	Brake Oil (350ml)	20 tin
10.	Distilled Water	60 L
11.	Battery terminals Clamp set	10 set
12.	Engine Over-hauling Kit	1 for each engine
13.	Emery Papers (0,1,2)	10 No's each
14.	Silicon Tube	10 No's
15.	Fan Belt(V-belts)	10 No's
16.	Oil Filter	20 No's
17.	Air Filter	20 No's
18.	Fuel Filter	30 No's
19.	Auto wire 3mm, 5mm	10 No's each coil
20.	Head Lights Beam	10 No's
21.	Auto Bulbs (different types)	24 No's each type
22.	Insulation Tape	30 No's
23.	Double Tape	50 Nos
24.	Thimbles (male and female types) box	10 each
25.	Spark Plug High tension leads Set	5 set for each engine
26.	Spark Plug Different Types	10 No's
27.	Cotton Waste (Towel and Cloth type)	100 kg of each type
28.	Malmal cloth	10kg
29.	Emery Past	5 tin
30.	Lapping Sticks	50 No's
31.	C.B Point	10 No's
32.	Condenser	10 No's
33.	Thrust Bearing	10 No's
34.	Piston Rings (set)	10 set
35.	Shell Bearings set	5 for each engine
36.	Ignition Switch	10 No's
37.	Soldering wire(60/40)	20 Roll's
38.	Fuses (various range)	50 dozen
39.	Wire brush	5 No's
40.	Sand paper sheet (60 to 100,800 and1000)	2 dozen each type
41.	Grinder disk	5 No's
42.	Steel putty with hardner	2kg
43.	Gasket material(cork sheet)	10 No's
44.	Washers (aluminum/copper/fiber) (Box)	1 box each type
45.	Assorted size of nuts & bolts	25 No's each size
46.	Screws deferent size (Box)	1 box each size
47.	Bearings (Ball type, Needle type, Bush type)	2 No's each type
48.	Engine timing belts	10 No's
49.	Hose pipe (set)	10 set
50.	Jubilee hose clips (different size)	2 dozen
51.	Tube vulcanizer solution (tin)	1 2 tin
52.	Jumper leads	6 No's
53.	Drill bit set	4 No's

54.	Oil drain Plugs(different types)	5 No's
55.	Cup type core plugs	1 dozen
56.	Internal & External circlips	20 No's each
57.	Splint pins (different size (box)	1 box each size
58.	Coil springs(different types)	1dozen each type
59.	Dust boot & seals (different types)	10 No's each
60.	Wiper blades (set)	2 set
61.	Engine flush chemical (450ml)	10 Pack
62.	Wind Screen wash fluid (1000ml)	10 L
63.	Pop Rivets (different sizes) Box	1 box each
64.	Cable ties	4 dozen
65.	Fire extinguisher filling powder (packet)	5 Packets
66.	Tire puncture kit	10 No's
67.	Tire valve	1 dozen
68.	Mechanics mat	6 No's
69.	Fender Cover	5 sets
70.	Lead acid Battery (85 AH)	05 No's
71.	Horn Relay	12 No's
72.	Horn (set)	10 set
73.	Horn Button	10 No's
74.	Dimmer Switch	10 No's
75.	Wheel Balancing weights (5gm -100gm)	25 No's each size
76.	Diode	2 dozen
77.	Capacitor	2 dozen
78.	Resistances (different range)	2 dozen
79.	Step down transformer (5A, 10A)	5 each type
80.	Transistor	2 dozen
81.	Battery post Cleaner	6 No's
82.	Carburetor service kit	6 No's
83.	Sand for Spark plug Cleaner machine	10 packets
84.	Wooden powder	20kg
85.	Hydrometer	10 nos
86	Thermemeter	10 nos
87	Photo diode	1 dozen
88	LEDs different colours	2 dozen
89	Safety gloves(rubber Lather,Cotton)	25 pairs Each
90	Dust Mask	10 packs
91	Soap For Hand Washing	10 dozen
92	Copper Tubes	100 feet
93	Brake Disc Pads	4 Set
94	Brake shoes	4 Set
95	Anti Rust Cleaner	10 Nos
96	Crab Cleaner	10 Nos
97	Power Steering Fluid	5 Liters
98	Automatic Tranmission Fluid	10 Liters

99	Metric Grease Nipples	12 Nos
100	Lacquer & Clear Coat	2 Liters
101	Paint Brushes(Different Size)	2 Dozen
102	Mixing Cups for auto body Paint	2 Dozen
103	Paint Mixing Strips	10 nos
104	Hardner	5 Liters
105	Thinner	10 Liters
106	Auto Body Compound Polish	2 Tins
107	Masking Tape (different Types)	2 Dozen
108	Scuff Pads	2 Dozen
109	Epoxies	1 Dozen
110	Raisen	40 kg
111	Tissue Mat	20 kg
112	Hardner	10 tin
113	MAKP	2 kg
114	Pigments	5 kg
115	Fiber Brushes	25
116	Baby Grinder	05
117	Paint Remover	25 tin
118	Sensors Assorted	10 each
119	Auto Body Paint (Different Colour)	8 Nos
120	Paint Stainer	5 Nos
121	Masking Paper	@% Sheets
122	Electric Arc Welding Rod	2 Packs
123	Measuring Jar (1000 ml)	3 Nos
124	Funnal Plastic	% Nos
125	Trafic Cones	25 Nos
126	Hitching Pins	12 Nos
127	Belts Different sizes	10 Nos
128	Tractor Oil Filter	5 Nos
129	Tractor Fuel Filter	5 Nos
130	Tractor Hydraulic Oil	30 Liters
131	Peat Moss(Composit Manure)	20 Kgs
132	Seeding Trays	10 Nos
133	Plastic Sheet	As Per Field Requirment
134	Fertilizer NPK	50 kgs
135	Fertilizer DAP	50 Kgs
136	Fertilizer Urea	50 Kgs
137	Herbicide,Insecticide And Pesticide Sprays	5 Liter Each
138	Seeds of Different Crops	50 Grams Each
139	Cultivator Tines	24 Nos
140	Thresher Cutters	24 Nos
141	Cultivator Springs	24 Nos
142	Rotavator Blades	64 Nos
143	Lock Pins	24 Nos

144	Disk Harrows Bearing	6 Nos
145	Disk Plough Bearing	6 Nos
146	Mulching Sheet	20 Feet
147	White Polythene Trandprant Sheet	20 Feet
148	UV Sheet	20 Feet
149	Anti Insect net	30 Feet
150	Flexible Rods (hooper Pipe)	50 Feet
151	Ground Pipes	As Per Field Requirment
152	GI Pipes (Low & High)	As Per Field Requirment
153	Hybrid Seeds	500 Grams
154	Seedling (Different Vegitables)	5 Kgs
155	Humic Acid	10 Kgs
156	Urea Liquid	10 Kgs
157	Plastic Bowls	15 Nos
158	Plastic Drum	1 Nos
159	GI Sheet	4'x4'
160	Electric Hand Lamp(Portable)	2 Nos
161	Tooth Brushes For Cleaning	12 Nos
162	Gas Valve (25mm,32mm)	4 Each
163	ELectrc Spray Paint Machine	1 Nos
164	Electric Battery Sprayer	2 Nos
165	Phase Tester	6 Nos
166	Soldering Paste	10 Nos
167	Weight Machine	1 Nos
168	Elfy	12 Nos
169	Pipes for Drip Irrigation	100 Feet
170	Pump For Drip irrigation	2 Nos
171	Wire Stripper plier	2 nos
172	Wire thimble Press Plier	2 Nos
173	Wire Guage	01 Nos
174	Dagi Rod For Welding	24 Nos
175	Master cylinder(Mehran)	2 Nos
176	Wheel cylinder(Mehran)	8 Nos
177	Extension Wire	2 Nos
178	Temp Guage (mehran)	2 NOs
179	Oil Pan Jain	2 Nos
180	Jumping Wires (12 Feet)	2 Nos
181	Jump Start Bank With Wires	1 Nos
182	Carbon Brushes For Grinder	12 Nos
183	Hacksaw Blades	12 Nos
184	Radiator Pressure Cap	3 nos
185	Valve and Valve Guide(70 cc &125 cc)	2 Each
186	Switches Different(Revers,BrakeLight,fan ,Door,Ignition)	2 Each
187	Fuel Tank Guage	2 nos
188	D.c. Pump	2 Nos

189	D.C. Fan	2 Nos
190	Clutch Plate Lining	2 Nos
191	Gear Leaver Cable	2 Nos
192	Clutch Cable	2 Nos
193	Plastic Tub	1 N0
194	UHU	6 Nos
195	Samad Bond	6 Nos
196	Axle Seal	6 Nos
197	Main Oil Seal(Mehran&Cultus)	2 Nos
198	Water Body(Mehran)	1 Nos
199	Generator	1 Nos
200	Ignition Coil	1 Nos
201	Distributer Cap With Roter (Mehran)	3 Nos
202	Taflon Tape	10 Nos
203	Oil Cane Plastic	2 Nos
204	Grinding Brush	6 Nos
205	Iron Cutting Disk	6 Nos
206	Nylone Pipe	50 Feet
207	Plastic Pipe	100 Feet
208	Battery Terminal Cleaner	1 No.

List of Tools & Equipment/ Machinery for Farm Machinery

Sr. No.	Nomenclature of Equipment / Tools	17.6.1.1.1.1.1 Quantity
1.	Tractor min 50 Hp and min 80 Hp	1 No Each
2.	Tractor 4wd min 85 Hp	1 No.
3.	Excavator (optional)	1 No.
4.	Self-propelled vibrating Road compactor (optional)	1 No.
5.	Motor grader (Optional)	1 No.
6.	Bulldozer (Optional)	1 No.
7.	Power shovel (optional)	1 No.
8.	Combine harvester (optional)	1 No.
9.	Sugar cane planter (optional)	1 No.
10.	Sugar cane harvester (Optional)	1 No.
11.	M.B plough	1 No
12.	Disc plough	1 No
13.	Sub soiler	1 No
14.	Chisel plough	1 No
15.	Tine Cultivator 11 tines	1 No
16.	Rotavator min 48 Blade	1 No
17.	Multi crop thresher	1 No.

18.	Soil Augur Sampler	10 No.
19.	Soil texture tester	01 No.
20.	Oven for soil moister testing	01 No.
21.	Drone Sprayer	01 No.
22.	Water Testing Kit	01 No.
23.	Disc harrow	1 No
24.	Boom sprayer machine	1 No
25.	Knap Sack Spray Machine	5 No's
26.	Seed drill & Planter	1 No each
27.	Potato digger	1 No
28.	Wheat thresher	1 No
29.	Rigger	1 No
30.	Border disc	1 No
31.	Centrifugal pumps of tube well	1 No
32.	Wheat Reaper	1 No
33.	Farm tripping trolley Hydraulic	1 No
34.	Peter engine 16-18 Hp	1 No
35.	Lawn Mover	1 No
36.	Land leveler	1 No.
37.	Planker	1 No.
38.	Front bucket	1 No.
39.	Fertilize Broad caster	1 No.
40.	Kurpa, Kassi, Kasola,	50 Each
41.	Wheel barrow	2 No.
42.	Post hole digger	1 No.
43.	Portable mechanical reaper	2 No.
44.	Potato digger	1 No.
45.	Fork lift truck 3 ton	1 No.
46.	Mold board plough	1 No.
47.	Front blade	1 No.
48.	Rear blade	1 No.
49.	Lase land leveler	1 No.
50.	Adjustable pintle hook	1 No.
51.	Jib Crane	1 No.
52.	Walk in tunnel min 20' x 60'	1 No.
53.	Trickle irrigation unit ½ Cusec	1 No.
54.	Water Sprinkler min 8 unit set	1 No.
55.	Straw Chopper	1 No.
56.	Hay Bailer	1 No.
57.	Bar Harrow	1 No.

Other list of useful reference books for revised curriculum 2025

S.No	Book Name	Author Name
1.	Automotive Technology A System Approach	Jack Erjavec
2.	Automotive Excellence (Volume 1 & 2)	McGRAW Hill International
3.	Modern Automotive Mechanics	James E. Duffy
4.	Automotive Electrical and Electronic systems	Frank C. Derato
5.	Automotive Electricity & Electronics	Barry Hollembeak
6.	Automotive Chassis Systems	James D. Helderman
7.	Suspension & Steering Systems	Clifton Owen
8.	Automotive Brake Systems	Clifton Owen
9.	Automotive Diagnostic fault codes manual	Haynes Techbook
10.	Automotive Tools manual	Haynes Techbook
11.	Automotive Mechanics	Willium H. Crouse
12.	Auto fundamentals	Martin W. Stockal
13.	Automotive Engine Management System	Jeff Hartmen
14.	Automotive Diagnostic Scanner	Martin
15.	AutoCAD -2007	Alf Yarwood
16.	Performance Automotive Math	John
17.	A Practical Approach to Motor Vehicle Engineering & maintenance	Allan Bonnick
18.	Advance Automotive Electronics Systems	Barry Hollembeak
19.	Automotive Control Systems	A. GalipUlsoy
20.	Automotive Body Work and Rust Repair	M. Joseph
21.	Auto Body Repair	Duenk-Williams-Brooks
22.	Auto Repair & Service	Martin W. Stockal
23.	Automobile Engineering	K K Jain
24.	Automotive Engine Theory & Servicing	James D. Helderman
25.	Automobile Technology	Dr. N.K. Giri
26.	Automotive Mechanics (Volume 1 & 2)	Ed May
27.	A Text Book of Automobile Engineering	R.K. Rajput
28.	Automotive Electricity, Electronics & Computer Controls	Barry Hollembeak
29.	Internal Combustion Engine	V Ganesan
30.	Automobile Engineering	Er. A.K. Babu
31.	Book of Driving	Automobile association
32.	Team Training Manuals (Step-1,2,& 3)	Toyota Motor Japan
33.	Farm Tractor	S.C. Rai
34.	Fundamentals of Tractor & Energy conservation	Dr. GulamSarwar
35	A text Book of Irrigation & Drainage	Dr. Muhammad Rafiq
36	Farm Machinery and Equipment	Harris P. Smith
37	Agricultural Power and Machinery	JaccobHarrel
38	A Textbook of Agriculture	M. Ibrahim Bajwa
39	Fundamentals of soil Science	Henry D. Forth,

Minimum Qualification of Teacher/ Instructor (Technical)

- M.Sc. in Mechanical/Automotive/Agriculture Engineering
- B.Sc. in Mechanical/Automotive/Agriculture Engineering with 2-Years relevant experience in teaching/ industry
- BS-Tech. / B.S Engineering & Technology in Mechanical/Automotive with 4-Years of relevant experience in teaching/ industry

  Lab. Technician:
- DAE Auto & Farm / Auto & Diesel Technology with 6-Years of relevant experience in teaching/industry

For Subjects pertaining to Humanities / Related Studies /Management / IT

i) MA degree in English/ Islamiat / Pst. with 2 years of teaching experience

ii) M.Sc. degree in IT / Computer Sciences or BE in Computer Engineering/ Sciences with 2-years of teaching experience

iii) M.Sc. degree in Mathematics with 2-years of teaching experience

iv) M.Sc. degree in Physics / Chemistry with 2-years of teaching experience

v) MBA/ MBE-con./ BBA (Hons.) degree with 2-years of teaching experience

Employability of the Pass-outs/Graduates

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

- Manufacturing Industry
- Automobile Industry
- Tractor manufacturing units Packages.

1. Service technician in private / government organization as under:-

    a. petrol mechanics

    b. diesel mechanics

    c. engine overhauling mechanic

    d. wheel alignment and wheel balancing mechanic

    e. store man auto

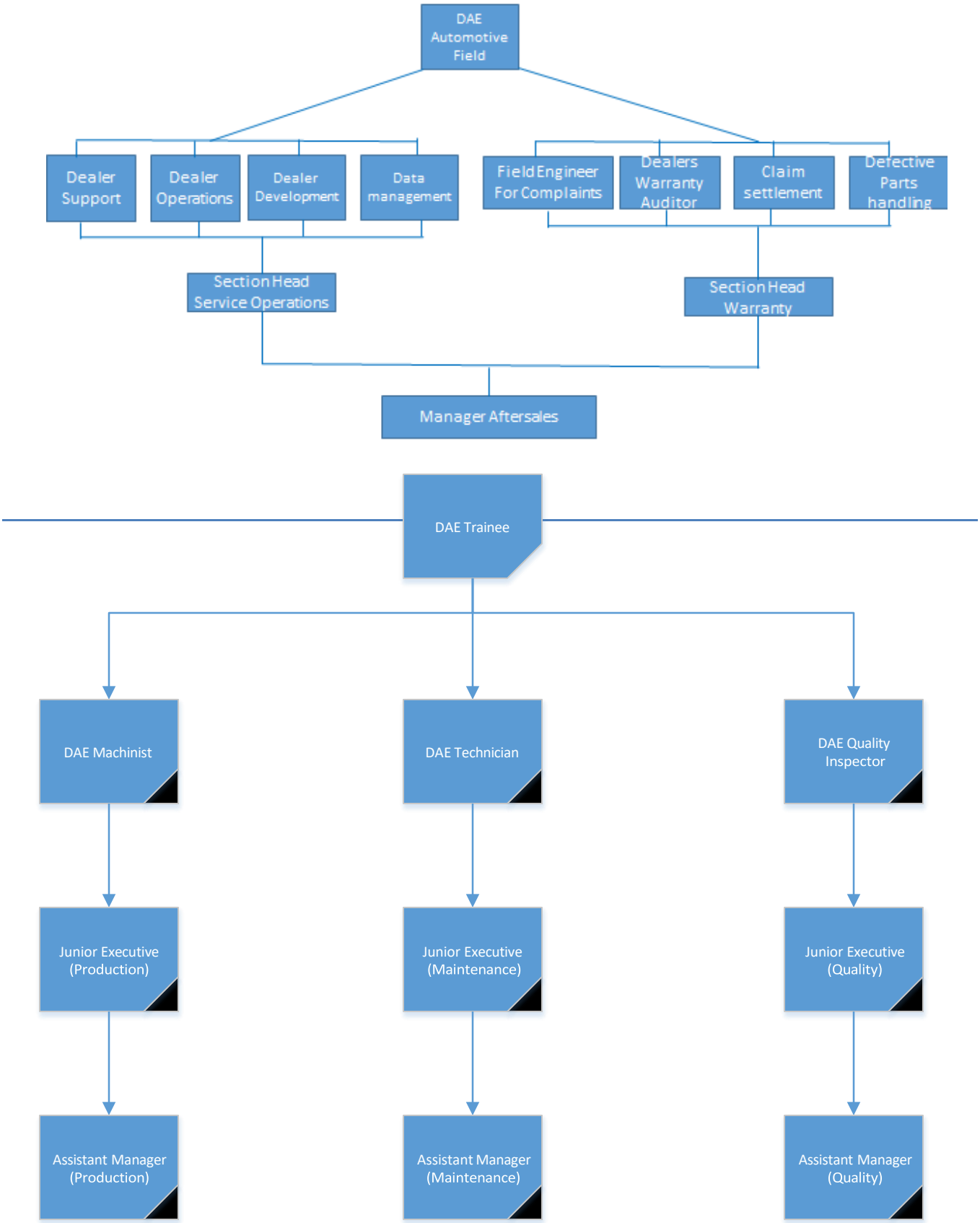
    f. Mechanic / foreman in government organization

    g. Auto mobile assembler in assembly plants

ORGANIZATIONS

1. Auto Mobile Manufacturing units
2. Petrol pump and service stations
3. Power generation plants
4. Agriculture machinery manufacturing units
5. Earth moving machinery manufacturing units
6. Auto repair work shops.

DAE Automotive Career in Aftersales Department



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