



**GOVERNMENT OF KERALA
DEPARTMENT OF TECHNICAL EDUCATION**

**CURRICULUM DEVELOPMENT CENTRE
KALAMASSERY**

**CURRICULUM OF
DIPLOMA COURSE**

IN

AUTOMOBILE ENGINEERING

**SEMESTER SYSTEM
(Revision 2006)**

Prepared at
CURRICULUM DEVELOPMENT CENTRE, KALAMASSERY

RULES AND REGULATIONS OF THE DIPLOMA COURSES
IN ENGINEERING/TECHNOLOGY/COMMERCIAL PRACTICE
UNDER THE STATE BOARD OF TECHNICAL EDUCATION,
KERALA STATE. (SEMESTER SYSTEM)

01. Duration of the Diploma Course

The duration of the regular Diploma courses will be of three academic years, consisting of Six (6) consecutive semesters. The first 2 Semesters are combined and run on an year pattern, and called “Combined First and Second Semesters”.

02. Medium of Instruction

The medium of instruction in all the theory and practical subjects shall be English.

03. Eligibility for Selection to the Diploma Course

Candidates for admission shall be required to have passed Xth class examination (S.S.L.C.) conducted by the Board of Public Examinations, Kerala State or any other equivalent examinations already recognized by the Board of Public Examinations, of Kerala State, with the eligibility for Higher Education.

04. Instructional duration in an academic year

- a) The academic year shall consist of 2 Semesters, each consisting of a minimum of 16 weeks of instruction, including intervening holidays, but excluding the period of examinations and study holidays.
- b) The course will follow Semester pattern, with an End semester examinations, conducted by the Board of Technical Examinations, Kerala State. The examinations for first year (Semester I & II Combined) will be conducted at the end of second semester.
- c) There will be 7 Instructional periods of 55 Minutes duration per Day, and there shall be 5 working days in a week from Monday to Friday, and thereby 35 Periods per Week.

05. Minimum attendance required for obtaining eligibility to appear for the Examination.

- a) A candidate must secure a minimum of 80% attendance in the combined First and Second Semester and in each subsequent Semester, in order to secure the eligibility to appear for each End Semester examinations.
- b) In the case of those students with 65% or more attendance but could not attain 80% attendance due to Medical reasons, the Principal of the Polytechnic, at his/her discretion, may grant the eligibility to appear for the examination, subject to the remittance of “Condonation fee”, fixed by the Government from time to time.
- c) Students who have secured less than 65% attendance are not eligible to apply for “condonation”, and will not be allowed to appear for the examination under any circumstances.

- d) Students who have shortage of attendance, but not condoned, in any of the semesters including first year, are not eligible to appear for the end Semester Examinations, and therefore not eligible to be promoted to the higher semesters. They may seek readmission. Application for readmission may be entertained only for genuine cases on medical grounds and in doubtful cases the Principal may seek report from medical board for verification.
- e) Condonation of attendance is permitted only once in the entire course of study both in the case of regular and part time courses.

06. Scheme of Evaluation.

- a) The scheme of evaluation shall consist of (1) Internal assessment (Sessional) and (2) End Semester examinations in Theory and Practical Subjects. The maximum marks for End Semester Examinations, and Internal Assessment, both for the Theory and Practical papers will be 75 and 25 respectively except for the Combined I & II Semesters. However, for some exceptional subjects, this may vary. Details of break up of marks are given in the Curricula of each discipline.
- b) The Total marks (Internal and End Semester Examinations) will be as follows:
 - Combined I &II Semesters: 1000 Marks
 - III to VI Semesters: 700 Marks/ Semester
- c) All the end examination including the drawing examination will normally be of 180 Minutes duration. In certain specialized disciplines this requirement may not be adhered to strictly and the End Semester Examination of a longer duration may be permitted.

07. Award of internal assessment marks.

- a) In respect of theory subjects the award of sessional mark will be on a Continuous Evaluation method, based on tests, assignments and attendance in the proportion of 40% for tests, 40% for assignments and 20% for attendance. There will be a minimum of three tests and Three Assignments, and all the 3 Test papers and 3 Assignments are taken into account for the calculation of Final Internal Assessment Marks.
- b) Split up of Internal Assessment Marks :

A. Attendance:

Sl.No.	Percentage of Attendance*	Marks to be awarded (computed for 5 Marks)
1	Below 65	Zero
2	65 to 79	1
3	80 to 84	2
4	85 to 89	3
5	90 to 94	4
6	95 and above	5

B. Practical:

Sl.No.	Criteria component	Marks to be awarded
1	Observation Note/ Rough Record	20%
2	Fair Record (Timely submission, Accuracy and Neatness)	20%
3	Attendance*	20%
4	Test	40%

C. Drawing

Sl.No.	Criteria component	Marks to be awarded
1	Submission of Completed Drawing Sheets (Timely submission, Accuracy and Neatness)	40%
2	Attendance*	20%
3	Test	40%

*Percentage of attendance for that particular subject only is counted here.

D. Seminar

Sl. No.	Criteria component	Marks to be awarded
1	Relevance of Topic	10%
2	Collection of materials	20%
3	Presentation (Presentation slides, Delivery)	40%
4	Question-Answer./Discussion	20%
5	Seminar Report	10%

E. Project Work

Sl. No.	Criteria component	Marks to be awarded
1	Relevance of Topic & Selection of	10%
2	Knowledge in the Tool	20%
3	Selection of Tool	20%
4	Fabrication & Final product	20%
4	Role of the individual in the Team	20%
5	Project Report	10%

- c) The Faculty concerned will maintain a record of all details regarding Attendance and Internal Assessment marks awarded in the prescribed log book. The students can represent their grievances, if any, in respect of marks awarded, to the concerned Head of Section for clarification.
- d) The students are required to keep a record of all their laboratory exercises performed by them in the form of a laboratory record. This record has to be authenticated by the teacher-in-charge of the laboratory and certified as the record of the bonafide work done by the student by the Head of Section before he is allowed to take the practical examinations. No student will be permitted to take any practical examinations without the bonafide Record.

08. End Examination

- a) In each theory subject and in the drawing subject there will be an end examination in each Semester conducted by the Board of Technical Examination, Kerala State as per the pre-announced notification of examinations. The Timetable for the examination will also be informed to the students ahead of their conduct.
- b) Regular/Supplementary examination for all semesters will be held at the end of each semester as the case may be.
- c) The question paper for each Theory paper (excluding the Drawing papers) will consist of Two parts:
Part A – is for a maximum of 15 marks consisting of 10 short answer type questions of 1½ (One and a half) marks each (to be answered in one or two sentences) covering the whole subjects area. There will be no choice in Part A.
Part B – consists of 10 structured essay type questions of 12 marks each with two question from each of the five units in a subject. Students will have to attempt one question from each unit to score the prescribed maximum of 60 marks.
The part A and Part B will be given together in one question paper.
- d) For drawing subjects, the design of question paper will be according to the needs of that particular drawing. There will not be any short answer type question in drawing.
- e) For practical end examinations, the Board of Technical Examination, Kerala State will appoint examiners who will set a question paper consisting of practical exercises. This will be used for that practical subject.

09. Minimum marks for a pass

- a) A candidate must secure a minimum of 40% marks in the End Semester examination in Theory and Practical for a Pass in each subject. There will be no separate minimum for a pass in the internal assessment but the total marks of End Semester examination and Internal assessment should not be less than 40% for a pass each subject.

10. Rules for promotion to the Higher Semesters.

- a) A candidate will be allowed to go to the next higher Semester, if he/she attended the Combined I & II Semester/ Previous Semester, and has fulfilled the conditions of attendance requirement. However,
- b) A candidate will be permitted to register for the Fifth Semester Examination if and only if he/she has passed all the subjects of the Combined I & II Semester, and
- c) A candidate will be permitted to register for the Sixth Semester Examination only if he/she has passed all the subjects of Combined I & II, and III Semesters.

11. Classification of successful candidates

- a) Candidates shall be declared to have passed the diploma course only if he/she has secured a Pass in all the theory and practical subjects in all the Six Semesters of study.
- b) There will be 3 classifications of passed candidates namely.
 - First class with distinction
 - First class and
 - Second class
- c) The total marks of the Semesters from 3 to 6 shall be considered to classify the successful candidates. That is all these marks will be added and the percentage of marks out of 2800 worked out.

First Class with Distinction

A candidate will be declared to have passed the Diploma Course in First Class with Distinction if he/she secures not less than 75% of the aggregate marks in all Semesters put together except First Year (Combined I & II Semesters) and passes all the above semesters including the Combined I & II Semesters in the first appearance itself, within the stipulated period of normal study, i.e., Three Years of Six Consecutive Semesters, without any break.

First Class

A candidate will be declared to have passed the Diploma Course in First Class if he/she secures not less than 60% of the aggregate marks in all Semesters put together except First Year (Combined I & II Semesters) and passes all the above semesters including the Combined I & II Semesters, within three consecutive chances including his regular chance offered by the Board of Technical Examination.

Second Class

All other successful candidates will be declared to have passed in the Second Class

12. Provision for Improvement/Betterment:

- a). A candidate, if he desires, may improve his/her marks in any subject, in the immediate chance that follow his regular chance/attempt, in the 3rd, 4th and 5th Semesters. A “regular attempt/chance” is defined as the examination chance of the current semester of his/her study.
- b) A candidate, if he/she desires, will be permitted to better his/her marks of the 6th Semester Subjects by reappearing for the entire subjects of that semester together, by taking the next available chance only. (Betterment can be done only for the 6th Semester)
- c) Improvement/betterment will not be reckoned as another chance/attempt. Candidates appearing for betterment will not be considered for the purpose of ranking.

13. **Award of Rank:** Rank Holder in each Discipline will be selected from among the successful candidates who have passed the Diploma course in “FIRST CLASS WITH DISTINCTION” only. “Grace mark” awarded for the performance in arts/sports/similar extra or co- curricular

activities will not be considered for determining the rank holders subject to rules 11 and 12 above.

14. Maximum duration of the Diploma Course:

Normal duration of the diploma course is 6 consecutive Semesters, spanned in 3 Academic Years, as stated in para 01. However, in the case of those who have not acquired Diploma within the stipulated minimum duration of 3 Years, he/she may acquire the Diploma taking a maximum duration of another 3 Years. However, the maximum number of chances to appear for the End Semester examination is limited to 4, including his/her regular chance.

15. Cancellation of Candidature in the Diploma Examination:

If a candidate desires to cancel his candidature for end semester Examination he/she should forward the duly filled in Application Form, recommended by the Principal of the Polytechnics so as to reach the office of the Controller of Technical Examinations within 10 days after the completion of the last theory Examination of that particular Semester examination. For those who have applied for the examination and absent without canceling their candidature, it will be treated as an attempt/ chance. Cancellation of candidature in any Semester Examination is allowed only once. Candidates reported for malpractice will not be eligible for cancellation of examination.

16. Defaulters of fee:

Defaulters of fee will not be permitted to register for the End Semester examination

17. General Information:

Norms for transfer of students:

- a) Application for transfer from one institution to another will be entertained only at the second year (3rd Semester) of the Diploma course. Candidates who desire to get transfer to another institution in the second year (3rd Semester) should submit the application in the prescribed “format for transfer” to the Principal of the Institution to which transfer is requested, through the Principal of the institution where the candidate is studying within 10 days from the date of re-opening of the institution after midsummer vacation.
- b) All applications received within the stipulated time will be processed and the list of candidates selected for transfer on the basis of the index marks secured by the candidates for admission to Polytechnics to the first year (Combined I and II semester) will be published by the concerned principals of the polytechnics to which transfer is requested for, and the selected candidates will be informed accordingly.
- c) Principals of Polytechnics should intimate the names of candidates transferred with branch of study to other institution to the Joint Controller of Technical examinations with details such as name of institutions to which transferred, date of transfer, and Diploma Examinations Register Number within ten days from the last date of admission.

SUBJECTS OF STUDY AND SCHEME OF EVALUATION

Branch: Automobile Engineering

Semesters I&II Combined.

CODE	SUBJECT	Periods Per Week			Evaluation (Marks)			
		Theory	Practical	Total	Theory	Practical	Internal	Total
	THEORY:							
GE101	English	4	----	4	100	---	25	125
GE102	Technical Mathematics	6	----	6	100	---	25	125
GE103	Applied Science							
A	Physics	3	---	3	50	---	12.5	62.5
B	Chemistry	3	--	3	50	---	12.5	62.5
GE104	Engineering Graphics	1	3	4	100	----	50	150
GE105	Computer Fundamentals & Programming in C	2	1	3	100	---	25	125
		4	----	4	100	---	25	125
AU101	Automobile power plant. PRACTICAL:							
GE106	Applied Science Lab	----	1	1	----	25	12.5	75
A	Physics		1	1		25	12.5	
B	Chemistry	-----	6	6	-----	100	50	150
AU102	Manufacturing Process Practical - I							
TOTAL		23	12	35	600	150	250	1000

SUBJECT TITLE	:	ENGLISH
SUBJECT CODE	:	GE 101
PERIODS PER WEEK	:	4
PERIODS PER YEAR	:	128
TOTAL MARKS	:	100 (YEARLY EXAMINATION FOR I AND II SEMESTERS)

TIME SCHEDULE

UNIT	TOPICS	PERIODS
I	a) Lessons – From Ignited minds	
	The dream and the message	10
	Give us a role model	10
II	a) Lessons – From Ignited minds	
	Visionary teachers and scientists	15
III	a) Phonetics and Grammar	
	Introducing speech sounds	
	Consonants, Vowels, Syllables, Stress etc.	
	Tense, Nouns, Verbs, Articles, Active voice and Passive voice	
	Prepositions, Adverbs, Auxiliaries, Direct and Indirect Speech	
	Formation of Questions & Question tags	29
IV	a) Lessons – from Ignited minds	
	Learning from Saints & Seers	15
	Patriotism Beyond Politics and Religion	15
	To My Country Men	5
	Epilogue	5
V	a) Composition	
	Essay writing	
	Comprehension	
	Precise writing	
	Note making	
	Application for Jobs	
	Preparation of bio – data	24
	Total Periods	128

AIM :

The special needs of the technical students in English language require a curriculum that enables them to handle the language as an effective tool for communication. An integration of the four – fold language abilities namely listening, speaking, reading and writing aims at developing the ability to correctly and effectively use the language for specific technical requirements. Thus the teaching of English language to Technical students will definitely help them for their performance in their professional needs.

OBJECTIVES :**1. Comprehension**

- 1.1 Discriminate words and derive ideas in a speech/writing
- 1.2 Express the main ideas in a summary
- 1.3 Organise logically the piece of information provided.
- 1.4 Comprehend written English available in the prescribed text.

2. Vocabulary

- 2.1 Identify the key words
- 2.2 Relate the correct meaning to the terms used
- 2.3 Extend the vocabulary
- 2.4 Use a thesaurus
- 2.5 Study the arrangement of words in sentences
- 2.6 Identify the structural functions of words in sentences.

3. Grammar

- 3.1 Use of tense forms
- 3.2 Nouns, Verbs, Articles
- 3.3 Identify sentence types
- 3.4 Analyse the different types of sentences
- 3.5 Study the ways of negation
- 3.6 Convert direct speech into Indirect speech
- 3.7 Realise active and Passive Voice constructions.

4. Composition

- 4.1 Practice writing essays, précis, note making
- 4.2 Preparation of Application for Jobs and Bio – data

5. Spoken Communication

- 5.1 Distinguish between formal and informal speech situations
- 5.2 Simulate model conversations
- 5.3 Converse within the peer group
- 5.4 Conduct seminars on topics learned in the text.
- 5.5 Conduct model Interviews
- 5.6 Arrange group discussions on General topics

6. Pronunciation

- 6.1 Introduce speech sounds
- 6.2 Consonants, Vowels, Syllables, Stress etc.
- 6.3 Find out pronunciation of words from dictionary
- 6.4 Transcribe words and short passages in broad phonemic script

STUDY MATERIALS

1. Ignited Minds by A.P.J. Abdul Kalam Published by Penguin Books
Chapters : The Dream and the message, Give us a role model, Visionary teachers and scientists. Learning from Saints and seers, Patriotism beyond politics and religion, To my country men, Epilogue.
2. Essential English Grammar by Raymond Murphy Published by Cambridge University Press.
3. Intermediate English Grammar by Raymond Murphy published by Cambridge University Press.
4. Phonetics – A Text Book of English Phonetics for Indian Students by T. Balasubramaniam Published by Macmillan India (P) Ltd.
5. Composition – A Text Book of Two way Communication Techniques by Prof. P.P. John Published by Publication Division, University of Calicut.
6. English Pronouncing dictionary by Daniel Jones Published by Cambridge University Press.

SCHEME FOR SETTING QUESTION PAPERS

TOTAL MARKS : 100
DURATION 3 HOURS

I	Short answer questions	7 Numbers	Answer any 5 (5X2)	10 marks
II	Paragraph questions	7 Numbers	Answer any 4 (4X5)	20 marks
III	Essay questions	3 Numbers	Answer any 1 (1X10)	10 marks
IV	Grammar			30 marks
V	Phonetics			10 marks
VI	Composition			20 marks
			Total	<hr/> 100 marks

SUBJECT TITLE : TECHNICAL MATHEMATICS
SUBJECT CODE : GE 102
PERIODS/WEEK : 6
TOTAL PERIODS : 6 x 32 = 192

TIME SCHEDULE

<u>UNIT</u>	<u>TOPIC</u>	<u>PERIODS</u>
I	1.1 Matrices	8
	1.2 Determinants	6
	1.3 Binomial Series	6
	1.4 Trigonometric Functions	8
	Tutorials	4
	Test on Topics 1.1 to 1.4	3
II	2.1 Properties of Trigonometric functions	7
	2.2 Properties of triangles	6
	2.3 Solutions of a triangle	7
	2.4 Co-ordinate Geometry	8
	Tutorials	4
	Test on Topics 2.1 to 2.4	3
III	3.1 Functions and Limits	8
	3.2 Methods of Differentiation – I	10
	3.3 Methods of Differentiation – II	10
	Tutorials	4
	Test on Topics 3.1 to 3.3	3
IV	4.1 Application of differentiation	10
	4.2 Maxima and minima	8
	4.3 Indefinite Integral	10
	Tutorials	4
	Test on Topics 4.1 to 4.3	3
V	5.1 Integration by parts	6
	5.2 Definite Integral	6
	5.3 Application of integration	8
	5.4 Differential Equations	8
	Tutorials	4
	Test on Topics 5.1 to 5.4	3
	Revision	10
	Model test and feed back	7
		----- 192

OBJECTIVES

On completion of the units, the student will be able to

UNIT – I

1.1 Matrices

- 1.1.0 Understand operations on matrices such as addition, subtraction, transpose, adjoint, inverse and multiplication
- 1.1.1 Define a matrix
- 1.1.2 Identify the type of a given matrix (Square, Unit, Singular etc)
- 1.1.3 Perform operations of addition and multiplication of a given matrix
- 1.1.4 Define – transpose, adjoint and inverse of a matrix
- 1.1.5 Find the inverse of 2 x 2 and 3 x 3 matrices
- 1.1.6 Solve linear equations by using the inverse of the coefficient matrix

1.2 Determinants

- 1.2.0 Solve simultaneous linear equations using determinants
- 1.2.1 Evaluate determinants of second and third order
- 1.2.2 Find the minors and cofactors of the elements in a determinant
- 1.2.3 Solve simultaneous linear equations in 3 unknowns using Cramer's rule.
- 1.2.4 Elimination of three linear equations in to unknowns.

1.3 Binomial series

- 1.3.0 Understand the binomial theorem for positive integers
- 1.3.1 State the meaning of nC_r
- 1.3.2 Derive formula for nC_r and the proof of $nC_r = nC_{n-r}$
- 1.3.3 State the Binomial theorem for positive integers
- 1.3.4 Find a given term in a binomial expansion

1.4 Trigonometric functions

- 1.4.0 Understand the concept of trigonometric functions of any angle
- 1.4.1 Define trigonometric functions
- 1.4.2 Describe signs of trigonometric functions in each quadrant
- 1.4.3 Find other functions, given a trigonometric function and its quadrant
- 1.4.4 Find the trigonometric values of the angle between 0° and 360° .
- 1.4.5 Find the value of trigonometric functions by using tables.

UNIT – II

2.1 Properties of Trigonometric Functions

- 2.1.0 Apply properties of trigonometric functions of compound angles, multiple and submultiple, sum and product formulae
- 2.1.1 State the identities for $\sin(A \pm B)$, $\cos(A \pm B)$, $\tan(A \pm B)$.
- 2.1.2 Solve the problems of the types
 - (1) Prove that $\frac{\cos A - \sin A}{\cos A + \sin A} = \tan(45^\circ - A)$
- 2.1.3 Prove the formulas for $\sin 2A$, $\cos 2A$, $\tan 2A$, $\sin 3A$ and $\cos 3A$
- 2.1.4 State the identities for $\sin A$, $\cos A$, $\tan A$ in terms of $A/2$.
- 2.1.5 Solve the problems of the type: if $\sin A = 0.6$ and A is acute, find $\sin 2A$ and $\cos A/2$
- 2.1.6 Express sum or difference of two sines or two cosines as a product and vice versa.
- 2.1.7 Apply sum and product formulae to do the problems of the type
 - (1) $\frac{\sin A + \sin 3A + \sin 5A}{\cos A + \cos 3A + \cos 5A} = \tan 3A$
 - (2) $\sin 10^\circ \sin 50^\circ \sin 70^\circ = 1/8$

2.2 Properties of Triangles

- 2.2.0 Understand the properties of triangles
- 2.2.1 State and prove the following identities
- 1)
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} = 2R$$
 - 2) $a^2 = b^2 + c^2 - 2bc \cos A$
 - 3) $a = b \cos C + c \cos B$
- 2.2.2 State and prove
- 1) Napier's formula
$$\tan\left(\frac{B-C}{2}\right) = \frac{b-c}{b+c} \cot(A/2)$$
 - 2) $(b-c) \cos(A/2) = a \sin\left(\frac{B-C}{2}\right)$

2.3 Solution of triangles

- 2.3.0 Solve a triangle given necessary data
- 2.3.1 Solve a triangle, given
- 1) Three sides
 - 2) Two sides and the included angle by using Napier's formula.

2.4 Co-ordinate Geometry

- 2.4.0 Understand various forms of the equation of a straight line
- 2.4.1 Define slope of a straight line
- 2.4.2 Find the slope of a line joining two points (x_1, y_1) and (x_2, y_2)
- 2.4.3 Derive the equation of a straight line of the form
- 1) $y = mx + c$
 - 2) $y - y_1 = m(x - x_1)$
 - 3) $\frac{y - y_1}{y_1 - y_2} = \frac{x - x_1}{x_1 - x_2}$
 - 4) $\frac{x}{a} + \frac{y}{b} = 1$
- 2.4.4 Find the equation of a line given suitable data using any of the above form.
- 2.4.5 Find the slope and intercepts on the axes, given a linear equation in 'x' and 'y'.
- 2.4.6 Find the point of intersection of two lines whose equations are given
- 2.4.7 Find the angle between two lines
- 2.4.8 Find the condition for two lines are
- 1) Parallel
 - 2) Perpendicular
- 2.4.9 Find the equation of the line
- 1) Parallel and
 - 2) Perpendicular to a given line and passing through a given point.

UNIT – III

3.1 Functions and Limits

- 3.1.0 Understand the concepts of functions and limits
- 3.1.1 Give example for functions
- 3.1.2 Explain the meaning of limit of the following type
- 1) $\lim_{x \rightarrow a} f(x) = 1$
 - 2) $\lim_{x \rightarrow \alpha} 1/x = 0$
- 3.1.3 Find the limit of the following type
- 1) $\lim_{x \rightarrow 1} \frac{2x + 1}{3x - 2}$
 - 2) $\lim_{x \rightarrow \alpha} \frac{2x^2 + 3x}{5x^2 + 4x + 1}$

- 3) $\lim_{x \rightarrow 3} \frac{x^2 - 3x}{x^2 - 9}$
- 3.1.4 verify the following results
- 1) $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a} = n a^{n-1}$, when n is rational
- 2) $\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1$, is in radian
- 3.1.5 Solve problems of the type
- 1) $\lim_{x \rightarrow a} \frac{\sqrt{x} - \sqrt{a}}{x - a}$
- 2) $\lim_{\theta \rightarrow 0} \frac{\sin m\theta}{\theta}$
- 3.1.6 Describe the general definition of continuous functions

3.2 Methods of Differentiation – I

- 3.2.0 Apply the methods of differentiation
- 3.2.1 Define the derivative of a function $y = f(x)$ as $\lim_{\Delta x \rightarrow 0} \frac{\Delta y}{\Delta x}$
- 3.2.2 Show the geometrical concept of derivatives
- 3.2.3 Find the derivatives of x^n , $\sin x$, and $\cos x$ from first principles
- 3.2.4 State the rules of differentiation
- 1) Sum or difference
 - 2) Product
 - 3) Quotient
- 3.2.5 Find derivatives of e^x and $\log n$. State all the fundamental formulae
- 3.2.6 Apply the rules and differentiate simple functions of the type
- 1) $x^2 \sec x$
 - 2) $\frac{\tan x}{x^2 + 1}$
 - 3) $\frac{x \operatorname{Cosec} x}{3x - 2}$

3.3 Methods of Differentiation – II

- 3.3.0 Apply different methods of differentiation
- 3.3.1 Find the derivatives if the functions of the form $[f(x)]^n$, $\sin f(x)$, $\cos f(x)$, with respect to x .
- 3.3.2 Find the derivatives of $e^{\sin x}$, $\log \sin x$, $(x^2+1)^{10}$, $\sec 5x$, $\frac{\sin 2x}{1+\cos 2x}$, $\cot^5(x^3)$, $\log(\sec x + \tan x)$
- 3.3.3 Find the derivative of the implicit functions of the form $ax^2 + 2hxy + by^2 = 0$
- 3.3.4 Differentiate parametric functions of the type $x = f(t)$, $y = g(t)$
- 3.3.5 Find the second derivative of the functions $y = \frac{x}{x-2}$, $y = x^2 \sin x$
- 3.3.6 Solve the problem of the type
If $y = x^2 \cos x$, show that $x^2 \frac{d^2y}{dx^2} - 4x \frac{dy}{dx} + (x^2+6)y = 0$

UNIT – IV

4.1 Applications of Differentiation

- 4.1.0 Apply the theories of differentiation in different problems
- 4.1.1 State geometrical meaning of derivatives
- 4.1.2 Find the slope of the curve
 $y = x^2 - 3x + 2$ at (3,2)
 $y = \tan x$ at $x = \pi/3$
- 4.1.3 Find the equation of the tangent and normal to the semi circle
 $y = \sqrt{25-x^2}$ at (4,3) on it
- 4.1.4 Solve problems of the type: The radius of a circular plate is increasing in length at 0.1 cm per second. What is the rate at which the area is increasing when the radius is 12 cm.
- 4.1.5 Solve problems of the type: A spherical balloon is inflated with air such that its volume increases at the rate 5.c.c per second. Find the rate at which its curved surface is increasing when its radius is 7 cm.
- 4.1.6 Solve problems of the type: The displacement 'S' in time 't' is given by $S = 2/3t + \text{Cost}$ at $t = \pi/4$; find the velocity and acceleration

4.2 Maxima and Minima

- 4.2.0 Apply the concept of derivative to find maxima and minima
- 4.2.1 State the conditions for a function
 $y = f(x)$ to be (1) increasing (2) decreasing
- 4.2.2 State the conditions for maximum and minimum values of a function
- 4.2.3 Solve the problem of the type:
1) Find the maximum and minimum values of $y = x^3 - 18x^2 + 96x$
2) Prove that a rectangular of fixed perimeter has its maximum area when it becomes a square.

4.3 Indefinite integral

- 4.3.0 Apply various methods of integration
- 4.3.1 Explain that $\int f(x)dx = f(x) + c$ means $\frac{d}{dx}[f(x)+c] = f(x)$, c being an arbitrary constant
- 4.3.2 State the standard formulas of integral x^n , $\sin x$, $\cos x$, e^x , etc
- 4.3.3 Find the integrals using the rules
1) $\int (u \pm v) dx = \int u dx \pm \int v dx$
2) $\int k u dx = k \int u dx$
- 4.3.4 Evaluate the integrals of the form
1) $\int f(ax+b) dx$
2) $\int \sin^2 x dx$
- 4.3.5 Evaluate the integrals of the form
1) $\int x \sin(x^2) dx$
2) $\int \frac{2x^4}{1+x^{10}} dx$
3) $\int \cos^3 x \sin x dx$
4) $\int e^{x^2} x dx$

UNIT – V

5.1 Integration by parts

5.1.0 Solve the problems of the type

- 1) $\int x \cos x \, dx$
- 2) $\int x^2 e^{-x} \, dx$
- 3) $\int x \log x \, dx$
- 4) $\int \log x \, dx$

5.2 Definite Integrals

5.2.0 Understand the concept of definite integral

5.2.1 Define the definite integral

$$\int_a^b f(x) \, dx = f(b) - f(a) \text{ where } F'(x) = f(x)$$

5.2.2 Evaluate the definite integral

- 1) $\int_0^1 x(1-x)^2 \, dx$
- 2) $\int_0^\pi \sin^2 x \, dx$
- 3) $\int_0^1 x \sqrt{1+x^2} \, dx$
- 4) $\int_0^\pi \frac{1-\sin x}{x+\cos x} \, dx$
- 5) $\int_0^{\pi/2} x \cos x \, dx$

5.3 Application of Integration

5.3.0 Apply the concept of definite integral to solve problems of the following

5.3.1 Find the area bounded by a curve, two ordinates (abscissa) and x – axis (y axis)

5.3.2 Find Volume of a solid of revolution about x or y axis

5.4 Differential equations

5.4.0 Solve simple differential equations of first order

5.4.1 Solve the differential equation of the variable separable type

5.4.2 Solve the differential equation of the form $dy/dx + Py = Q$ where P and Q are simple functions of x

CONTENT DETAILS

UNIT – I

1.1 Matrices

Matrix notation, order of a matrix, and type of matrices: - Square matrix, unit matrix, Zero matrix, and Singular matrix. Transpose of a matrix, symmetric and skew-symmetric matrices, sum and product of matrices, Adjoint of a matrix, inverse of a matrix (definition only) and problems.

1.2 Determinants

Determinants of second and third order matrices, minors and cofactors, Cramer's rule, solution of simultaneous linear equations in three unknowns by Cramer's rule. Elimination of three linear equations in two unknowns.

1.3 Binomial series

Idea of nC_r , Value of nC_r (no derivation). Binomial theorem for positive integers (no proof), finding a given term in a Binomial Expansion.

1.4 Trigonometric functions

Definition of trigonometric functions of an angle in any quadrant, Signs of trigonometric functions of related angles, Given a trigonometric functions of an angle and its quadrant find others. Find the values of the trigonometric functions between 0° and 360° .

UNIT – II

2.1 Properties of trigonometric functions

Addition formulae, Multiple and Sub-multiple formulae, Sum and Product formulae, simple problems.

2.2 Properties of triangles

State and prove Sine rule, Cosine rule and projection formula. State and prove Napier's formula and simple problems relating to this.

2.3 Solution of triangle

Solve the triangle given

1. Three sides
2. Two sides and the included angle (use Napier's formula)

2.4 Co-ordinate geometry

Straight line-Slope, Equations of a straight line in the forms

- 1) $Y = mx + C,$
- 2) $y - y_1 = m(x - x_1),$
- 3) $\frac{y - y_1}{y_1 - y_2} = \frac{x - x_1}{x_1 - x_2}$
- 4) $\frac{x}{a} + \frac{y}{b} = 1$

Points of Intersection of two lines, Angle between two lines, Conditions for two lines, Conditions for two lines to be parallel and predictor.

UNIT – III

3.1 Function and Limits

Definition, some problems for finding limits, Properties

Limit $\frac{x^n - a^n}{x - a} = na^{n-1}$ and limit $\frac{\sin \phi}{\phi} = 1$ (statements only),
 $x \rightarrow a$ $\phi \rightarrow 0$

General definition of continuous functions.

3.2 Methods of Differentiation I

Definition of derivative of x^n , $\sin x$, $\cos x$ etc by using first principle, find derivatives of e^x and $\log x$, Fundamental formulas, product and Quotient rules (statement only). Derivatives of other trigonometric functions, Simple problems.

3.3 Methods of Differentiation II

Function of a function rule, Differentiation of implicit and parametric equations, problems on differentiation of functions involving these forms, second order derivatives, Simple problems.

UNIT – IV

4.1 Application of Differentiation

Geometrical meaning of derivatives, Slope, Tangent, Normal and Equation of a straight line, Rate of change.

Problems connecting Area and Volume, Velocity and Accelerations.

4.2 Maxima and Minima

Increasing and Decreasing functions, Turning points, Finding Maximum and Minimum values of a function by using derivatives, Conditions for Maximum and Minimum, Simple problems.

4.3 Indefinite Integral

Definition of integration, Fundamental formulas, Problems, Integration by substitution, function of the form $\int f(g(x))g'(x) dx$, $\int f(ax + b)^n dx$

UNIT – V

5.1 Integrates by parts

Integral of the product of two functions, formula (without proof) and simple problems.

5.2 Definite Integral

Definitions, simple problems, $\int_0^{\pi/2} \sin^2 x dx$, $\int_0^{\pi/2} \frac{\sin x}{\sqrt{1-\cos x}} dx$

5.3 Application of integration

Finding areas between the curve $y = f(x)$ and the axes, Volume of the solid, Problems

5.4 Differential equations:

Solutions of equations of the form Variable separable, Linear equations.

REFERENCE BOOKS

1. Washington A.J. : Basic Technical Mathematics, Addison Wesley
2. Green John. R : Calculus with Analytic Geometry, McGraw Hill Book Co.,
3. Karuppannan. T.C. : Mathematics for Technical Students, Macmillan and Co.,
4. T.T.T.I. Madras : Mathematics for Technicians Vol. I and II,
Sehgal Educational Consultants (P) Ltd, Faridabad
5. Shanti Narayanan : Algebra

SUBJECT TITLE : APPLIED SCIENCE – A - PHYSICS
SUBJECT CODE : GE 103 A
PERIOD/WEEK : 3
PERIODS/YEAR : 96

TIME SCHEDULE

<u>UNIT</u>	<u>TOPIC</u>	<u>PERIODS</u>
I	1.1 Units And Dimensions	5
	1.2 Dynamics	14
	1.3 Work, Power and Energy	5
	1.4 Rotational Dynamics	6
	Test – I	2
II	2.1 Statics	10
	2.2 Elasticity	4
	2.3 Fluid Flow	5
	2.4 Viscosity	3
	2.5 Surface Tension	3
	2.6 Simple Harmonic Motion	5
	Test – 2	2
III	3.1 Optics	7
	3.2 Electricity	12
	3.3 Semiconductors	6
	3.4 Laser	2
	3.5 Photoelectric Effect	3
	Test – 3	2
	Total	----- 96 =====

OBJECTIVES

On Completion of the unit, the student will be able to

UNIT – I

1.1 Units And Dimensions

- 1.1.0 Understand the concept of units and measurements with a basic knowledge about dimensions
- 1.1.1 Define Unit of a physical quantity.
- 1.1.2 Explain the principle of measurement.
- 1.1.3 Identify fundamental and derived units.
- 1.1.4 Define dimension of a physical quantity.
- 1.1.5 Derive dimensional formula for physical quantities.

1.2 Dynamics

- 1.2.0 Apply the dynamics of a particle in practical situations.
- 1.2.1 Identify vector and scalar quantities.
- 1.2.2 Derive the expression $S_n = u + a(n - \frac{1}{2})$
- 1.2.3 Solve Problems related to gravity with equations of motion.
- 1.2.4 Derive the expressions for time of flight, horizontal range and maximum height for a projectile.
- 1.2.5 Solve the problems based on the above expression
- 1.2.6 State the Newton's laws of motion
- 1.2.7 Define the terms:
1. Force 2. Inertia 3. Momentum
- 1.2.8 Derive the relation $F = ma$
- 1.2.9 State Law of conservation of momentum and prove it in the case of two bodies making a collision.
- 1.2.10 Explain the principle behind recoil of gun and derive an expression for recoil velocity.
- 1.2.11 Solve Problems related to Laws of motion.
- 1.2.12 Define angular displacement, angular velocity and angular acceleration.
- 1.2.13 Derive relation between linear velocity and angular velocity.
- 1.2.14 Derive expression for centripetal acceleration.
- 1.2.15 Apply the principle of centripetal force in the case of banking of roads and rails.
- 1.2.16 Solve problems related to centripetal force.

1.3 Work, Power and Energy

- 1.3.0 Understand the concepts of work, power and energy and their applications
- 1.3.1 Define 1. Work 2. Power 3. Energy
- 1.3.2 Distinguish between Potential Energy and Kinetic Energy and mention the expressions for them.
- 1.3.3 Solve problems using the above expressions.

1.4 Rotational Dynamics

- 1.4.0 Understand the dynamics of a rotating body.
- 1.4.1 Define Moment of Inertia of a rigid body
- 1.4.2 Define Radius of gyration
- 1.4.3 State theorems of parallel and perpendicular axes.
- 1.4.4 Define Torque
- 1.4.5 Mention relation between torque and angular momentum.
- 1.4.6 Mention the expression for kinetic energy of rotation.
- 1.4.7 Derive an expression for moment of inertia of a uniform circular disc about an axis passing through its center and perpendicular to its plane.
- 1.4.8 Derive expression for kinetic energy of a disc rotating on a horizontal plane.
- 1.4.9 Solve problems using the above expressions.

UNIT – II

2.1 Statics

2.1.0 Understand the principles of statics and its applications

- 2.1.1 Add Vectors using triangle method.
- 2.1.2 Define Resultant and Equilibrant of vectors.
- 2.1.3 State Parallelogram law of forces.
- 2.1.4 Derive expression for resultant using Parallelogram law.
- 2.1.5 State the law of triangle of forces.
- 2.1.6 State Lami's theorem.
- 2.1.7 Explain moment of a force.
- 2.1.8 State the conditions of equilibrium of a rigid body acted upon by a large number of coplanar parallel forces.
- 2.1.9 Derive expression for work done by a couple.

2.2 Elasticity

- 2.2.0 Comprehend the concept of elasticity
- 2.2.1 Define Stress, Strain and Elastic limit.
- 2.2.2 State Hooke's law.
- 2.2.3 Derive expression for Young's modulus, rigidity modulus and bulk modulus.
- 2.2.4 Solve Problems related to modulus of elasticity.

2.3 Fluid Flow

- 2.3.0 Understand the principle of fluid flow
- 2.3.1 Distinguish between Streamline and Turbulent flow.
- 2.3.2 Explain Pressure energy, Kinetic energy and Potential energy of a liquid.
- 2.3.3 Mention equation of continuity.
- 2.3.4 State Bernouille's theorem.
- 2.3.5 Explain the working of airfoil and atomizer.

2.4 Viscosity

- 2.4.0 Apply the principle of viscosity in solving problems.
- 2.4.1 Define coefficient of viscosity.
- 2.4.2 Give the Poiseuille's formula.
- 2.4.3 Explain terminal velocity.
- 2.4.4 Mention Stoke's formula.
- 2.4.5 Explain the effect of temperature on viscosity
- 2.4.6 Solve problems using Poiseuille's formula.

2.5 Surface Tension

- 2.5.0 Comprehend the phenomenon of surface tension and its applications.
- 2.5.1 Define surface tension.
- 2.5.2 Define surface energy.
- 2.5.3 Derive the relation between surface tension and surface energy.
- 2.5.4 Mention the expression for the excess of pressure inside a spherical drop and bubble.
- 2.5.5 Solve problems related to surface tension.

2.6 Simple Harmonic Motion

- 2.6.0 Comprehend the concept of wave motion
- 2.6.1 Define Simple Harmonic motion.
- 2.6.2 Derive equation for S.H. motion.
- 2.6.3 Explain period, frequency, amplitude and phase.
- 2.6.4 Distinguish between transverse and longitudinal waves.
- 2.6.5 Define wavelength.
- 2.6.6 Derive the relation $V = n\lambda$
- 2.6.7 Explain resonance.
- 2.6.8 Explain ultrasonic frequency.
- 2.6.9 Mention applications of ultrasonic.

UNIT – III

3.1 Optics

- 3.1 Understand the concept of optical phenomena
- 3.1.1 State Snell's law of refraction.
- 3.1.2 Explain critical angle and total internal reflection.
- 3.1.3 Explain the propagation of light through optic fiber.
- 3.1.4 Convex and concave mirror- focus, image formation.
- 3.1.5 Mention the formula $1/u + 1/v = 1/f$ (No derivation)
- 3.1.6 Convex and concave lens - focus, image formation.
- 3.1.7 Mention the formula $1/f = (n-1)(1/R1 - 1/R2)$, No derivation
- 3.1.8 Simple microscope, Magnifying power $m = 1 + D/f$, No derivation.

3.2 Electricity

- 3.2 Understand the fundamentals of electricity and its magnetic effect
- 3.2.1 State Kirchoff's law.
- 3.2.2 Derive expression for balancing condition of wheat Stone's Bridge.
- 3.2.3 State Biots and Savarts law.
- 3.2.4 Mention the expression for magnetic field due to current through a circular cuf.
- 3.2.5 State Fleming's left hand rule.
- 3.2.6 Describe the principle and construction of a moving coil galvanometer.
- 3.2.7 Explain the conversion of galvanometer into ammeter and voltmeter
- 3.2.8 Solves problems based on the above laws.

3.3 Semiconductors

- 3.3 Comprehend the working of semiconductor devices
- 3.3.1 Explain P.N. Junction.
- 3.3.2 Describe a junction transistor PNP and NPN.
- 3.3.3 Explain transistor configuration.
- 3.3.4 Describe a common emitter amplifier.
- 3.3.5 Represent Logic gates symbolically.
- 3.3.6 Explain with the help of truth table.

3.4 Laser

- 3.4 Understand laser action and its application
- 3.4.1 Explain population inversion, spontaneous emission, stimulated emission and optical pumping.
- 3.4.2 Write down the characteristics of LASER.
- 3.4.3 Describe various applications of Laser.

3.5 Photoelectric Effect

- 3.5.0 Comprehend the theories of photoelectric effect
- 3.5.1 Describe Max planks quantum theory.
- 3.5.2 Explain Photoelectric effect and its application.
- 3.5.3 State Laws of Photoelectric emission.
- 3.5.4 Device Einstein's photoelectric equation.
- 3.5.5 Solve problems using the above equation.

CONTENT DETAILS

UNIT – I

1.1 Units and dimensions

Units – fundamental and derived units. Systems of units – S.I. Dimensions – Application – Derivation of expression of period of a simple pendulum using dimension.

1.2 Dynamics

Equation of motion (re-capitulation only) - Derivation of $S_n = U + a(n - \frac{1}{2})$ - Acceleration due to gravity – equation of motion under gravity. Numerical problems.

Projectile motion – Derivation of expressions for Time of flight, Horizontal range, Maximum height Problems.

Linear Momentum, Newton's laws of motion – Definition of force and inertia – Derivation of $F = ma$ – Unit of force. Law of conservation of momentum – Derivation – Recoil of gun. Numerical Problems.

Circular motion – definitions for angular displacement angular velocity and angular acceleration – relation between linear velocity and angular velocity (deviation). Centripetal acceleration and centripetal force-derivation-examples Banking of roads and rails (qualitative) centrifugal force – Numerical problems.

1.3 Work, power and energy

Definitions for Work, Power, Energy – Units of work – Power and energy, Potential energy and Kinetic energy – Expression for P.E and K.E. (no derivation). Numerical problems.

1.4 Rotational Dynamics

Moment of inertia of a rigid body – Radius of gyration. Theorems of Parallel and Perpendicular axis (only statement) – Angular momentum Torque – Relation between Torque and angular momentum

(no derivation) expression for K.E. of rotation (no derivation). Moment of Inertia of a uniform circular disc about an axis passing through its center and Perpendicular to its Plane (derivation) – K.E. of disc rolling on a horizontal Plane. Numerical problems.

UNIT – II

2.1 Statics

Vectors and Scalars – Triangle Method of vector addition – Concurrent forces – Resultant and equilibrant – Parallelogram law – Derivation of the resultant in Magnitude and direction – Law of triangle of forces – Lami's theorem – Resolution of forces – Parallel forces – Like and unlike Parallel forces – moment of force- Conditions of equilibrium of body under the action of a number of coplanar parallel forces couples – Moment of a couple – work done by a couple – Numerical problems.

2.2 Elasticity

Elastic and plastic bodies – Stress – Strain – units - Hooke's law – Young's Modulus Rigidity modulus, Bulk modulus – Numerical problems.

2.3 Fluid flow

Stream line and turbulent flow – Pressure energy, Potential energy and kinetic energy of a liquid – Equation of continuity – Bernoulli's theorem – Applications – Air foil and Atomizer.

2.4 Viscosity

Viscous force – Coefficient of viscosity – Unit dimension - Poiseuille's formula (no derivation). Stokes formula - Variation of viscosity with temperature - Numerical problems.

2.5 Surface tension

Surface tension - Surface energy – Relation between S.T and Surface energy (Proof) – Expression for excess of Pressure inside a spherical drop and bubble (no derivation) – Problems.

2.6 Simple Harmonic Motion

Definition of Simple Harmonic Motion – Examples – SHM as projection of uniform circular motion on any diameter of a circle – Equation of SHM – Period, frequency, amplitude, phase motion – Transverse and longitudinal waves. Definition of wavelength and frequency – Derivation of relation $V + f\lambda$ - free vibration – forced vibration – Resonance – Ultrasonic Applications.

UNIT – III

3.1 Optics

Smells law of refraction – Critical angle – Total internal reflection – Optical fiber Convex and concave mirror – Focus, image formed by mirror (Qualitative idea only), Mention the formula $1/u + 1/v = 1/f$, (no derivation) – Convex and concave lens, focus image formed by lenses(qualitative idea only), mention the formula $1/f = (n-1)[1/R1 - 1/R2]$, no derivation. Simple microscope – magnifying power $m=1+d/f$, No derivation.

3.2 Electricity

Kirchoff's Laws – WheatStone's bridge - Condition for balancing – Magnetic effect of Electricity – Biot and Savart Law – Right hand palm rule – Magnetic field due to current through circular coil at a point on the axial line and at the center (no derivation) – Fleming's Left hand rule – Force on a current carrying Conductor placed in a magnetic field – moving coil galvanometer – theory and construction – Conversion of a galvanometer into ammeter and voltmeter – Numerical problems.

3.3 Semiconductors

PN Junction – Junction transistor – Transistor configuration, α and β – Common emitter amplifier. Logic gates (symbolic representation and truth task only) – AND, OR, NOT gates – universal gates NAND, NOR, XOR gates.

3.4 Laser

Population inversion, Spontaneous emission, stimulated emission, optical pumping – characteristics – applications.

3.5 Photoelectric Effect

Quantum theory – Photoelectric effect – Laws of photoelectric effect – Einstein's photoelectric equation – Numerical problems.

REFERENCE BOOKS

- | | |
|------------------------------------|------------------------|
| 1. Physics | - Halliday and Resnick |
| 2. Mechanics | - D.S. Mathur |
| 3. Optics | - Jenkins and White |
| 4. Digital and Computer Principles | - Malvino |

SUBJECT TITLE : APPLIED SCIENCE – B. CHEMISTRY
SUBJECT CODE : GE 103 B
PERIODS/WEEK : 3
PERIODS/YEAR : 96

TIME SCHEDULE

<u>UNIT</u>	<u>TOPIC</u>	<u>PERIODS</u>
I	INORGANIC AND THEORETICAL CHEMISTRY	
	1.1 Introduction	9
	1.2 Acid Base & Redox Reactions	9
	1.3 Water	8
	Test – I	1
II	PHYSICAL CHEMISTRY	
	2.1 Electrochemistry	10
	2.2 Corrosion	7
	2.3 Energetics	10
	2.4 Colloids	5
	Test – II	1
III	ORGANIC CHEMISTRY	
	3.1 Introduction	4
	3.2 Polymers	9
	3.3 Paints, Varnishes & Adhesives	6
	3.4 Fuels	9
	3.5 Environmental Pollution	5
	3.6 Chemistry In Action	2
	Test – III	1
	Total	----- 96 =====

OBJECTIVES

UNIT - I INORGANIC AND THEORETICAL CHEMISTRY

Formulae and Equations

- 1.1.1 Review the fundamental ideas in chemistry
- 1.1.2 Explain the terms atom, molecule, valency, radical, molecular formula
- 1.1.3 Compute molecular weight from molecular formula
- 1.1.4 Do the calculations based on simple stoichiometric equations – weight(s)/volume(s) of product(s)/reactant(s)

Structure of Atom

- 1.1.5 Understand the basic ideas related to modern approach to the structure of atom
- 1.1.6 State the fundamental particles – proton, electron, neutron – their charge & mass
- 1.1.7 Differentiate atomic number & mass number
- 1.1.8 Explain the concept of isotopes
- 1.1.9 Describe the dual nature of matter
- 1.1.10 Outline de-Broglie equation
- 1.1.11 State Heisenberg's uncertainty principle
- 1.1.12 Explain the concept of uncertainty
- 1.1.13 Distinguish between orbit & Orbital
- 1.1.14 Illustrate the Hund's rule & Aufbau principle
- 1.1.15 Illustrate the electronic configuration of first 20 elements
- 1.1.16 State modern periodic law
- 1.1.17 Classify elements based on electronic configuration

Chemical Bonding

- 1.1.18 Understand the different types of chemical bonds – how & why they are formed
- 1.1.19 Explain the reason for inactivity of zero group elements
- 1.1.20 Illustrate ionic, covalent & co-ordinate bond
- 1.1.21 Define electro-negativity
- 1.1.22 Explain the polar character of covalent bond & significance of Hydrogen Bonding
- 1.1.23 Illustrate the application of hydrogen bonding – high boiling point of water, density of ice, silky nature of proteins (elementary idea only)

Acid-base & Redox reactions

- 1.4.0 Appreciate the reactions of acids & bases
- 1.4.1 Illustrate Arrhenius' & Lewis concept of acids and bases
- 1.4.2 Distinguish between strong and weak acids and bases
- 1.4.3 Explain neutralization
- 1.4.4 Illustrate the calculation of equivalent weights of acids and bases based on equations
- 1.4.5 Explain the electronic concept of oxidation & reduction
- 1.4.6 State oxidation number
- 1.4.7 Define the O.N concept of oxidation & reduction
- 1.4.8 Illustrate redox reactions taking the reactions in Daniel Cell as example

pH & Its Applications

- 1.5.0 Understand the ionic product of water
- 1.5.1 State pH – understand its expression
- 1.5.2 Describe what is pH scale
- 1.5.3 Solve simple problems
- 1.5.4 Define buffer solutions
- 1.5.5 Describe what is acid buffer & basic buffer – one example each

Volumetric Analysis

- 1.6.0 Understand the theory behind volumetric analysis
- 1.6.1 Describe what is meant by the terms titration, end point & indicator
- 1.6.2 Identify the indicators phenolphthalein/methyl orange to be used in a given acid-base titration, know the respective pH ranges
- 1.6.3 Solve problems based on the relation $V_1N_1=V_2N_2$ & $V_1M_1 = V_2M_2$

Water

- 1.7.0 Understand hard & soft water- definition, types of hardness, its causes & certain methods of removal
- 1.7.1 Distinguish between hard water & soft water
- 1.7.2 Mention the types of hardness
- 1.7.3 Explain methods of removal of hardness – one each (temp. – boiling, permanent – ion exchange)
- 1.7.4 Define degree of hardness
- 1.7.5 Explain the method of determination of degree of hardness using EDTA – principle, procedure & calculation
- 1.7.6 Explain disadvantages of using hard water – wastage of soap in laundry, formation of boiler scales

UNIT - II PHYSICAL CHEMISTRY

Electrochemistry

- 2.1.0 Review the outline of electrolysis, distinguish between electrolytic cells & galvanic cells, identify corrosion as an electrochemical process
- 2.1.1 Distinguish between a) conductors & insulators b) metallic & electrolytic conduction c) strong & weak electrolytes
- 2.1.2 Explain electrolysis taking molten NaCl as example anode reaction & cathode reaction as oxidation & reduction.
- 2.1.3 Explain the applications of electrolysis, electroplating & anodizing
- 2.1.4 Distinguish between electrolytic cell & galvanic cell, the difference in the sign of the electrodes in the above cells
- 2.1.5 Outline the schematic representation of galvanic cell
- 2.1.6 Explain the classification of galvanic cells as primary & secondary
- 2.1.7 Illustrate primary cell with Daniel cell as examples
- 2.1.8 Illustrate secondary cell with lead storage cell as examples
- 2.1.9 Explain the electrode reactions while recharging
- 2.1.10 Explain the term electrode potential
- 2.1.11 Define electrochemical series
- 2.1.12 Illustrate the construction of a galvanic cell – minimum 3 examples
- 2.1.13 Explain the concept of fuel cells (elementary idea only)
- 2.1.14 Explain hydrogen-oxygen fuel cell & methanol-oxygen fuel cell
- 2.1.15 Describe the chemical reactions in the cell
- 2.1.16 Mention the advantages of fuel cells

Corrosion

- 2.2.0 Understand the concept of corrosion & identify it as an electrochemical process
- 2.2.1 Define corrosion
- 2.2.2 Explain the rusting of iron-mention the conditions for rusting
- 2.2.3 Explain the electrochemical theory of corrosion
- 2.2.4 Describe the methods of prevention of corrosion, barrier protection and sacrificial protection
- 2.2.5 Explain the theory behind each method learned

Chemical Energetics

- 2.3.0 Appreciate the basic concepts of ‘Thermodynamics’ & ‘Chemical Thermodynamics’
- 2.3.1 Explain the scope and limitations of thermodynamics
- 2.3.2 Distinguish between a) reversible & irreversible reactions b) exothermic & endothermic reactions
- 2.3.4 Explain ‘system & surroundings’
- 2.3.5 Distinguish between open, closed & isolated systems
- 2.3.6 Define macroscopic properties
- 2.3.7 Distinguish between extensive & intensive properties

- 2.3.8 Describe the different thermodynamic processes like isothermal, adiabatic, isobaric & isochoric process
- 2.3.9 State the first law of thermodynamics
- 2.3.10 Explain internal energy E & ΔE
- 2.3.11 Explain the concept of work & heat
- 2.3.12 State the mathematical expression for the first law of thermodynamics
- 2.3.13 State Hess's Law – only statement & examples (solving problems not expected)
- 2.3.14 Describe the limitations of the 1st law
- 2.3.15 Explain the terms a) 'enthalpy' H & ΔH b) entropy S & ΔS
- 2.3.16 Describe spontaneous & non-spontaneous processes with suitable examples.
- 2.3.17 State 2nd law of thermodynamics
- 2.3.18 Explain Gibb's free energy G & ΔG
- 2.3.19 Derive the mathematical expression (only) for Gibb's – Helmholtz equation
- 2.3.20 State 3rd law of thermodynamics

Colloids

- 2.4.0 Comprehend the methods of preparation, the properties & some industrial applications of colloid
 - 2.4.1 Define 'colloids'
 - 2.4.2 Illustrate the different types of colloids with examples.
 - 2.4.3 Describe the method for the preparation of $\text{Fe}(\text{OH})_3$ sol
 - 2.4.4 Describe Bredic's Arc method
 - 2.4.5 Describe the purification of colloids by Dialysis
 - 2.4.6 Describe the properties 1) Tyndall effect 2) Brownian movement 3) electrophoresis 4) coagulation
 - 2.4.7 State Hardy-Schultze rule & explain with examples.
 - 2.4.8 Define Gold-No
 - 2.4.9 Describe the industrial applications – 1) smoke precipitation 2) sewage treatment 3) purification of drinking water

UNIT – III ORGANIC CHEMISTRY

Introduction to organic chemistry

- 3.1.0 Understand the fundamental ideas of organic chemistry
- 3.1.1 List the differences between organic & inorganic compounds
- 3.1.2 Describe the uniqueness of carbon atom
- 3.1.3 Define 'catenation'
- 3.1.4 Distinguish between saturated & unsaturated compounds
- 3.1.5 Illustrate general classification & that based on functional groups
- 3.1.6 Define isomerism – explain with simple examples only

Polymers

- 3.2.0 Understand the nature of some industrially important polymers
 - 3.2.1 Define polymerization
 - 3.2.2 Distinguish between addition & unsaturated compounds
 - 3.2.3 Differentiate between thermoplastics & thermosetting plastics
 - 3.2.4 Outline the merits & demerits of plastics
 - 3.2.5 Distinguish natural rubber from synthetic rubber with suitable examples
 - 3.2.6 Explain vulcanization & its merits
 - 3.2.7 Define "fiber"
 - 3.2.8 Describe different types of fibers with suitable examples

Paints, varnishes, adhesives & lubricants

- 3.3.0 Appreciate the requisites of good paints
 - 3.3.1 Name the constituents of paints – vehicle, pigment & other additive
 - 3.3.2 Identify the role of various additives – acrylics, polymethanes, fillers, plastisizers, driers, antiskinning agents (one examples each)
 - 3.3.3 List the two types of varnishes & their constituents
 - 3.3.4 State the common uses of varnishes

- 3.3.5 List the various constituents of varnish
- 3.3.6 Explain the principle of lubrication
- 3.3.7 List the types of lubricants – with one example each
- 3.3.8 Define ‘adhesives’
- 3.3.9 List the two types of adhesives
- 3.3.10 State the applications of 1) paper adhesive 2) wood adhesive 3) metal bonding adhesive 4) break & clutch bonding adhesive 5) printed circuits

Fuels

- 3.4.0 Comprehend the classification and use of various types of fuel.
- 3.4.1 Define “fuel”
- 3.4.2 Explain their classification into solid, liquid & gaseous
- 3.4.3 Give brief explanation of solid fuels wood, charcoal, lignite, bituminous coal, anthracite coal – list their applications
- 3.4.4 Explain briefly the liquid fuels petrol, diesel, kerosene & list their applications
- 3.4.5 Explain gaseous fuels natural gas (CNG), producer gas, water gas, LPG & Gobar gas
- 3.4.6 Describe nuclear fuels with examples
- 3.4.7 Define 1) calorific value 2) octane number 3) Cetane no.
- 3.4.8 Explain 1) knocking 2) cracking

Environmental pollution

- 3.5.0 Investigate the impact of pollution on the environment
- 3.5.1 Describe the categorization and sources
- 3.5.2 List the different methods of controlling pollution
 - 1) Effluent treatment 2) removal of toxic gases and particulate materials
- 3.5.3 Distinguish between BOD & COD

Chemistry in action

- 3.6.0 Understand some commonly used medicines & propellants
- 3.6.1 Explain what is 1) dyes 2) antipyretics & analgesics 3) antiseptics & disinfectants 4) tranquilizers 5) antibiotics - mention 2 examples each
- 3.6.2 Define propellants
- 3.6.3 Classify propellants with one example each.

CONTENT DETAILS

UNIT – I INORGANIC AND THEORETICAL CHEMISTRY

1.1 Introduction

Atoms and Molecules, Valency, Molecular formula, Atomic weight, Molecular weight, Chemical equation, Problems based on Chemical equation.

Structure of atom, Modern approach De-broghi & Heisenberg’s uncertainty Principle (Elementary idea only) – Concept of Orbit, orbital, Aufbau, Hund, Pauli’s Principle – Electronic configuration – Modern Periodic Law - classification of elements based on electronic configuration.

Chemical Bonding - theory of valency – Inertness of Zero group elements - Ionic bond, Coordinate bond, Co-valent bond, Polar character of covalent bond – Hydrogen bond – Applications High B.P of Water, density of ice, silky nature of protein (Idea only).

1.2 Acids-bases and Redox reactions

Acids-Bases – (Arrhenius, & Lewis Concepts) – Concepts of strong and weak acids & bases – Neutralization - Equivalent weight of acid & bases (Calculate based on Equation) -Oxidation, Reduction (electronic concept and oxidation No concept) - Redox reaction (Eg: - Daniel Cell reaction).

Ionic product of water, PH & POH (Definition and expression) PH Scale – Calculation of PH & POH – Buffer solution (examples) – Application of PH a) Boiler feed water b) Potable water c) Effluent treatment.

Volumetric analysis: Quantitative & Qualitative analysis – Units of measurement of Concentration (Normality, Molarity & PPM) – Titration, Endpoint Acid – Base Indicators (Phenolphthalein & Methyl orange) – Choice of Indicators.

1.3 Water

Hard & soft water, Types of Hardness – degree of hardness. One method to remove Temporary hardness (Boiling) – Renormal of permanent hardness (Ion-exchange method) – disadvantages of using hard water a) Wastage of Soap in laundry) Boil Scales – Determination of Degree of hardness using EDTA (Principle & Procedure only).
(Problems not expected from the chapter)

UNIT – II PHYSICAL CHEMISTRY

2.1 Electrochemistry & corrosion

Conductors & Insulators, Metallic & electrolyte conductors, strong & weak electrolytes – Mechanism of electrolysis – Molten Nail – Application of electrolysis – Electroplating & Anodizing.

Galvanic cell – Difference in the sign of electrodes – Primary cell (eg: - Daniel cell construction details, Anode reaction, cathode reaction & Net cell reaction)

Secondary cells – Lead storage battery, (Constructional details – charging & discharging) Electrochemical series – Application in the construction of a cell.

Fuel cells – Introduction, Hydrogen – Oxygen fuel cell, Methanol – Oxygen fuel (elementary idea only) – Advantages.

2.2 Corrosion

Definition – Rusting of Fe condition for Rusting of Fe, Electrochemical theory of corrosion, Preventing of corrosion

- i) Barrier protection
- ii) Sacrificial protection
- iii) Cathodic protection
- iv) Antirust solution.

2.3 Chemical Energetics

Understand the term chemical energetic & thermodynamics _ Scope & Limitations of Thermodynamics. Basic concepts – Reversible & Irreversible reaction, Exothermic & endothermic reactions, systems & surroundings – Types of systems Open, closed, Isolated – process – Macroscopic properties – Extensive & Intensive properties.

Thermodynamic process - Isothermal, Adiabatic, Isobaric, Isochoric Process.

First Law of Thermodynamics – (statement)

Internal energy (E) and Internal energy change (E)

Concept of Work & heat

Mathematical expression for the 1st Law of thermodynamics

Application of 1st Law (Hess's Law)

(Statement and eg), Limitation of 1st Law.

Enthalpy (H) and Enthalpy Change (H), Entropy (S) and Entropy Change (S)

Second Law of Thermodynamics (statement & Mathematical Expression)

Gibbs Free energy (G) and Gibbs free energy change (AG)

Gibbs-Helmholtz equation (expression only)

Third Law of Thermodynamics (statement only)

2.4 Colloids

Definition, Types of colloids, preparation 1) Condensation-e.g. Ferric hydroxide sol 2) Dispersion- e.g. Bredig's arc method, purification – dialysis, Properties. 1. Tyndall effect 2. Brownian movement 3. Electrophoresis 4. Coagulation Hardy – Schulze rule, Gold number Industrial application 1) Smoke precipitation 2) Treatment of sewage 3) Purification of drinking water.

UNIT – III ORGANIC CHEMISTRY

3.1 Introduction

Differences between organic and inorganic compounds – uniqueness of carbon – catenation, saturated and unsaturated – general classification of organic compound – classification based on functional groups isomerism (definition with an example).

3.2 Polymers

Polymerization – illustrate with examples – Addition and condensation polymerization with one example each.

3.3 Plastics - Thermoplastics, Thermosetting plastic, with one example each – advantages.

3.4 Rubber – Natural and synthetic rubber (example), vulcanization.

3.5 Fiber – Natural fibers, synthetic fibers, semi synthetic fibers, examples.

3.3 Paints and Varnishes and adhesives, lubricants

Requisites of a good paint – Constituents – acrylics, polyurethane, filler, plasticizers, pigments, driers and antiskinning agents.

VARNISHES - Type, Constituents

LUBRICANTS - Principle of lubrication – Types of lubricants

ADHESIVES - Types and Applications.

3.4 Fuels

Types of fuels - solid, liquid, gaseous and nuclear - Calorific value of fuels. Knocking, Cracking - Octane number and octane number.

3.5 Environmental pollution

Categorization, Sources and Controlling.

3.6 Chemistry ice action:

Dyes – antipyretics and analgesics – antiseptic – disinfectant – tranquilizers – antibiotics (Concept and two examples each). Propellants – definition classification (solid – liquid – hybrid) one example each.

REFERENCE BOOKS

- | | | | |
|----|-------------------------|------------------------------------|-----------------------------|
| 1. | Soni P.L. | A Text Book of Inorganic Chemistry | S.Chand & Co., New Delhi |
| 2. | Puri B.L. & Sharma L.R | A Text Book of Inorganic Chemistry | Shoban Lal Nagin Chand&Co |
| 3. | B.S.Bahl | Text book of Organic Chemistry | S.Chand & Co., New Delhi |
| 4. | I.L. Finar
Arun Bahl | Organic Chemistry – Vol I | ELBS & Longman, Group Ltd., |
| 5. | Sono. P.L. | Textbook of physical Chemistry | Sultan Chand & Sons, New |
| 6. | A.J. Mee | Physical Chemistry | William Heinemann Ltd., |
| 7. | Glasstone & Lewis | Element of Physical Chemistry | Macmillan Press |

SUBJECT TITLE : ENGINEERING GRAPHICS
SUBJECT CODE : GE 104
PERIOD/WEEK : 4
PERIOD/YEAR : 128

TIME SCHEDULE

<u>UNIT</u>	<u>TOPIC</u>	<u>PERIODS</u>
I	1.1 Importance of Engineering Graphics	2
	1.2 Drawing Instruments	2
	1.3 Drawing standards	2
	1.4 Free hand Lettering and Numbering	3
	1.5 Dimensioning	3
	1.6 Geometric construction	16
	Test 1	3
		----- 31
II	2.1 Projection of Points, Lines and planes	18
	Test 2	3
		----- 21
III	3.1 Orthographic Projection of Objects	27
	Test 3	3
		----- 30
IV	4.1 Sectional views of objects	11
	4.2 Auxiliary views	3
	Test 4	3
		----- 17
V	5.1 Pictorial Drawing	8
	5.2 Visualization	4
	5.3 Perspective Drawing	3
	5.4 Development of surfaces	11
	Test 5	3
		----- 29
Total		128 Periods

Note : A minimum number of 10 sheets should be done.

OBJECTIVES

UNIT - I

On completion of this study the student should be able to –

1.1 Importance of Engineering Graphics

- 1.1.0 Understand the importance of engineering graphics
 - 1.1.1 Explain the importance of engineering communication medium
 - 1.1.2 Describe the development of engineering graphics and computer aided drafting CAD
 - 1.1.3 Indicate the link between engineering graphics and other subjects of study in diploma courses

1.2 Drawing Instruments

- 1.2.0 Use engineering drawing instruments
 - 1.2.1 Select the proper instrument to draw horizontal, vertical and inclined lines
 - 1.2.2 Select the proper instrument to draw large and small circles and arcs to its specifications
 - 1.2.3 Select the proper pencil to draw different types of line according to its specifications
 - 1.2.4 Identify the steps to keep the drawing clean and tiny

1.3 Drawing standards

- 1.3.0 Appreciate the standards of engineering drawing
 - 1.3.1 Select the drawing sheet
 - 1.3.2 Draw different types of lines
 - 1.3.3 Prepare of title block as per BIS
 - 1.3.4 Fold of drawing sheets as per standards

1.4 Free hand Lettering & Numbering

- 1.4.0 Apply free hand lettering and numbering
 - 1.4.1 Write drawing tile using sloping and vertical lettering including numerals as per BIS
 - 1.4.2 Select suitable size of letters of different layout and applications
 - 1.4.3 Write engineering drawings notes using lettering stencils

1.5 Dimensioning

- 1.5.0 Apply dimensioning as per standards
 - 1.5.1 State the need of dimensioning as per BIS specification
 - 1.5.2 Identify the notations used in a drawing as per BIS
 - 1.5.3 Identify the system of placement of the dimensions as per BIS
 - 1.5.4 Dimension of a given drawing according to BIS including features
 - 1.5.5 Apply the rules for dimensioning of standard features, given a drawing comprising of standard features
 - 1.5.6 Identify principles of dimensioning, given a dimensioned drawing
 - 1.5.7 Identify the correctness or otherwise of an engineering drawing dimensioned as per SP 46 and dimension the same correctly

1.6 Geometric construction

- 1.6.0 Apply principles of geometrical construction
 - 1.6.1 Construct polygon, given the length of the side
 - 1.6.2 Insert a regular polygon in a circle.
 - 1.6.3 Define Ellipse, involutes, helix, Parabola, Hyperbola and Cycloid,
 - 1.6.4 Construct Ellipse by different methods (concentric, eccentricity, parallelogram
 - 1.6.5 Construct an involute, helix, parabola from given data
 - 1.6.6 Identify the application of these constructions in engineering practice.

UNIT – II

2.1 Projection of Points, Lines and Planes

- 2.1.0 Understand the projection of points, lines and planes
 - 2.1.1 Project points in different quadrants
 - 2.1.2 Project lines parallel to both planes
 - 2.1.3 Project lines perpendicular to HP and || to VP

- 2.1.4 Project lines perpendicular to VP and \parallel to HP
- 2.1.5 Project lines inclined to HP and \parallel to VP
- 2.1.6 Project lines inclined to VP and \parallel to HP
- 2.1.7 Project lines inclined to both planes-simple direct questions and answers
- 2.1.8 Find true length of lines
- 2.1.9 Project of planes parallel to VP and perpendicular to HP
- 2.1.10 Project planes parallel to HP and perpendicular to VP

UNIT - III

3.1 Orthographic Projection of Objects

- 3.1.0 Apply principles of orthographic projection
 - 3.1.1 Explain the principle of orthographic projection with simple sketches
 - 3.1.2 Prepare an engineering drawing of a given simple engineering part in first angle and third angle projection
 - 3.1.3 Draw the orthographic views of an object, given its pictorial drawing
 - 3.1.4 Sketch (free hand) the orthographic views of 3.2 and 3.3
 - 3.1.5 Select the minimum number of views needed to represent a given object fully
 - 3.1.6 Identify the engineering part correctly from a number of orthographic drawings

UNIT - IV

4.1 Sectional views of objects

- 4.1.0 Recognize the need of sectional views
 - 4.1.1 Explain the need to draw sectional views
 - 4.1.2 Select the section plane for a given component to reveal maximum information
 - 4.1.3 Draw the sectional views for 4.2
 - 4.1.4 Sketch simple sections (Full and half) for a range of simple engineering objects
 - 4.1.5 Select the component from a given sectional view

4.2 Auxiliary views

- 4.2.0 Recognize the need of auxiliary views
 - 4.2.1 State whether the auxiliary view is needed, given an engineering drawing
 - 4.2.2 Draw the auxiliary views of a given engineering drawing

UNIT - V

5.1 Pictorial Drawing

- 5.1.0 Prepare pictorial drawing
 - 5.1.1 Explain the need for and types of commonly used pictorial drawings
 - 5.1.2 Prepare isometric drawing of simple objects using appropriate construction procedures given their orthographic drawings
 - 5.1.3 Sketch the isometric views of simple engineering objects given either orthographic drawing or actual components
 - 5.1.4 Prepare oblique drawing – cavalier and cabinet-of simple engineering objects given either orthographic drawings or actual components
 - 5.1.5 Sketch 5.4 by free hand
 - 5.1.6 Identify the correct pictorial view from orthographic drawings

5.2 Visualization

- 5.2.0 Visualize and object in 3D, given its orthographic drawings
 - 5.2.1 Compare an engineering part with its drawings
 - 5.2.2 Identify surfaces with reference to orthographic drawing
 - 5.2.3 Prepare a model of the part, given its orthographic drawing

5.3 Perspective Drawing

- 5.3.0 Prepare perspectives
 - 5.3.1 State the principle of perspective projection
 - 5.3.2 Prepare two-point perspective of a rectangular block
 - 5.3.3 Sketch perspective of combination of rectangular block

5.4 Development of surfaces

- 5.4.0 Prepare development of surfaces
 - 5.4.1 State the need for preparing the development drawings
 - 5.4.2 Prepare development of surfaces of simple engineering component like tray, funnel, ducts (rectangular and square hopper)
 - 5.4.3 Prepare development of surfaces of 90-degree elbow pipe

CONTENT DETAILS

UNIT - I

1.1 The Importance of Engineering Graphics

Explanation of the scope and objective of this subject – its importance as a graphic communication, Computer Aided Drafting (CAD) need for preparing drawing as per standards – BIS, SP 46.

1.2 Drawing Instruments.

Basic drawing instruments – T square – Set square – compass dividers – drawing boards – Pencils – Drawing papers – Mini drafter – French curves – Stencils – Selection and mode of using them.

1.3 Drawing Standards

Size of drawing sheets – Layouts of drawing sheet – Title Blocks – Types of lines – Folding of drawing sheets.

1.4 Free hand Lettering and Numbering

Need for legible lettering and numbering on drawings – selection of suitable size of lettering for different drawing writing of Engineering drawing titles and notes using both vertical and sloping styles.

1.5 Dimensioning

Function of dimensioning need for dimensioning engineering drawing according to BIS – rotation used in dimensions – dimension line – extension line – arrow heads and leader – system of dimensions - method I and method II

1.6 Geometric construction

Construction of regular polygon given the length of its side - methods of inserting a regular Polygon in a given circle – construction of ellipse by different methods (eccentrically, concentric circle, parallelogram). Definition of involute, helix, parabola & hyperbola – Construction of cycloid helix, involute and parabola.

UNIT – II

2.1 Projection of points, lines and planes

Projection of points in different quadrants, projection of straight lines parallel to one or both planes, parallel to one plane –perpendicular to other – inclined to one plane and parallel to other line inclined to both planes (In first quadrant only)

Methods of finding true length and its inclination with the reference planes. Projection of planes – parallel to one plane and perpendicular to other plane (in first quadrant only)

UNIT - III

3.1 Orthographic projection of objects

Explanation of the meaning of orthographic projection using a viewing box and a model- number views obtained need of only three views for displaying the object. Concept front view, top view and side view-sketching these views for a number of engineering objects- explanation of the meaning of first angle and third angle projection – symbol of projection

UNIT - IV

4.1 Sectional views of objects

Need for sectional drawing of an engineering object- selection of the section plane to reveal the maximum information – sectional views (full and half section) of simple engineering objects.

4.2 Auxiliary views

Need of auxiliary views – auxiliary views given engineering drawings

UNIT - V

5.1 Pictorial drawings

Isometric projection, construction of isometric scales- isometric projection of simple Engineering objects

Oblique projection cavalier and cabinet of simple Engineering objects

5.2 Visualization

Preparation of pictorial views from a group of orthographic drawings

5.3 Perspective drawing

Principle of perspective projection – type of perspective projection – two-point perspective of a rectangular block and combination of two rectangular blocks of different sizes

5.4 Development of surfaces

Development of surfaces of simple engineering components trace-funnel, ducts-rectangular and square –hopper-90 degree Elbow

REFERENCE BOOKS

- | | |
|-------------------------|------------------|
| 1. Engineering Drawing | - N. D Bhutt |
| 2. Engineering Graphics | - K. C. John |
| 3. Engineering Graphics | - P. I. Varghese |

**SUBJECT TITLE : COMPUTER FUNDAMENTALS & PROGRAMMING
IN C**

SUBJECT CODE : GE 105

PERIODS/WEEK : 3

PERIODS/YEAR : 96

TIME SCHEDULE

<u>UNIT</u>	<u>TOPIC</u>	<u>PERIODS</u>
I	1.1 Introduction to Computers	12
	1.2 Windows & Word Processing	6
	Test 1	2
II	2.1 Data Processing	5
	2.2 Problem solving methodology	11
	Test 2	2
III	3.1 Introduction to C Programming	12
	3.2 Programming practice	6
	Test 3	2
IV	4.1 Arrays, strings & functions	12
	4.2 Programming practice	6
	Test 4	2
V	5.1 Graphics in C	7
	5.2 Computer Networks	3
	5.3 Programming practice	6
	Test 5	2
	TOTAL	96

OBJECTIVES

UNIT – I

1.1.0 Know the application, classification and working of computers

1.1.1 Define a Computer

1.1.2 Discuss the various applications of computers

1.1.3 List the different classifications of computers based on processing methods

1.1.4 Describe the working of analog, digital and hybrid computers

1.2.0 Appreciate the functions of hardware and software components

1.2.1 Define hardware and software

1.2.2 Discuss about Instruction and program

1.2.3 Describe the hardware functional components of a digital computer with the help of a block diagram

1.2.4 List the functions of ALU, Memory, Input, Output Units and Control Unit

1.2.5 Define CPU and Microprocessor

1.2.6 List the classifications of computers based on capability

1.2.7 Describe micro, mini, mainframe and supercomputers in brief

1.2.8 Discuss machine language, Assembly language and high level language

- 1.2.9 List the different software components
 - 1.2.10 Define system software and application software
 - 1.2.11 Give examples for system software and application software
 - 1.2.12 State the need for translators – assembler, compiler
 - 1.2.13 Define operating system
 - 1.2.14 List the functions of operating system
 - 1.2.15 List the names of various operating system

- 1.3.0 **Appreciate the working of memory and input – output devices**
 - 1.3.1 Define memory
 - 1.3.2 Discuss the units' bit, byte, kilobyte, megabyte, gigabyte etc.
 - 1.3.3 Discuss the characteristics of primary memory and secondary memory
 - 1.3.4 Distinguish between sequential access memory and Random Access Memory
 - 1.3.5 Differentiate between Read Only Memory and Read/Write memory
 - 1.3.6 Discuss RAM & ROM
 - 1.3.7 List the different types of ROM
 - 1.3.8 List the different secondary memory devices
 - 1.3.9 Discuss the working of floppy disk, magnetic tape, Hard disk, Compact disk (block diagrams and detailed description not necessary)
 - 1.3.10 Discuss working of CDROM, CD-R, CD-RW & DVD (block diagrams and detailed description not necessary)
 - 1.3.11 List the names of various I/O devices
 - 1.3.12 Discuss input devices – Keyboard, mouse, scanner, Optical Character reader, Optical Mark reader, bar code reader, digitizer, light pen, joystick in brief (block diagrams and detailed description not necessary)
 - 1.3.13 Discuss output devices – monitor, Printer, plotter (block diagrams and detailed description not necessary)
 - 1.3.14 Describe the printers – Dot matrix printer, Inkjet printer, Laser printer in brief (block diagrams and detailed description not necessary)

- 1.4.0 **Use the provisions of windows o s and word processing**
 - 1.4.0 Define Booting
 - 1.4.1 Define Booting
 - 1.4.2 Demonstrate the features of Windows Operating System
 - 1.4.3 Operate various facilities in windows- 95 or higher version such as Desktop, icon, menu, folder, programs, screen saver, media player, shut down procedure
 - 1.4.4 Discuss word processing
 - 1.4.5 Prepare documents using WORD - create, format, save, print and open documents
 - 1.4.6 Prepare presentations using power point – creation and use of slide show presentations

UNIT – II

- 2.1.0 **Use data processing techniques and DBMS (not for theory exam)**
 - 2.1.1 Define Data, Database, and Database management system
 - 2.1.2 Define Data, Database, and Database management system
 - 2.1.3 State the need of spreadsheet
 - 2.1.4 List the name of electronics spreadsheet and DBMS software packages
 - 2.1.5 Use Excel for the creation, formatting, formula, save, print, open close and exit worksheets
 - 2.1.6 Use Access for the creation, editing and querying of tables
- 2.2.0 **Understand problem solving methodology**
 - 2.2.1 List the various steps involved in problem solving
 - 2.2.2 Define what is an Algorithm
 - 2.2.3 Write Algorithm for solving general and computer related problems
 - 2.2.4 Define what is a Flow chart
 - 2.2.5 Discuss the different flow-charting symbols

- 2.2.6 Draw flow chart for solving general and computer related problems
- 2.2.7 Define syntax and semantic of programming languages
- 2.2.8 List the name of two programming methods
- 2.2.9 Discuss the characteristics of procedural and object oriented programming languages
- 2.2.10 Give examples for procedural and object oriented language

UNIT – III

3.1.0 Use ‘C’ language in programming

- 3.1.1 Discuss the characteristic of C language
- 3.1.2 Describe the structure of a C program
- 3.1.3 State the need for header files, main ()
- 3.1.4 Discuss the basic data types in C –int., float, and double char
- 3.1.5 Discuss about identifiers, keywords and declaration of identifiers
- 3.1.6 Discuss about statements and compound statements
- 3.1.7 Describe briefly assignment, arithmetic operators, increment-decrement operators and arithmetic expressions
- 3.1.8 Discuss operator precedence and rules for evaluation of an expression
- 3.1.9 State the need of stdio.h
- 3.1.10 Discuss various input and output statements-printf(), scanf(), getchar(), putchar (), getchar ()
- 3.1.11 Discuss the need of various control sequences and escape sequences
- 3.1.12 Write simple programs using input/output assignment and arithmetic statements
- 3.1.13 Describe the relational operators and relational expressions with their precedence in brief
- 3.1.14 Describe logical operators with their precedence in brief
- 3.1.15 Write programs with relational operators and logical operators

3.2.0 Prepare programs involving branching and looping statements

- 3.2.1 State the need for branching statements
- 3.2.2 Describe IF, IF ELSE statement, nested IF and IF Ladder
- 3.2.3 Describe the Switch Statement
- 3.2.4 Write Programs using IF Else and Switch statement
- 3.2.5 State the need for looping statements
- 3.2.6 Discuss the method of looping using While, Do and for loops
- 3.2.7 Write programs using While, Do and For loops

UNIT – IV

4.1.0 Create arrays and strings

- 4.1.1 State the need of arrays
- 4.1.2 Discuss the method declaring arrays and subscripting in arrays
- 4.1.3 Discuss the method of inputting, processing, and outputting values of array element
- 4.1.4 Write program for array processing
- 4.1.5 Write program for linear search and bubble sort
- 4.1.6 Discuss about multidimensional arrays
- 4.1.7 Write programs on multidimensional arrays, matrices manipulation
- 4.1.8 Discuss the declaration of character string
- 4.1.9 Discuss various string input and output functions – gets() and puts()

4.2.0 Understand functions in ‘C’ language

- 4.2.1 State the need for function
- 4.2.2 Compare user defined and library functions
- 4.2.3 Discuss the structure of a user defined function and its calling with or without parameters
- 4.2.4 Define void function
- 4.2.5 Describe various library functions – sin (), cos(),tan(),exp(), abs(), log(),log10(), POW(), sqrt(), - strlen (), strcpy (), strcmp (), strcat ()
- 4.2.6 Write simple programs on functions and strings

UNIT – V

5.1.0 Use computer graphics in ‘C’ language to prepare programs

- 5.1.1 State the use of graphics.h
- 5.1.2 Define resolution
- 5.1.3 Discuss the functions initgraph(), setcolor(), setbkcolor(), putpixel(), line(), circle(), rectangle(), outtexty()
- 5.1.4 Write programs based on graphics

5.2.0 Understand new trends in information technology

- 5.2.1 Define the work ‘multimedia’
- 5.2.2 Define the word ‘multimedia’
- 5.2.3 Discuss the components required for a multimedia personal computer
- 5.2.4 Define computer network
- 5.2.5 Define LAN, WAN
- 5.2.6 Discuss the concept of Server and nodes
- 5.2.7 Discuss Internet, World Wide Web, and e-mail
- 5.2.8 Discuss Computer virus and anti-virus programs
- 5.2.9 Define artificial Intelligence and discuss its application fields

CONTENT DETAILS

UNIT – I Introduction to Computers & Word Processing

Introduction, application of computers, generations of computers, classification of computers – analog, digital, hybrid Computers, Structure of a computer - Hardware and Software components – Input unit, Output unit, ALU, Memory unit, Control unit, CPU, Microprocessor, micro, mini, supercomputers – machine languages, assembly languages, high level languages – system software, application software – assembler, compiler, operating system – Types of memory – primary memory, secondary memory, sequential access, random access memory, RAM, ROM – magnetic tape, floppy, hard disc, compact disc – input devices, output devices.

Practical sessions on Windows O/S, Word, Power point

UNIT – II Data Processing and Programming Methodology

Practical session on Electronic spread sheet and DBMS – EXCEL, ACCESS

Steps in problem solving – Algorithm, Flowchart- Flow chart symbols- examples syntax, semantics- types of high level languages – characteristics of high level languages - Types of high level languages – Examples – Procedural and object oriented programming languages

UNIT – III Introduction to C Programming

Characteristics of C-language – structure of a program header files, main (), Statements, compound statements, Data types – Keyword and variables, assignment operators, arithmetic operators, expressions, precedence of operators, order of evaluation – relational and logical operators - Input /output statements – control sequences – escape sequences – branching statements, if, if-else, switch – looping statements while, do, for statements.

Writing Sample programs – Practical session on programming

UNIT – IV Arrays and Functions

Arrays – declaration, processing, searching, sorting – linear search, bubble sort – multi dimensional arrays- matrix manipulations, character strings, string declaration, input/output functions gets (), puts ()

User defined functions – library functions – structure of functions, calling functions, argument passing, void functions – mathematical and string library functions – math.h, stdio.h, string.h

Writing programs – Practical session on programming

UNIT – V Graphics and Networking

C-Graphics – resolution – graphics functions – initgraph (), setcolor (), setbkcolor (), putpixel (), Line (), circle (), rectangle (), out text (), outtextxy ()

Multimedia – Computer networking

LAN, WAN- Internet, modem, www-E-mail, computer virus, artificial intelligence.

REFERENCE BOOKS

1. Brian w. Kernigham and Dennys M. Ripchie The ‘C’ programming Language PHI
2. Hughes J. K. and Michton J. I. A structured approach to Programming PHI
3. Gottfried.B Theory and problems Programming with C TMH
4. E. Balaguruswamy Programming ANSI C TMH
5. Robert A. Radcliffe Encyclopedia C BPB

SUBJECT TITLE : AUTOMOBILE POWER PLANT
SUBJECT CODE : AU101
PERIODS/WEEK : 4
PERIODS/SEMESTER : 128

TIME SCHEDULE

<u>UNIT</u>	<u>CONTENTS</u>	<u>PERIODS</u>
I.	Classification and Working of Automobile Engines	24
	Test – 1	1
II.	Construction Details of Automobile Engines	27
	Test – 2	1
III.	Fuel System in Petrol Engines	24
	Test – 3	1
IV.	Fuel System in Diesel Engines	24
	Test – 4	1
V.	Lubrication and Cooling Systems	24
	Test – 5	1
	Total	128

OBJECTIVES

Upon completion of study of this subject the student should be able to

1.1.0 Know the development of Automobile Since 1770 giving examples

- 1.1.1 Outline the development of Automobile Since 1770 giving examples
- 1.1.2 Appreciate the working of I.C. Engines and its classifications
- 1.1.3 Explain the working of I.C. Engines
- 1.2.0 Understand working principle of different kinds of I.C. Engines and their differences
 - 1.2.1 Explain the working principle of petrol engine, 2 – stroke and 4-stroke
 - 1.2.2 Explain the working principles of diesel engine, 2-stroke and 4-stroke
 - 1.2.3 Distinguish between petrol engine and diesel engine
 - 1.2.4 Distinguish between 2-stroke and 4-stroke engines

2.1.0 Understand constructional details of I.C. Engines

- 2.1.1 Explain the details of components of I.C. Engines – cylinder block, cylinder head, , piston rings, gudgeon pin, connecting rod, crank shaft, main bearings, flywheel, valves, valve operating mechanisms and cam shaft

3.1.0 Comprehend the working of Petrol and Diesel fuel systems

- 3.1.1 Describe petrol fuel system – different fuel feed system, petrol fuel filters and air cleaners
- 3.1.2 Describe the working of carburetors- classifications
- 3.1.3 Describe the working of Solex, Su, and Solex - Mikuni carburetors
- 3.1.4 Explain exhaust system

4.1.0 Explain diesel fuel system with various components

- 4.1.1 Describe fuel injection systems, common rail, unit injection and individual pump system.
- 4.1.2 Explain the types of combustion chamber in diesel engines
- 4.1.3 Describe, fuel injection pump for single and multi cylinder engines, distributor type pump, rotary type pump, feed pump and hand primer
- 4.1.4 Describe diesel fuel filters.
- 4.1.5 Describe governors – purpose and types
- 4.1.6 Describe fuel injectors and its types

5.1.0 Comprehend the working of lubricating and cooling system

- 5.1.1 Specify properties of lubricating oil
- 5.1.2 Explain the different types of grading of oil
- 5.1.3 Explain the working of engine lubrication
- 5.1.4 Describe types of engine lubrication
- 5.1.5 Describe lubricating oil pumps – gear type, vane type, plunger type and lobe type
- 5.1.6 Describe oil cooler, oil filter, pressure relief valve crank case ventilation, dilution and oil seals
- 5.1.7 Explain cooling system
- 5.1.8 Describe air and water cooling
- 5.1.9 Explain thermo siphon system, pump circulation system, use of thermo stat, types of thermo stat
- 5.1.10 Describe type of radiators, functions of radiator cap
- 5.1.11 Explain types of coolants – antifreeze agents in coolant
- 5.1.12 Explain different types of cooling fans

CONTENT DETAILS

UNIT – I

History of automobiles – from 1770 to the present, I.C. engines and its classifications – introduction single cylinder, multi cylinder, V-type, radial, rotary- Wankel, petrol, diesel, gas turbine, stratified, CNG and LPG & Hybrid engines. Working principles of petrol and diesel engines, 2-stroke and 4-stroke. Difference between 2-stroke and 4-stroke, diesel and petrol engines

UNIT – II: CONSTRUCTIONAL DETAILS OF I.C. ENGINES

Cylinder block - Single cylinder and multicylinder, materials, Water jackets – cooling fins, cylinder liners – wet type and dry type – materials.

Cylinder head - Materials, method of fixing the cylinder block, cylinder head gasket, combustion chamber of petrol engines – expansion chambers

Pistons - Trunk type pistons, composite pistons - piston materials expansion control in pistons – methods and types of piston

Piston rings - Materials, method of manufacture, types of rings – compression ring, oil ring and special purpose ring

Gudgion pin - Types of fastening, material used

Connecting rod - Function, materials used big end and small end bearings

Crank shaft - different shapes, different crank shaft arrangements

Main bearings

Fly wheel functions

Types of valves - Poppet, reed valve and disc valve, sodium vapour cooled valves, hydraulic tappet and free valve rotators

Classification of engine according to valve arrangement 1-Head, L-Head, T-Head and F- Head engines

Valve operating mechanisms – side cam shaft and over head cam shaft Inlet and exhaust valve materials, valve timing diagram

Cam shaft – functions and drives, cam shaft bearings

UNIT – III: PETROL FUEL SYSTEM

Different fuel feed systems, A.C. mechanical pump, S U Electrical pump ,petrol filters and air cleaners

Carburetors

Simple carburetors – parts, principle of working, compensation, mixture strength requirement, modern carburetors, float system, idle and slow speed system, high speed system, Acceleration pump and choke system. Other commercial carburetors, Su, Solex and Solex – Mikoni carburetor.

Exhaust system: - Manifolds, silencer types, tail pipes etc.

UNIT – IV: DIESEL FUEL SYSTEM

Various components in Diesel fuel system – types of fuel injection – air injection and mechanical injection, common rail and unit injection system.

Types of combustion chamber in Diesel engines – open, turbulent and pre-combustion chamber, etc

Fuel injection – single cylinder and multicylinder. Distributor type pump, rotary type pumps

Fuel feed pump and hand priming, diesel fuel filters. Governors – purpose, types – mechanical, pneumatic and hydraulic governors

Fuel injectors – single hole, multi hole, pintle and pintox type

UNIT – V: LUBRICATION AND COOLING SYSTEM

Lubrication system: - Properties of lubricating oil, different ratings of lubricating oil, types of engine lubrication- wet and dry sump lubrication, splash and pressure feed systems. Oil pumps – gear type, Vane type, plunger type and lobe type, pressure relief valve, oil pressure indicator

Oil coolers, oil filters, oil seals

Crank case ventilation – dilution

Cooling system: - Air and water cooling, thermo-syphon and pump circulation system over cooling, under cooling and optimum cooling – thermostat

Radiators – types, pressure cap, types of coolants, pump, antifreeze solution , cooling fan – types.

REFERENCE BOOKS

- | | |
|--|---------------------|
| 1. Automobile Engg., Vol. I | – Kirpal Singh |
| 2. Automobile Engg., | - R.B. Guptha |
| 3. Automobile Engg., Vol. I& II | – K.M.Guptha |
| 4. Automobile Engg., Vol. I | – Anil Chikara |
| 5. Automotive mechanics | – William.H.Crouse |
| 6. Automobile Engg., Theory and Practice | – K.K.Ramalingam |
| 7. Automobile Technology | – Dr.N.K. Giri |
| 8. I.C. Engines | – Mathur and Sharma |
| 10 Automotive Mechanics | -- S.Sreenivasan |

SUBJECT TITLE : APPLIED SCIENCE LAB - PHYSICS
SUBJECT CODE : GE 106 A
PERIODS/WEEK : 2
PERIODS/YEAR : 64

LIST OF PRACTICAL EXPERIMENTS – PHYSICS

1. Vernier Calipers
2. Screw Gauge
3. Common balance
4. Simple Pendulum
5. Hooke's law
6. Moment bar
7. Inclined Plane
8. Concurrent forces (Mass of the body)
9. Hare's apparatus
10. U-tube
11. Quill tube
12. Resonance column
13. Diode Characteristics
14. Convex lens
15. Ohm's law

SUBJECT TITLE : APPLIED SCIENCE LAB – CHEMISTRY
SUBJECT CODE : GE 106 B
PERIODS/WEEK : 2
PERIODS/YEAR : 64

OBJECTIVES

I. VOLUMETRIC ANALYSIS

- 1.1 Acidimetry Alkalimetry
 - 1.1.a Determine the strength of the given hydrochloric and solution using a standard solution of sodium hydroxide and calculate the amount of HCl in a given volume
 - 1.1.b Determine the strength of given sulphuric acid solution using a standard solution of sodium carbonate. Calculate the amount of sulphuric acid and in a given volume
 - 1.1.c Determine the strength of given sodium hydroxide solution given a standard solution of sodium carbonate using a link solution sulphuric acid/hydrochloric acid. Calculate the amount of sodium hydroxide in a given volume
 - 1.1.d Determine the strength of given nitric acid solution given a standard solution of oxalic acid using link solution sodium hydroxide/potassium hydroxide. Calculate the amount of nitric acid in a given volume.
- 1.2 Permanganometry
 - 1.2.a Determine the strength of given potassium permanganate solution using a standard solution of ferrous ammonium sulphate
 - 1.2.b Determine the strength and calculate the amount of crystalline ferrous solution
- 1.3 Hardness estimation
 - 1.3.a Determine the degree of hardness of a given sample of hard water using a standard solution of EDTA.

II. pH DETERMINATION

- 2.1.1 Determine the pH of three different solutions using pH meter
- 2.1.2 Determine the pH value of three different solutions using universal indicator
- 2.1.3 Determine the pH value of three different solutions using pH test paper

III. PREPARATION OF STANDARD SOLUTIONS

- 3.1.1 Weigh accurately a crystalline substance using a chemical balance
- 3.1.2 Prepare a standard solution of sodium carbonate by weighting out accurately solid sodium carbonate and making it into a definite volume
- 3.1.3 Prepare a standard solution of oxalic acid when oxalic acid crystals are given.

CONTENT DETAILS

I. VOLUMETRIC ANALYSIS

- 1.1 Acidimetry Alkalimetry
 - a) Estimation of Hydrochloric acid
 - b) Estimation of Sulphuric acid
 - c) Estimation of Sodium hydroxide given standard sodium carbonate solution
 - d) Estimation of Nitric acid given standard sulphuric acid solution
- 1.2 Permanganometry
- 1.3 Estimation of potassium permanganate
- 1.4 Estimation of crystalline ferrous sulphate
- 1.5 Estimation of sodium hydroxide, given standard ferrous salt solution
- 1.3 Hardness estimation
 - Estimation of total hardness of water – using standard EDTA solution

II. pH DETERMINATION

- 2.1 Determination of pH using pH meter
- 2.2 Determination of pH using universal indicator, pH test paper.
- 2.3 Determination of pH using pH test paper.

III. PREPARATION OF STANDARD SOLUTION

- 3.1 Preparation of a standard solution of sodium carbonates
- 3.2 Preparation of a standard solution of oxalic acid

REFERENCE BOOKS

A.O. Thomas & Mani Practical Chemistry for B.Sc. main

SUBJECT TITLE : MANUFACTURING PROCESS PRACTICAL – I
SUBJECT CODE : AU 102
PERIODS/WEEK : 6
PERIODS/YEAR : 192

TIME SCHEDULE

<u>UNIT</u>	<u>TOPIC</u>	<u>PERIODS</u>
I	Carpentry and pattern making	45
	Test – I	3
II	Fitting	45
	Test – II	3
III	Smithy	45
	Test – III	3
IV	Foundry	21
	Test – IV	3
V	Sheet Metal and Aluminium Fabrication	21
	Test – V	3
	Total	192

OBJECTIVES

Upon completion of the course of study, the student should be able to:
 Perform various exercises as per the given drawing and specifications
 Identify the required tools from a given number of tools
 Select particular tool for a specified operation
 Locate the functional part of equipments and tools
 Explain the use of tools and equipment
 Prepare the edges/work piece as per drawing standard
 Set up the job as per the procedures of operation
 Perform various steps as per the procedure
 Inspect the job for achievement of accuracy and finish
 Clean the tools, instruments and work place
 Return the tools, instrument as per regulations
 Exhibit safety precautions

CONTENT DETAILS

UNIT – I: CARPENTRY AND PATTERN MAKING

Introduction, Objectives, safety in the carpentry shop.

Familiarization of tools

Marking and measuring tools such as straight edge, mitre square, tri square, bevel square, combination square, marking knife, marking gauge, mortise gauge, cutting gauge, wing compares, trammel divides, outside and inside calipers, spirit level and plumb bob.

Cutting tools such as Rip saw, Cross out saw, tenon saw, bow saw, compass saw, key hole saw, firmer chisel, bevel edge firmer chisel, paring chisel, mortise chisel, jack plane, wooden and metal, trying plane, smoothening plane, rebate plane, plough plane, router plate, spoke shave.

Boring tools such as bradawl ratchet brace, wheel brace, shell bit fostries bit, counter sunk bit.

Striking tools such as mallet etc

Holding devices – Bench vice, bench stop, sash clamp, G-clamp, hard screw. Miscellaneous tools – Rasp and file, scraper, glass paper, pincers, ratchet and cabinet – structure of wood.

Classification of timber – soft wood and hard wood

Seasoning of wood – air, water, electrical and kiln method. Defects in timber – natural, fungi insects, seasoning, manufacturing

Carpentry Practice

Marking, sawing, planing, chiseling, grooving, rebating exercises
Preparation of carpentry joints
Making utility models (group activity)
Repair of furniture

Pattern Making

Study of various pattern making tools such as contraction scales dividers. Trammels, Calipers, Pinch dogs, Bradawl, Fillet Iron, gauges practice work prepare pattern from blue prints.

UNIT- II: FITTING

Introduction, objective.

Familiarization of tools.

Hand tools

Marking tools – Scribes, compass, dividers, out side and inside caliper, jenny caliper, ordinary scribes block, universal scribing block, angle plate, V-block, center punch, prick punch, try square, bevel square, surface plate, straight edge.

Cutting tools – Chisels – flat, cross, half round, diamond point, side chisel.

Files – Single cut and double cut files, rough, bustard, second cut, smooth dead smooth files – flat, square, pillar, round, triangular, half round knife and needle files.

Scribes – Hack saw – solid and adjustable frames – blades – cutting with point hacksaw

Drill – Flat, straight, fluted, twist dull, taper and straight shank drills

Reamers – Havel, expansion and machine reamers

Taps - Rough, intermediary and finishing taps; tap wrenches.

Dies – Solid, split and adjustable dies, stocks

Striking tools - Ball peen, straight peen, cross peen and double-faced hammers

Holding devices – Vice - bench, leg, pipe, hand pin and toolmakers vice

Marking tools – Scriber – ordinary and universal scribing block, center and prick punch. Angle plate, V-block, Tri Square, surface plate

Miscellaneous tools – Screwdrivers, plane, spanner- double ended, adjustable box spanners and ring spanner

Fitting Practice

Cutting, Chipping, filling, scribing, drilling, reaming, tapping, and dieing exercises

Making of utility models (group activity)

Marking, measuring and checking instruments are to be used during working

UNIT – III: SMITHY

Familiarization of Smithy tools

Hand tools – anvil swage block, hammers such as ball peen, straight peen, cross peen and sledgehammers. Tongs such as flat, hallow, cold and hot chisels, swages, fullers, and flatters, set hammers, pinch and drift.

Equipment: Open and closed hearth, heating furnaces, hand and power driven blowers, open and stock fire, fuels such as charcoal, coal, oil and gas

Workshop Practice

Building fire in the furnace

Upsetting, bending, drawing, setting down, punching, cutting and welding exercises

Preparation of utility article like bolts, tongs, spanners

UNIT – IV: FOUNDRY

Familiarization of tools

Hand tools – Showel, riddle, rammers, trowels, slick, lifters, strike off bar, sprue, balloons, swab, gate cutter, mallet, vent rod, draw spike, lifting plate, pouring weight, gagers, clamps.

Practice Work:

Preparation of moulding sand

Prepare moulds of different types using different patterns

Non-ferrous metal casting using simple patterns

UNIT – V: SHEET METAL AND ALUMINIUM FABRICATION**Sheet metal work**

Practice of cutting of sheet

Formation of joints like grooved joints, locked grooved joints

Preparation of a rectangular open type tray

Preparation of Hollow cylinder

Preparation of utility article such as dust pan, mug, funnel etc

Aluminium Fabrication

Introduction: - Aluminium fabrication and its scope

Tools: - Different types of files, hacksaw, screw driver, hammer, drill bits etc

Measuring tools: - Steel tape, try square, bevel square, combination set etc.,

Practice work: - Cutting, filing, drilling with hand drill, making keyholes

Making of different types of joints such as straight joints, corner joints cut joint with different Aluminium sections

SUBJECT OF STUDY AND SCHEME OF EVALUATION

Semester III

BRANCH: AUTOMOBILE ENGINEERING

Code	Subject	Periods Per Week				Evaluation (Marks)			
		Theory	Tutorial	Practical	Total	Theory	Practical	Internal	Total
AU 301	Applied Thermodynamics	5	1		6	75		25	100
AU302/TD302 /ME302	Fluid mechanics and Pneumatics	4	1		5	75		25	100
AU303/TD303 /ME303	Electrical and Electronics Engineering	4	1		5	75		25	100
AU304/ME304 /WT304	Machine drawing	1		3	4	75		25	100
AU 305	Hydraulics Lab			3	3		75	25	100
AU 306	Petrol Engine Service Lab			6	6		75	25	100
AU 307	Manufacturing Process Practical - II			3	3		75	25	100
	Soft Skills development			3					
	TOTAL	14	3	18	35	300	225	175	700

SUBJECT TITLE : APPLIED THERMODYNAMICS
SUBJECT CODE : AU 301
PERIODS/WEEK : 5+1
PERIODS/SEMESTER : 96

TIME SCHEDULE

<u>UNIT</u>	<u>MAJOR TOPICS</u>	<u>PERIODS</u>
I.	Thermodynamic Processes	18
II.	Air Standard Cycles	18
	Test – 1	2
III.	Power Developed in I.C. Engines	18
IV.	Principles of Heat Transfer	12
	Principles of Heat Exchanger	8
	Test –2	2
V.	Air Compressors	16
	Test-3	2
	Total	96

OBJECTIVES

Upon completion of the study of this subject the student should be able to: -

- 1.1.0 Understand terms associated with Thermodynamics and different process**
 - 1.1.1 Distinguish between specific heat at constant volume and at constant pressure
 - 1.1.2 Derive the relation between specific heats and gas constant
 - 1.1.3 Explain pressure- volume diagram
 - 1.1.4 Derive formulae for work, change in internal energy, heat transfer, relation between P, V and T etc, during Isochoric, Isobaric, Isothermal, Isentropic and Polytropic processes.
- 2.1.0 Comprehend cycles of operation of I.C. Engines**
 - 2.1.1 Distinguish between reversible and irreversible cycles
 - 2.1.2 Describe available work of a cycle
 - 2.1.3 Express air standard efficiency of a cycle
 - 2.1.4 Derive formulae for air standard efficiency of Carnot cycle, Otto cycle, diesel cycle, dual combustion cycle and Joule cycle
- 3.1.0 Compute power developed in I.C. Engines**
 - 3.1.1 Explain indicator diagrams
 - 3.1.2 Discuss slow speed and high speed engine indicators
 - 3.1.3 Find brake power, indicated power, friction power, mean effective pressure, specific fuel consumption, mechanical efficiency, thermal efficiencies and volumetric efficiency
 - 3.1.4 Demonstrate Morse test
 - 3.1.5 Prepare heat balance sheet
- 4.1.0 Comprehend the principles of Heat Transfer**
 - 4.1.1 Explain the three modes of heat transfer
 - 4.1.2 Name the fields of application of heat transfer
 - 4.1.3 State and explain Fourier's law of thermal conduction
 - 4.1.4 Define thermal conductivity
 - 4.1.5 Analyse conduction through plain wall and composite plain wall
 - 4.1.6 Estimate heat loss/square meter/hour
 - 4.1.7 Explain thermal radiation, reflection, absorption and transmission of radiation
 - 4.1.8 Define absorptivity, reflectivity and transmittivity
 - 4.1.9 Explain the concept of a black body

- 4.1.10 State and explain Stefan - Boltzman law of total radiation
- 4.1.11 Explain the concept of a Grey body
- 4.1.12 Explain Newton – Reichman equation of thermal convection
- 4.1.13 Explain free convection and forced convection
- 4.2.0 Understand principles of heat exchangers**
 - 4.2.1 Classify heat exchangers – Recuperator type and Regenerative type,
 - 4.2.2 Parallel flow and counter flow type
 - 4.2.3 Define overall heat transfer coefficient
 - 4.2.4 Define LMTD
 - 4.2.5 Write equations for LMTD for various flow types
 - 4.2.6 Solve problems to calculate surface area of heat exchanger tubes
 - 4.2.7 Distinguish between evaporators and condensers
- 5.1.0 Understand working and constructional features of various types of air compressors and its safety devices**
 - 5.1.1 Outline the function of air compressor
 - 5.1.2 List the uses of compressed air
 - 5.1.3 Classify compressors
 - 5.1.4 Explain the working of single stage and multi stage air compressors
 - 5.1.5 Defend the advantages of multistage compression
 - 5.1.6 Compare reciprocating and rotary air compressors
 - 5.1.7 Explain the constructional features of various compressors
 - 5.1.8 Describe roots blower, vane type, centrifugal and axial flow compressors
 - 5.1.9 Indicate the necessity of safety devices in compressor
 - 5.1.10 List various safety devices
 - 5.1.11 Explain pressure relief valve and automatic cut off
 - 5.1.12 Derive formulae for work done in single stage and multi stage compression, efficiency, volume of free air delivered
 - 5.1.13 Solve problems in this topic

CONTENT DETAILS

UNIT – I: Thermodynamic Processes

Revision of topics like, thermodynamic system, thermodynamic properties, boundary, state, process, internal energy, flow of work, enthalpy, entropy, first and second law of thermodynamics. Specific heats at constant volume and at constant pressure. Establish the relation between specific heats and gas constant. Derivation of formulae for work, heat, change in internal energy, relation between pressure, volume and temperature during constant volume, constant pressure, constant temperature, adiabatic and polytropic processes – problems.

UNIT – II

Air standard cycles – Reversible and irreversible cycle. Available work and energy of a cycle. Theoretical thermal efficiency and air standard efficiency. Pressure- volume diagram and temperature – entropy diagram. Derivation of formulae for air standard efficiency of Carnot cycle, Otto cycle, Diesel cycle, Dual combustion cycle and Joule cycle, problems to find air standard efficiency.

UNIT – III

Power developed in I.C. Engines – Indicator diagram and measurement of mean effective pressure. Slow speed and high speed engine indicators. Indicated power, brake power, friction power, indicated thermal efficiency, brake thermal efficiency, volumetric efficiency, specific fuel consumption, Morse test and preparation of heat balance sheet.

UNIT – IV

Principles of heat transfer – introduction to heat transfer. Modes of heat transfer and fields of application of heat transfer. Thermal conduction, Fourier’s law of thermal conduction, thermal conductivity. Conduction through plain wall and composite plain wall – simple problems. Thermal radiation, reflection, absorption and transmission of radiation. Absorptivity, reflectivity and transmittivity. Concept of a black body, Stefan – Boltzman law of total radiation. Concept of gray body. Newton – Reichmann equation. Free convection and forced convection. Basic principles of heat exchangers. Classifications of heat exchangers. Evaporator and condenser.

UNIT – V

Air compressors – uses of compressed air, classification of air compressors – working of single stage and multistage air compressors. Intercooler, compressor terminology. Derivation for work done in single stage and multistage compression, efficiency, volume of free air delivered etc.

Comparison of reciprocating and rotary compressors, working of rotary compressors. Safety devices – pressure release valve and automatic cut off. Problems

REFERENCE BOOKS

- | | |
|---|---------------------------------------|
| 1. Elements of Heat engines | - R.C.Patel and Karan Chandani |
| 2. Thermal engineering Vol.-I | - Lakshminarayana |
| 3. Automobile mechanics | - N.K.Giri |
| 4. Heat and Mass transfer | - S.K.Suchdev and
S.Kothanda Raman |
| 5. Vehicle operations and testing | - J G Giles |
| 6. Intenal combustion engines | - V.Ganesan |
| 7. Intenal combustion engines theory and practice | - S.P.Sen |
| 8. Internal combustion engines | - Mathur and Sharma |
| 9. IC Engines | - Maleeve |
| 10. IC Engines | - P.M.Heldt |

SUBJECT TITLE : FLUID MECHANICS AND PNEUMATICS
SUBJECT CODE : AU 302 / TD 302 / ME 302
PERIODS/WEEK : 5
PERIODS/SEMESTER : 80

TIME SCHEDULE

<u>UNIT</u>	<u>TOPIC</u>	<u>PERIODS</u>
I	1.1 Introduction	1
	1.2 Properties of Fluids	4
	1.3 Fluid pressure and its measurements	8
	1.4 Buoyancy and Floatation	3
II	2.1 Kinematics and Dynamics of Fluid flow	7
	2.2 Flow through Orifices, Notches, Pipes and Nozzles	8
	Test – I	1
III	3.1 Fluid Power	3
	3.2 Hydraulic system	5
	3.3 Hydraulic Control elements and components	5
	3.4 Hydraulic Circuits	3
	Test – II	1
IV	4.1 Pneumatic System	4
	4.2 Pneumatic Control elements and Components	6
	4.3 Pneumatic Circuits	5
V	5.1 Hydro Pneumatic system	5
	5.2 Electrical Control of Fluid Power	5
	5.3 Micro-electronic control of fluid power	5
	Test – III	1
	Total	----- 80 =====

OBJECTIVES

Upon completion of the study of this subject, the student should be able to:

UNIT – I

1.1.0 Know the areas of application of Hydraulics and the Associated Machines in Engineering

- 1.1.1 Explain the areas of application of Hydraulics
- 1.1.2 Explain various Hydraulic and Pneumatic Machines in the areas of transfer of motion, force multipliers and conversion of energy from one form to other like hydraulic press, machine tools, turbines and pumps

1.2.0 Appreciate the properties of Hydraulic Fluids

- 1.2.1 Explain the various properties of commonly used hydraulic fluids
- 1.2.2 Solve the problems to calculate various property values

1.3.0 Understand Fluid Pressure and the methods to Measure it

- 1.3.1 Explain the terms pressure and pressure head and solve problems on these
- 1.3.2 State and explain Pascal's law

- 1.3.3 Explain Absolute, Gauge, Atmospheric and Vacuum pressure and Solve simple problems on those
- 1.3.4 State the fundamental principles of pressure measuring devices balancing by liquid columns and balancing by spring or dead weight
- 1.3.5 Explain and illustrate the principle of working of piezometer, simple U-tube manometer, differential manometer, inverted differential manometer bourdon's tube pressure gauge
- 1.3.6 Calculate pressure and difference of pressure using manometer readings and other data
- 1.3.7 Explain the term total pressure
- 1.3.8 Derive equations for total pressure on an immersed surface in positions of horizontal, vertical and inclined
- 1.3.9 Solve problems to compute the total pressure of 1.3.8

1.4.0 Understand Buoyancy and Metacenter and Equilibrium of Floating Body

- 1.4.1 State Buoyancy and Centre of Buoyancy
- 1.4.2 Explain Equilibrium of floating bodies and its types- Stable, unstable, Neutral Equilibrium
- 1.4.3 Explain Metacentre and metacentric Height

UNIT – II

2.1.0 Understand the Principles Kinematics and Dynamics of Fluid Flow

- 2.1.1 Explain the term Kinematics
- 2.1.2 Explain the types of fluid flow – steady and unsteady flow, uniform and non-uniform flow, Laminar and Turbulent flow, compressible and incompressible flow – rotational and Irrotational flow, one dimensional flow, two dimensional flow, and three dimensional flow
- 2.1.3 Explain Discharge
- 2.1.4 Explain the equation for continuity of flow
- 2.1.5 Solve simple problems on 2.1.3 and 2.1.4
- 2.1.6 Explain the term Hydro Dynamics
- 2.1.7 Explain the energies possessed by a liquid particle that is potential, kinetic and pressure
- 2.1.8 Define total energy and total head
- 2.1.9 State Euler's equation of motion
- 2.1.10 State and prove Bernoulli's equation from Euler's equation
- 2.1.11 State the limitations of the Bernoulli's theorem
- 2.1.12 Solve problems using Bernoulli's equation
- 2.1.13 Explain practical applications of Bernoulli's equation venturi meter and solve problems using it
- 2.1.14 Sketch a pitot tube and explain how it is used to measure the velocity of a flowing liquid

2.2.0 Appreciate the Flow of Liquids through Orifices, Notches and Pipes

- 2.2.1 Explain Orifices, types of Orifices, point of venacontracta and Hydraulic coefficients C_c , C_v and C_d
- 2.2.2 Solve simple problems of hydraulic coefficients
- 2.2.3 Explain Notches, types of Notches
- 2.2.4 Derive the equation for discharge over rectangular Notch, Triangular Notch and Trapezoidal Notch
- 2.2.5 Mention the advantages of Triangular Notch over a Rectangular Notch
- 2.2.6 Define coefficient of discharge of a Notch
- 2.2.7 Solve simple problems on 2.2.3 and 2.2.5
- 2.2.8 Explain losses of head in pipes and identify Major losses and Minor losses
- 2.2.9 Explain the significance of losses of head due to friction in pipe flow
- 2.2.10 Derive Darcy's formulae and Chezy's formulae for loss of head in pipes and explain the terms hydraulic mean depth and hydraulic gradient

- 2.2.11 Solve the problems on 2.2.10
- 2.2.12 Explain Hydraulic gradient line and total energy line
- 2.2.13 Derive the equation of loss of head due to sudden enlargement and loss of head due to sudden contraction loss head at the entrance in a pipe and loss of head at the exit of a pipe
- 2.2.14 Solve the problems on 2.2.13
- 2.2.15 Explain transmission of power through pipes and derive the equation for power transmitted through a pipe
- 2.2.16 Solve simple problems on 2.2.15
- 2.2.17 Explain water hammer

UNIT – III

3.1.0 Understand the Fluid Power Technology

- 3.1.1 Understand the basic law
- 3.1.2 Identify the applications of fluid power
- 3.1.3 Understand the types of hydraulic fluids used in Industrial applications
- 3.1.4 Know the essential properties of the fluids

3.2.0 Identify the elements of Hydraulic System

- 3.2.1 Classify the pumps
- 3.2.2 Identify Positive displacement pumps
- 3.2.3 Explain the working principle of Positive displacement pumps
- 3.2.4 Describe gear pumps, vane pumps, piston pumps
- 3.2.5 Explain the Type of Hydraulic Actuators – Rotary (Hydraulic motor) – Semi-rotary-linear motion type (Hydraulic cylinders)

3.3.0 Understand the various control elements of various hydraulic control System

- 3.3.1 Describe the working principle of different control valves – pressure control valves, direction control valves and flow control valves
- 3.3.2 Know the applications of valves
- 3.3.3 Classify various types seals, materials for seals ,
- 3.3.4 Types of filters, necessity of filtration of fluids
- 3.3.5 Describe the types of accumulator
- 3.3.5 Identify the purpose of accumulators

3.4.0 Know the hydraulic circuits

- 3.4.1 Describe deceleration circuit – intensifier circuit – regenerative circuit – synchronizing circuit
- 3.4.2 Describe the multiple circuitry used for lifting fork lift
- 3.4.3 Describe Automatic cylinder reciprocating circuit – double sequencing circuit Safety circuit
- 3.4.3 Describe hydraulic circuit for robotic arm

UNIT – IV

4.1.0 Understand the basic concept of pneumatic system

- 4.1.1 Compare Pneumatic system with hydraulic system
- 4.1.2 Identify standard pneumatic symbols
- 4.1.3 Know the basic component of pneumatic system – air filters, pressure regulator – lubricator – mufflers

4.2.0 Understand pneumatic control elements and components

- 4.2.1 Explain with sketches pneumatic valves – direction control valves- pressure control valve and flow control valves
- 4.2.2 Describe the pneumatic actuators – pneumatic cylinders, air motors – types applications

4.3.0 Understand the simple pneumatic circuit

- 4.3.1 Describe the principle of power operated holding devices, chuck, mandrel, collet clamping circuits

- 4.3.2 Describe pneumatic safety circuits for protection against pressure drop – overloads – interlock for machine protection, emergency reversal
- 4.3.3 Explain with sketches of material handling circuits – both semi-automatic and automatic

UNIT – V

5.1.0 Understand the working of Hydro pneumatic system

- 5.1.1 Compare hydraulic, pneumatic and hydro pneumatic systems
- 5.1.2 State the advantage and application system of air and Oil
- 5.1.3 Explain the principle of working of air controlled valves and oil controlled valves
- 5.1.4 Sketch the arrangements for the control of hydraulic circuits by air
- 5.1.5 Explain the use air that acts as cushion in hydraulic system
- 5.1.6 Explain the principle of working of various instruments used for hydro pneumatic instruments

5.2.0 Identify the basic electrical devices used in the control of fluid power

- 5.2.1 Understand the electro-hydraulic pneumatic circuits
- 5.2.2 Mention the circuit for reciprocation of cylinder using pressure switch, Single limit switch

5.3.0 Introduction to Micro-electronic devices

- 5.3.1 Understand use of micro-electronic devices viz, PLC, Microprocessor and microcontroller in fluid power circuits

CONTENT DETAILS

UNIT – I

Introduction

Importance of Hydraulics – Board details of Hydraulic Machines, devices and systems

Properties of Fluids

Density – specific weight – specific volume – specific gravity – problems – viscosity – kinematics viscosity – Newton’s law of viscosity – types of fluids – simple problems – compressibility – surface tension – capillarity – problems

Fluid pressure and its measurement

Fluid pressure at a point – pressure head – problems – Pascal’s law – absolute, gauge, atmospheric and vacuum pressures – simple problems – measurement of fluid pressure – Piezometer tube – simple manometer – differential manometer – inverted differential manometer – Bourdon’s tube pressure gauge – problems – total pressure – total pressure on immersed surface – horizontal – vertical – inclined – problems

Buoyancy and Floatation

Buoyancy – Centre of Buoyancy – Types equilibrium of floating bodies, Metacentre and metacentric height

UNIT – II

Kinematics and Dynamics of fluid flow

Introduction – types of fluid flow – steady and unsteady flow – uniform and non-uniform flow – laminar and turbulent flow – compressible and incompressible flow – rotational and ir-rotational flow – one, two and three dimensional flow – rate of flow or discharge – equation of continuity of a liquid flow – simple problems – energy of a liquid in motion – potential energy – kinetic energy – pressure energy – total energy – total head of liquid in motion – Euler’s equation of motion – Bernoulli’s equation from Euler’s equation – assumptions – simple problems – practical applications of Bernoulli’s equation – venturimeter – Orifice meter – pitot tube – simple problems

Flow through Orifices, Notches, Pipes and Nozzles

Orifices – types of orifices – Vena contracta – coefficient of contraction – coefficient of velocity coefficient of discharge – problems

Notches – types of notches – Rectangular notches – triangular notch – trapezoidal notch – discharge over notches – simple problems

Simple pipes – loss of head in pipes – major energy losses – minor energy losses – loss of energy due to friction – Darcy’s formulae for loss of head in pipes – Chezy’s formula for loss of head in pipes – simple problems – loss of head due to sudden enlargement – loss of head due to sudden contraction – problems transmission of power through pipes – problems – water hammer

UNIT – III

Fluid Power

Introduction – Basic law – Applications of fluid power – types fluids used in industrial application – properties of fluids

Hydraulic system

Basic elements of hydraulic system – Oil reservoir pump unit – Principles of working of Positive displacement pump – Classifications – Gear pumps, Screw Pump, Vane pumps, Lobe pump, piston pumps, radial, bend axis type – method of coupling motor and pump by direct, flexible and pulley

Hydraulic actuators – Classifications – Rotary – Semi-rotary – Linear motion type – Hydraulic motors – Hydraulic cylinders – types - single acting, double acting, telescoping

Hydraulic control elements and components

Control valves – Functions – classifications – ratings – Describe the working of pressure control valves viz, relief valves - pilot operated relief valve – poppet valve – sequence valve

Direction control valves – types – sliding spool type – rotary spool type – check valves – 1 way, 2 way, 3 way directional control valves, pilot operated check valve, solenoid control valve

Flow control valves – types – gate, globe, pressure compensated butterfly valves, non return valve, application circuits of control valves

Seals – packings – materials for seals and packings – purpose of sealing

Filters – types – necessity of filtration of fluids – intensifier – motors and accumulators – purpose of accumulators viz, shock suppressions, fluid makeup, leakage compensation, emergency power and holding – types of accumulators – weight loaded, spring loaded, gas loaded

Hydraulic Circuits

Describe with diagram of deceleration circuit – intensifier circuit – regenerative circuit – synchronizing circuit used for lifting forklift – automatic cylinder reciprocating circuit – hydraulic circuit for robotic arm

UNIT – IV

Pneumatic System

Comparison of pneumatic system with hydraulic system – identification of standard pneumatic symbols – basic pneumatic system – air filter – pressure regulator – lubricator – mufflers

Pneumatic control elements and components

Pneumatic control valves – construction and operation of manually operated 2 way, 3 way, 4way directional control valves - pilot operated and solenoid valves – construction and operation of manually and cam operated flow control valves

Air cylinders – types - light, medium, heavy, tandem, duplex, double ended types

Functions of different parts of cylinder such as tube, cover, packing glands, cushion assembly, piston and piston seal – installation, maintenance and applications of air cylinders

Pneumatic circuits

Basic pneumatic circuits – principle of working of power operated holding devices – power operated chuck, mandrel, collet and clamping circuits – pneumatic safety circuit for protection against pressure drop, overloads, interlocks for machine protection – emergency reversal , material handling circuit

UNIT – V

Hydro Pneumatic System

Comparison of hydraulic, pneumatic and hydro-pneumatic system – advantages and application of combinational system of air and oil – principle of working of air controlled hydraulic valves – air controlled multiple hydraulic circuits – use of air as a cushion for hydraulic system – hydro-pneumatic measurements viz, mechanical flow meters, electro-magnetic flow meters and ultra sonic flow meters and air gauges

Electrical control of fluid power

Control devices – switches – types – push button switch, pressure switches, limit switches, temperature switches, solenoids, relays, timers

Electro hydraulic switches – Reciprocation of cylinder using pressure switch – electro hydro circuit to control the cylinder using single limit switch – Electro pneumatic circuit to achieve two cylinders sequencing circuit

Micro-electronic control of fluid power

Introduction to Programmable Logic Controller (PLC) – Microprocessor and Microcontroller - PLC used in fluid power application – micro controller used in fluid power applications

REFERENCE BOOKS

1. Hydraulics and Fluid mechanics – R.S.Khurmi (S.Chand & Co.)
2. Hydraulics - R.K. Rajput (S.Chand & Co.)
3. Engineering Fluid Mechanics – K. L Kumar (S.Chand & Co.)
4. Hydraulics and Fluid mechanics – Dr. Jagadish Lal (Dhanpathrai)
5. Support material in pneumatics - TTTI, Chennai
6. Basic applied fluid power - John Oster
7. Design pneumatic control circuits efficient technique for practical applications - Bruce . E . Macord
8. Hydraulic Pneumatic Control - Shanmuga Sundaram (S.Chand & Co.)
9. Hydraulics and Pneumatic Controls - R. Srinivasan, (Vijay Nicol, Chennai)
10. Pneumatic Systems: Principles and Maintenance - Majumdar, (Tata Mc Graw Hill)
11. Microprocessor and Microcontroller - Theagarajan, (SCITECH)
12. Concept of feature of Microcontroller - Raj Kamal (S.Chand & Co.)
13. Microcontroller - Ajay V. Deshmukh (Tata Mc Graw Hill)

SUBJECT TITLE : ELECTRICAL AND ELECTRONICS ENGINEERING
SUBJECT CODE : AU303 /TD 303 /ME 303
PERIODS/WEEK : 5
PERIODS/SEMESTER : 80

TIME SCHEDULE

<u>UNIT</u>	<u>TOPICS</u>	<u>PERIODS</u>
I	Lead Acid Cell D.C Generator D.C Motor	15
	Test 1	1
II	A C Circuits 3 Phase Circuits Transformer	15
III	A C Generator and Motor Measuring Instruments Utilization	15
	Test 2	1
IV	Electronics Components	16
V	Electronics Circuits ,Logic circuit & Instruments	16
	Test 3	1
	Total	80

OBJECTIVES

- 1.1.0 Understand the working and construction of lead acid cell**
 - 1.1.1 Describe the working of lead acid cell
 - 1.1.2 Explain the constructional details of lead acid cell
 - 1.1.3 State the method of charging and discharging of lead acid cell
 - 1.1.4 Define the efficiency and rating of batteries.
 - 1.1.5 Identify the various aspects for maintenance of lead acid cell
- 1.2.0 Understand the working and construction of D. C. Generator**
 - 1.2.1 Describe the principle of working of D C Generators
 - 1.2.2 Explain the constructional details of a D C generator
Classify the D.C. generators based on field connection
- 1.3.0 Understand the working and construction of motors**
 - 1.3.1 Describe the principle of working of D C Generators
 - 1.3.2 Compare the working principle of D.C. generator and Motor.
 - 1.3.3 Classify the D.C. motors based on field connection.
 - 1.3.4 State the necessity for a starter
 - 1.3.5 Draw the 3 phase starter details and connection for D.C. Motor
 - 1.3.6 List the various applications of D.C. motor
- 2.1.0 Understand the principle of a c circuits, single phase, three phase and transformer.**
 - 2.1.1 State the working of a simple loop generator and comprehend the feature of alternating current.
 - 2.1.2 Define cycle, , frequency, instantaneous , maximum value and effective values associated with alternating sinusoidal quantity.
 - 2.1.3 Define phase and phase difference
 - 2.1.4 Express the given alternating sinusoidal quantity in vector form
 - 2.1.5 Define power and power factor.

- 2.1.6 Compute unknown quantity in a given series, parallel or series – parallel A C circuits containing RLC combination.
- 2.1.7 State the procedure of the production of 3 phase timing
- 2.1.8 Define phase sequence and phase and phase difference in 3 phase system
- 2.1.9 State the two method of 3 phase connection star/delta and explain with the circuits.
- 2.1.10 Compute the value of line voltage and phase voltage, line current and phase current in star/delta
- 2.1.11 Derive the equation of power in a 3 phase system
- 2.1.12 State the working principle of a single phase transformer
- 2.1.13 Derive the e.m.f equation
- 2.1.14 Explain the term transformer ration and derive the equation for the same
- 2.1.15 Classify the transformers based on a) function (Power) , Distribution and installation b) construction (core, shell) C) cooling method
- 2.1.16 Describe the basic principle of working of 3 phase transformer
- 2.1.17 Draw the different types of transformer connection in primary and secondary.
- 2.1.18 Describe the different types of methods employed for cooling transformers.
- 2.1.19 State the working principle of Auto transformer
- 2.1.20 Identify the advantages of Auto transformer over 2 winding transformer.
- 2.1.21 Differentiate the constructional details of welding transformer with power transformer
- 2.1.22 Identify the two types of instrument transformer CT and PT
- 2.1.23 Specify the uses of chokes.

3.1.0 Understand the working of ac generator, motor and measuring instruments.

- 3.1.1 State the working principle of A C generator
- 3.1.2 Identify the Alternator based on construction
- 3.1.3 State the two method of rotor construction
- 3.1.4 State the working principle of a 3 phase induction motor and explain the rotating magnetic field produced by 3 phase supply
- 3.1.5 Classify the Induction motor based on rotor construction
- 3.1.6 State the constructional details of squirrel cage and slip ring.
- 3.1.7 Draw star/delta , on line and auto transformer starter used induction motor
- 3.1.8 List the various application of induction motors
- 3.1.9 State the principle of voltage developed in single phase induction motor
- 3.1.10 Classify the single phase induction motor
- 3.1.11 State the working principle of capacitor start induction motor
- 3.1.12 Write the constructional details of capacitor start SP motor
- 3.1.13 Classify instruments based on function, construction and method of measurements
- 3.1.14 State the mechanism of production of deflecting , controlling and damping torques , their needs and relations in MC and MJ instruments
- 3.1.15 Draw the sketches and explain the constructional details of MI and MC instruments.
- 3.1.16 Describe the working principle of dynamometer types wattmeter with sketch
- 3.1.17 Describe the working of a Megger with sketch
- 3.1.18 Explain the sketch the working of a multimeter
- 3.1.19 Describe the method for measuring power in 3 phase circuit system using two Watt meter
- 3.1.20 State the principle of heat production from electric power
- 3.1.21 Differentiate between induction heating and dielectric heating
- 3.1.22 Write down the various industrial application of electric heating
- 3.1.23 List the functions of induction furnaces and Arc furnaces
- 3.1.24 Describe the working principle of a fluorescent lamp with a neat sketch
- 3.1.25 Draw the connection of sodium vapor lamp and mercury vapor lamp
- 3.1.26 Practice the procedure to be adopted in giving treatment for electric shock and burns on human body

4.1 Appreciate the use of electronic components and devices

4.1.0 Passive components

- 4.1.1 Identify the various electronic components such as resistors, capacitors and inductors
- 4.1.2 List the BIS symbolic representation of various components
- 4.1.3 State the constructional details of carbon and wire wound resistors
- 4.1.4 Identify the various resistors using colour coding
- 4.1.5 State the various types of capacitors.
- 4.1.6 Identify the needs of af and rf chokes (only brief idea)
- 4.1.7 Write in brief about i/p and o/p transformers, IF transformer
- 4.1.8 Give a brief description of PCB, plug, clip etc.

4.2.0 Active components

- 4.2.1 State the mechanism of thermionic, photo, field and secondary emission (only brief idea)
- 4.2.2 Classify the materials in conductor, semi conductor
- 4.2.3 Give a brief description of p & n type semi conductor
- 4.2.4 Describe with the sketch the principle of transistor - different configurations.
- 4.2.5 Identify the different characteristics of CE configuration
- 4.2.6 Describe the various types of transistors – FET , UJT, DIAC , TRIAC (only brief idea) regarding the constructional details, principle of working & applications with the circuits.
- 4.2.7 Explain the working principle of SCR
- 4.2.8 Write down the various industrial applications of SCR

4.3.0 Diode circuits

- 4.3.1 Describe the principle or working of a diode on a rectifier
- 4.3.2 Draw neat circuit of a diagram of half wave and full wave rectifier
- 4.3.3 Define ripple factor
- 4.3.4 Appreciate the use of filter in rectifier circuit

5.1.0 Understand the various electronic circuits ,logic circuit and measuring instruments

- 5.1.1 Classify the different type of amplifiers
- 5.1.2 Define the term related to amplifiers – gain of amplifiers, db.
- 5.1.3 Give a brief description of RC coupled amplifier, feed back amplifier power amplifier
- 5.1.4 State clearly the principle of oscillation. And condition of oscillation

5.2.0 Logic circuit describe

- 5.2.1 State and explain the need for best suited number system for digital operation
- 5.2.2 Explain the features of binary,octal,decimel and hexa decimel system
- 5.2.3 Explain the logic theory and application
- 5.2.4 Give circuit diagram and explain functions of AND, OR,NOT operation and give the logic symbols of each
- 5.2.5 State an idea of switching circuits and cables
- 5.2.6 State the needs for simplifying Boolean Expression
- 5.2.7 Give the basic principle of Kamangh map (k-map)
- 5.2.8 Explain De-morgans theorem
- 5.2.9 Give the symbols of NAND, NOR operation and discuss the advantages of using Universal Gate
- 5.3.0 Electronic measuring instruments
- 5.3.1 Appreciate the functions of CRO with neat block diagram
- 5.3.2 List various uses of CRO
- 5.3.3 Appreciate the function of digital multimeter
- 5.3.4 List the various specification of multimeter

CONTENT OUTLINE

UNIT – 1

Lead Acid Cell, Dc Generators and Motors

Construction and materials used – charging – discharging - efficiency and rating – care and maintenance – constructional details and principle of working of D.C. generator types – based on field connections – difference between generator and motor – principle of working of D.C. motors – need of starter for D.C. motor – applications of d. C. motors. Stepper motor - Principles of working, construction and classification, applications of stepper motor

UNIT – 2

A.C. Circuits, Three Phase Circuit And Transformers

Alternating quantities – production of alternating voltage – mathematical representation – explanation of cycle, period, frequency RMS value, average value, maximum value, form factor – vector representation of alternating quantities, phase difference – inductance and capacitance impedance current calculations in general RLC series circuit. Calculations of power and power factor inductance – capacitance. A.C. three resistance – 3 phase circuits, star and delta connections. Voltage and current relations, expressions for power – transformers. Principles of operations of a single-phase transformer. Used transformations ratio- methods of cooling transformer - 3-phase transformer – autotransformer – principal, uses and advantage – welding transformer – use of choke. Instrumental transformer.

UNIT – 3

A.C. Generators And Motors, Measuring Instruments & Utilisation.

Construction and working of A.C. generators, classification. Salient pole and turbo types principles of working of phase induction motor. Types of induction motor. Applications method of starting of squirrel cage and slip ring induction motors. Principles of working of single phase induction motor – capacitor start type – uses. Measuring Instruments – Moving coil, moving iron – voltmeter and ammeter - dynamometer type wattmeter- megger, multimeter, Induction and dielectric heating – principle, advantages and applications – induction furnaces arc furnaces – direct and indirect types. Fluorescent, discharge lamp, mercury vapour lamp and sodium vapour lamp. Effect of shock and burns – procedure to be followed in case of electric shock

UNIT – 4

Introduction to electronics components

Introduction to electronics –passive components- Resistor-types, capacitor-types, colour coding, inductors-type, symbolic representation of passive components. Semi conductors-Intrinsic and extrinsic, P-type, N-type-formation and working of PN junction. Active components- Diodes, BJT, FET, SCR, Diac, Triac, UJT –principle of working-BJT configurations, Rectifiers – half wave and Full Wave C & L filters, ripple factor

UNIT – 5

Electronic circuits, Logic circuits, instruments

Amplifier –Gain- Band width, Oscillator- Condition of Oscillator
Fundamentals of digital Electronics- Logic gates- AND, OR, NOT, X-OR- Boolean Algebra – Simplification of expressions –De Morgan’s theorem K-map –Universal gates –NAND, NOR
Electronic instruments- CRO –Block Diagram, CRT, Digital Multimeter, Parameter Specification.

REFERENCE

- | | |
|---|-------------------------------|
| 1. Electronic devices | – Allan Mottershed |
| 2. Electronic devices and circuits | – Mittal |
| 3. Electrical Engineering | - B .J. Theraja. |
| 4. Basic Electronics and Linear IC’s | -Kulkshethra, Bhargava, Gupta |
| 5. Fundamentals of Digital Circuits | -Arun Kumar |
| 6. Digital Principle and Applications | -Malvino |
| 7. Fundamentals of Electrical and Electronics | - P.Thyagarajan |

SUBJECT TITLE : MACHINE DRAWING
SUBJECT CODE : AU 304 / ME 304 / WT 304
PERIODS/WEEK : 4
PERIODS/SEMESTER : 64

TIME SCHEDULE

<u>UNIT</u>	<u>TOPIC</u>	<u>PERIODS</u>
I	Fastening Devices	
	Thread fastenings	6
	Rivet & Riveted joints	6
	Test	1
II	Assembly and detailed drawings	
	Cotter joints	6
	Couplings	9
	Test	1
III	Assembly and Detailed drawings of Bearings	9
	Assembly and Drawings of machine parts	18
IV	Piping Layout	5
		Test
Total		64

CONTENT DETAILS

UNIT – I: FASTENING DEVICES

Basic Fastening Devices

Temporary and permanent fastenings – areas of applications – Bolts and nuts – different types of bolted joints for different applications – purpose of locking nuts – types & lock nuts – Types, proportion and specifications of rivets, - different types of riveted joints – single riveted lap joint, double riveted lap joint (Chain and zigzag), single riveted butt joint (Single strap and double strap)

Calculation of pitch and arrangements of rivets in row. Exercises in drawing bolted connection using standard proportion. Exercises in drawing riveted joints standard proportions.

Exercises in the selection of appropriate fastening devices to meet the given working conditions

UNIT – II: ASSEMBLY AND DETAIL DRAWINGS

Need and functions of assembly and detailed drawings – selection of sheet sizes – preparation of title block – bill of materials and parts list –

Steps in preparing assembly and detailed drawings, practice in tracing and inking

Exercises in assembly and detailed drawings of sleeve and cotter joint, socket and spigot joint, knuckle joint, gib and cotter joints

Exercises in assembly and detailed drawings of coupling such as Flanged coupling – protected pin type flexible – half lap muff coupling

UNIT – III:

ASSEMBLY AND DETAILED DRAWINGS OF BEARINGS

Assembly and detailed drawings

Plummer block, Bushed bearing, Foot step bearing

ASSEMBLY AND DETAILED DRAWINGS OF MACHINE PARTS

Slip bush, Turn buckle, Screw jack, Stuffing box, Non return valve, I.C. Engine connecting rod

UNIT –IV: PIPING LAYOUT

Classification of pipes and tubes components of a piping layout like pipe joints, valves, elbows etc., Exercises in schematic drawing with a – Single line diagram of layout using standard conventions – double line.

Note – Guidance for question paper setting.

Unit I – 15 marks

Unit II – 15 marks

Unit III – 35 marks

Unit IV – 10 marks

REFERENCE

1. Machine Drawing by P.I. Varghese & K.C. John
2. Machine Drawing by N.D. Bhatt
3. Machine Drawing by Gill
4. A test book of Machine Drawing by V. Lakshmi Narayan.
5. Machine Drawing ND Junnarkar (Pub. Pearson Education)

SUBJECT TITLE : HYDRAULICS LABORATORY
SUBJECT CODE : AU 305
PERIODS/WEEK : 3
PERIODS/YEAR : 48

TIME SCHEDULE

<u>UNIT</u>	<u>TOPIC</u>	<u>PERIODS</u>
1.	Bernoulli's theorem apparatus	3
2.	Orifices & Notches	12
3.	Venturimeter	3
4.	Pipe friction apparatus	6
5.	Pelton turbine	3
6.	Centrifugal pump & Reciprocating pump	6
8.	Pipe fittings, joints and valves	12
	Test	3
	Total	48

GENERAL OBJECTIVES

- 1.0 Use the Bernoulli's theorem apparatus
- 2.0 Use the orifices and Notches
- 3.0 Use the Venturimeter
- 4.0 Use the pipe friction apparatus
- 5.0 Use the Pelton turbine, Francis turbine and Kaplan turbine
- 6.0 Use centrifugal pump and reciprocating pump
- 7.0 Use Hydraulic Ram
- 8.0 Locate Joints, pipe fittings and valves
- 9.0 Locate the hydraulic and pneumatic circuits in the available machine tools

SPECIFIC OBJECTIVES

- 1.0 Use Bernoulli's theorem apparatus**
 - 1.1 Explain Bernoulli's theorem
 - 1.2 Verify Bernoulli's theorem using the apparatus
 - 1.3 Draw the graph-length of pipe Vs total energy
 - 1.4 Interpret the curve
- 2.0 Use the orifices and Notches**
 - 2.1 Differentiate orifices and Notches and its functions
 - 2.2 Determine the coefficient of discharge of each
 - 2.3 Plot the graph – discharge Vs coefficient of discharge
 - 2.4 Calibrate a given notch
- 3.0 Use the Venturimeter**
 - 3.1 State the function and application of a Venturimeter
 - 3.2 Determine the coefficient of discharge
 - 3.3 Calibrate a given Venturimeter
- 4.0 Use the pipe friction apparatus**
 - 4.1 Explain the term coefficient of friction in pipes
 - 4.2 State the effort of friction in pipes
 - 4.3 Determine the coefficient of friction of pipes of different diameters
 - 4.4 Plot total energy line and hydraulics gradient line

- 5.0 Use Pelton turbine, Francis turbine and Kaplan turbine**
 - 5.1 Differentiate the Pelton turbine, Francis turbine and Kaplan turbine
 - 5.2 State the conditions under which each type is preferred
 - 5.3 Plot the characteristics curves
 - 5.4 Interpret the above curves
- 6.0 Use centrifugal pump and reciprocating pump**
 - 6.1 Differentiate centrifugal pump and reciprocating pump
 - 6.2 State the function principle of working of each type
 - 6.3 State the application of each type
 - 6.4 Conduct experiment on each type
 - 6.5 Plot the characteristic curves
- 7.0 Locate Pipe fittings, joints and valves**
 - 7.1 Identify the various types of pipe fittings joints and valves
 - 7.2 Plumbing practice
- 8.0 Locate the hydraulic and pneumatic circuits in the available machine tools**
 - 8.1 Draw the hydraulic and pneumatic circuit in the available machine tools
 - 8.2 Identify the various parts of the circuit

CONTENT OUTLINE

1. Verification of Bernoulli's theorem using the apparatus
2. Tests on orifice and notches
 - (i) Determination of the coefficient of discharge of different orifices and notches
 - (ii) Calibration of notches and orifices
3. Test on Venturimeter
 - (i) Determination of coefficient of discharge of the Venturimeter
4. Test on pipe friction apparatus
 - (i) Determination of the friction factor using Darcy's formulae of pipes of varying cross section
 - (ii) Plot TEL and HEL
5. Tests on Pelton turbine, Francis turbine and Kaplan turbine
 - (i) Operations of the turbines
 - (ii) Measurement of brake power and overall efficiency
 - (iii) Plotting various characteristic curves
6. Test on centrifugal pump and reciprocating pump- operation of the pumps – plotting various characteristics curves

SUBJECT TITLE : **PETROL ENGINE SERVICING LABORATORY**
SUBJECT CODE : **AU 306**
PERIODS/WEEK : **6**
PERIODS/SEMESTER : **96**

CONTENT DETAILS

1. Safety precautions to be followed in an Automobile workshop
2. Study of tools, gauges and equipment
3. Cleaning, greasing or oiling of equipment
4. Engine dismantling and assembling two stroke and four stroke petrol engines
5. Inspection of various engine components and methods of reconditioning – checking of cylinder head for warping, and cracking – valve lapping, refacing and grinding – removal and refitting of valve guides – checking of cylinder for ovality and taper by using bore gauge – cylinder reboring and honing — use of connecting rod aligner and straightner – use of dial gauge for checking crank shaft and cam shaft – axial play adjustment in cam shaft and crank shaft . Piston reconditioning
6. Dismantling, cleaning and testing of A.C. mechanical pump
7. Dismantling, cleaning and tuning of carburetor – servicing of air cleaner
8. Engine oil and oil filter element changing
9. Flushing of lubricating and cooling systems/oil pump inspection,
10. Dismantling, cleaning and assembling of water pump
11. Checking of radiator for leakage – soldering practice
12. Checking and adjustments of fan belt tension.
13. Trouble shooting in petrol engines-setting the ignition timing and starting the engine.

SUBJECT TITLE : MANUFACTURING PROCESS PRACTICAL - II
SUBJECT CODE : AU 307
PERIODS/WEEK : 3
PERIODS/SEMESTER : 48

TIME SCHEDULE

<u>UNIT</u>	<u>TOPIC</u>	<u>PERIODS</u>
1.	Fitting Practice	15
2.	Welding Practice	15
3.	Machine shop practice	15
	Test	3
	Total	48

DETAILS OF PRACTICAL WORK

1. Fitting Practice

Different types of male and female joints.

2. Welding Practice

Arc welding practice , Lap joint, Butt joint, Tee joint.

3. Machine shop practice

Lathe Work

Turning practice – plain and step turning, Taper turning practice – offset method and attachment method.

Shaper Practice

Grooving practice

Information Search Analysis and Presentation Skills Development

Periods/Week : 3
Periods/Semester : 48

Introduction

The average Engineer walking out of education institution is surprised by the amount of non-technical work he or she faces in the real world (by the amount of personal contact, the number of phone calls, meetings, reports and presentation etc). Further many cannot find appropriate jobs, because of the lack of these skills. The problem aggravates in the case of diploma pass outs who are supposed to have interactions with different cadres in an industrial environment.

The time allotted for ISAP skills development are to be utilized to provide a slice of practical training in a form that may be used in a class room setting. This is not to be taught in a conventional manner. Here the emphasis will shift from teacher oriented methods to students oriented methods. While the information – skills acquired by all students will be same, the actual methods & techniques used by each student will vary according to his or her initiative, enthusiasm, effort taken etc.

These hours are to be taken as a supplement to the theory classes. Students will acquire ISAP skills based on the fundamental knowledge he/she has acquired from the theory sessions.

Objectives

Educational researchers have found that 17 year olds, in a single academic year, learn about 200 to 300 new words, in a university environment. However, during the same period they acquire around 4000 words in their informal home and play environment. That is learning is higher in an informal environment than in an academic one designed specifically for that purpose. The primary objective here is to simulate the informal learning environment.

Student is provided an ideal opportunity to acquire skills in learning to learn which is essential for the professional growth. This will inculcate information skills in the students. These skills will be a life long asset to him or her in fact they grow with age.

Oral and written communication skills are of at most importance to any engineer for a positive professional growth. Emphasis is given for this aspect also.

Activities

A. Part One.

Write articles on various technical areas and basic research papers. Students can identify simple projects individually or groups of not more than 4 any technical area. Emphasis here is on the acquisition of ISAP skills.

Source of Information

- a. People
- b. Print media – Magazines, News papers, Journals, Vendors catalogues etc.
- c. Electronic information – CD ROM, Usage of internet – User news groups, WWW.

B. Part Two

Transparency based Presentation

1. Preparation
 - 1.1 Audience Analysis.
 - 1.2 Information Gathering.
 - 1.3 Transparency design using Power Point/Presentation software.
 - 1.4 Production of transparency for OHP.
2. Delivery

Sample Projects

1. Prepare and deliver transparency based presentations on the topics,
 - a. Technicians are not properly appreciated in the society.
 - b. Engineers do not know about non technical topics.
 - c. Lay people do not know enough about technical topics.
 - d. India's products are not competitive in international markets as its quality is not good.
 - e. India's software professionals are paid too much.
2. Prepare transparency based presentation for the opposite side of the issue you choose in project 1.
3. Prepare and deliver a brief autobiographical presentation.
4. Prepare and deliver a sales promotional presentation (Example – Washing machine, Computer , Air conditioner, Microwave oven or other items related to your branch of study)
5. Prepare and deliver a brief sales promotional presentation on a service (Example- Insurance Policy, Credit cards etc)
6. Prepare and deliver a technical presentation before lay audience (Example – Use of computers to common man, energy saving measures in a domestic environment or other topics related to specific branches of study)

C. Part Three Communication Skills

Written Communication

Preparation of

- a. Reports
 - Formal reports
 - Progress reports
 - Feasibility Reports
 - Laboratory reports.
- b. Technical Proposals.
- c. Email.
- d. User manuals
- e. Job Hunting material
 - Resumes
 - Letters for job hunting
- f. Business letters
- g. Memo, Notices, Agenda and minutes

Oral Communication

Oral communication activities like,

- a. Dyadic communication (Interaction between two persons, example Telephone conversation)
- b. Meetings.
- c. Job interview.
- d. Group Discussions.
- e. Debates.
- f. Case studies.

EVALUATION

There is no separate evaluation for ISAP skills. But the teachers will consider this for the award of internal assessment marks related to the theory subjects in that semester. The performance of the student will be taken equivalent to an Assignment and an Examination while awarding the internal assessment marks.

SUBJECT OF STUDY AND SCHEME OF EVALUATION

Semester IV

BRANCH: AUTOMOBILE ENGINEERING

Code	Subject	Periods Per Week				Evaluation (Marks)			
		Theory	Tutorial	Practical	Total	Theory	Practical	Internal	Total
AU 401	Material Science & Strength of Materials	5	1		6	75		25	100
AU 402	Auto Electrical & Electronic Equipments	5			5	75		25	100
AU 403	Production Process of Automobile Components	6			6	75		25	100
AU 404	Auto Engineering Drawing			3	3	75		25	100
AU 405	Auto Electrical Lab			3	3		75	25	100
AU 406	Diesel Engine Service Lab			6	6		75	25	100
AU 407	Manufacturing process Practical-III			3	3		75	25	100
	ISAP skills Development			3	3				
	TOTAL	16	1	18	35	300	225	175	700

SUBJECT TITLE : MATERIAL SCIENCE AND STRENGTH OF MATERIALS
SUBJECT CODE : AU 401
PERIODS/WEEK : 6
PERIODS/SEMESTER : 96

TIME SCHEDULE

<u>UNIT</u>	<u>TOPICS</u>	<u>PERIODS</u>
1.	General Properties of Materials Heat Treatment of Metals	6 12
2.	Modern Automobile Engineering materials Alloy Steels Non Ferrous Metals and Alloys Non Metallic Materials	6 6 6
	Test-1	2
3.	Friction Geometric Properties of Sections	8 10
4.	Direct Stresses Shear and Bearing Stresses Riveted and Welded Joints Pressure Vessels	4 4 8 4
	Test-2	2
5.	Shear Force and Bending Moment Theory of simple bending Torsion of Shafts	10 3 3
	Test-3	2
	Total	96

OBJECTIVES

Upon completion of study of this subject the student should be able to: -

1.1.0 Appreciate the general properties of materials

- 1.1.1 State various mechanical properties
- 1.1.2 Describe the plastic deformation of metals with sketches

1.2.0 Understand the heat treatment of materials and its needs

- 1.2.1 Draw the cooling curve for pure iron
- 1.2.2 Study of iron-carbon phase diagram
- 1.2.3 Identification of eutectic and eutectoid zones
- 1.2.4 Determination of composition from the diagram
- 1.2.5 Explain the need for heat treatment
- 1.2.6 different processes, their applications

2.1.0. Understand the modern automobile engineering materials

- 2.1.1 Recognize alloy steels
- 2.1.2 State the need for alloying steel with other elements
- 2.1.3 Discuss the classification of different alloy steels with ISI specifications
- 2.1.4 Discuss the classification of different stainless steels
- 2.1.5 Recognize the various non-ferrous metals and alloys
- 2.1.6 Indicate the commercial specifications of various non-ferrous alloys.
- 2.1.7 Recognize the various non-ferrous metals and alloy

2.2.0 Know the various non-metallic materials

- 2.2.1 Identify plastics, fiber glass, fiber reinforced plastics, composites
- 2.2.2 Their classification
- 2.2.3 Properties and uses
- 2.2.4 Identify the applications of plastics in automobile industry

3.1.0 Understand the concept of friction

- 3.1.1 State the laws of friction
- 3.1.2 Explain limiting friction, normal reaction
- 3.1.3 Explain coefficient of friction, angle of friction and cone of friction
- 3.1.4 Understand sliding friction, rolling friction
- 3.1.5 Analyze the equilibrium of a body on an inclined plane
- 3.1.6 Solve simple problems in the laws of friction

3.2.0 Understand the geometrical properties of sections

- 3.2.1 Define centroid, centre of gravity, moment of inertia and radius of gyration
- 3.2.2 Locate the centroid of different geometrical sections, and their combinations
- 3.2.3 Derive the expression for the moment of inertia of geometrical section
- 3.2.4 Derive parallel axis and perpendicular axis theorem
- 3.2.5 Solve simple problems

4.1.0 Recognize the importance of direct stress

- 4.1.1 Define different loads with figures
- 4.1.2 Describe the behavior of ductile material under tension
- 4.1.3 Explain the salient points of a stress- strain curve
- 4.1.4 Differentiate ultimate stress from working stress
- 4.1.5 Discuss the concept of factor of safety and need for using it

4.2.0 Understand shear and bearing stresses

- 4.2.1 Explain the terms shear stress and shear strain and modulus of rigidity
- 4.2.2 Explain bearing stress

4.3.0 Justify riveted joints

- 4.3.1 Describe the types of riveted joints
- 4.3.2 Discuss methods failure of rivet and plate
- 4.3.4 Calculate the different strengths of rivet and plate
- 4.3.5 Determine the efficiency of riveted joint, minimum pitch required
- 4.3.6 Understand caulking and fullering

4.4.0 Justify welded joints

- 4.4.1 Describe, different types of welded joints
- 4.4.2 Know the Recommended working stress value for a welded joint
- 4.4.3 Understand the design of fillet weld
- 4.4.4 Compare riveted and welded joints

4.5.0 Understand stresses in Pressure vessels

- 4.5.1 Differentiate thin and thick cylinders
- 4.5.2 Discuss stress in thin cylinders and calculate the thickness

5.1.0 Compute shear force and bending moment in beams

- 5.1.1 Discuss the various types of loads and supports
- 5.1.2 Explain the effect of S.F and B.M at different sections in beam
- 5.1.3 Understand the procedure of construction of SF and BM diagrams

5.2.0 Explain the theory of simple bending

- 5.2.1 Derive the bending equation and state the assumption used
- 5.2.2 Explain the meaning of the terms, Neutral axis, and moment of resistance
- 5.2.3 Solve simple problems

5.3.0 Explain Torsion of shafts,

- 5.3.1 Derive the torsion equation and state the assumptions used
- 5.3.2 Solve simple problems

CONTENT DETAILS

UNIT – I: General Properties of Materials

Introduction

Mechanical properties, tensile strength, compressive strength, ductility, hardness, impact strength, fatigue, creep resistance, malleability, toughness etc. Mechanism of grain formation, effect of rate of cooling on grain size, effect of grain size on mechanical properties, factors promoting fine grain.

Mechanism of plastic deformation of metals, slip and twinning – strain hardening or work hardening. Heat treatment of metals – cooling curve for pure iron – study of iron – carbon phase diagram, identification of eutectic and eutectoid zones, and determination of composition from diagram. Need for heat treatment, description of different process and their applications, annealing, tempering, hardening, case hardening, normalizing and nitriding.

UNIT – II: Modern automobile engineering materials

Alloy steels - need for alloying, alloying elements ,effect of alloying on properties. Uses of alloy steels in automobiles.

Stain less steel – different types, their composition, specific properties and uses.

Non-ferrous metals and alloys – commercial specification and uses of alloys of the following non-ferrous metals – copper, aluminum, tin, lead, zinc and magnesium.

Non-metallic materials – composition and characteristics of plastics, fiberglass, and fiber reinforced plastics, synthetic polymers, composites- Metal matrix composites, Carbon- Carbon composites.

Applications in automobile industry

UNIT III Basic Engineering Mechanics

Friction. Introduction-Types of friction-static friction, dynamic friction, limiting friction, angle of friction, coefficient of friction, cone of friction, sliding friction, rolling friction. Laws of friction. Equilibrium of a body lying on a horizontal plane, inclined plane (no proof), force acting horizontally, at an angle. Simple problems.

Geometric Properties of sections- centroids of plane figures,-method of finding centre of gravity of simple sections and combinations. Moment of inertia of plane figures, radius of gyration about a given axis. Moment of inertia of rectangle, square, triangle, circle, semi circle and combinations about horizontal centroidal axis. Parallel axis theorem and Perpendicular axis theorem. Simple problems

UNIT – IV: Direct Stresses

Definition and explanation of tensile, compressive and shear load, stress and strain, behavior of ductile material under tension – limit of proportionality, modulus of elasticity, elastic limit, yield point, ultimate stress, percentage elongation, percentage reduction in area. Explanation of the term working stress – relation between ultimate stress and working stress – factor of safety – need for factor of safety, commonly used values of factor of safety for members under static and dynamic load. Shearing and bearing stresses – application of shearing and bearing stresses in riveted and welded joints. Riveted joints – types, strengths of a rivet, strength of a plate, efficiency of riveted joint, empirical relations for minimum pitch of riveting, caulking and fullering.

Welded joints – types, recommended working stress for a fillet weld, design of fillet weld, comparison between riveted and welded joints.

Pressure vessels– definition, stresses in thin cylinders, calculation of thickness of shell of a thin cylinder.

UNIT – V: Shear Force And Bending Moment

Different types of loads with examples. Types of supports. Effect of lateral load on a beam in equilibrium – definition of shear force and bending moment – calculation of shear force and bending moment at any section along a loaded beam, construction of shear force and bending moment diagram on cantilever and simply supported beams with point load and Uniformly distributed load load. Location of points, on the beam, having maximum shear force and bending moment.

Theory of simple bending- Bending equation, derivation, assumptions used. Explanation of the terms – neutral axis and moment of resistance.

Torsion of shafts- derivation of torsion equation, assumptions used. Simple Problems .

REFERENCES

- | | |
|---|--|
| 1. Science of metals | - Jeffries and Archer |
| 2. Function of alloying elements in steel | - E.C.Bain |
| 3. Production Technology | - R.K.Jain and S.C. Gupta |
| 4. Strength of materials | - R.K.Rajput |
| 5. Strength of materials | - R.S.Khurmi |
| 6. Materials science | - R.S.Khurmi and R.S. Sedha James |
| 7. Plastics in the automobile industry | - James Maxwell |
| 8. Materials Science | - S.K.Hajra Choudhry and
A.K.Hajra Choudhry |
| 9. A text book of production Technology | - P.C.Sharma |
| 10. Engineering materials | - R.K.Rajput |
| 11. Plastic materials | - J.A.Brydson |
| 12. A handbook of engineering plastics | - Plastic and Rubber Institute,
London. |
| 13. Material science | - SL Kakani & Amit Kakani |
| 14. Engineering Mechanics | - Shames & Rao |

SUBJECT TITLE : AUTOMOBILE ELECTRICAL AND ELECTRONIC EQUIPMENTS
SUBJECT CODE : AU 402
PERIODS/WEEK : 5
PERIODS/SEMESTER : 80

TIME SCHEDULE

<u>UNIT</u>	<u>TOPICS</u>	<u>PERIODS</u>
1.	Battery	12
2.	Generator and Alternator	4
	Charging system, charging circuits.	4
	Starter motor	4
	Motor drives	4
	Test –1	2
3.	Ignition system for multi cylinder engines 10	
	Electronic ignition	3
	Magneto ignition & C.D.I	3
4.	Lighting system	8
	Other electrical accessories	8
	Test – 2	2
5.	Sensors	6
	Actuators	2
	Electronic control of fuel in petrol and diesel engines	6
	Test –3	2
	Total	80

OBJECTIVES

Upon completion of study of this subject the student should be able to: -

1.1.0 Know the different features of Battery

- 1.1.1 List the parts of Battery and state their functions (Lead Acid)
- 1.1.2 List the parts of Battery and state their functions (Nickel alkaline)
- 1.1.3 State the changes noticed on charging and discharging
- 1.1.4 Specify the rating of Battery
- 1.1.5 Describe the effect of temperature on voltage and capacity
- 1.1.6 Describe the different charging methods
- 1.1.7 Label the different battery defects
- 1.1.8 State the various tests for Battery
- 1.1.9 Suggest the care & maintenance of Battery

2.1.0 Recognize the constructional details of dynamo

- 2.1.1 Explain the constructional details of Alternator
- 2.1.2 Suggest the care & maintenance of Dynamo & Alternator
- 2.1.3 Identify the need of charging system
- 2.1.4 Describe the working of regulators
- 2.1.5 Explain the constructional details of starter motor
- 2.1.7 Infer the characteristics of starter motor
- 2.1.8 Describe the working of starter switch

2.2.0 Recognize the necessity of motor drives

- 2.2.1 Explain the working of motor drive mechanisms

3.1.0 Understand the working of Ignition system

- 3.1.1 Discuss the type of ignition system
- 3.1.2 Explain the working of ignition system components

- 3.1.3 Defend the need of spark advance & retard mechanism
- 3.1.4 Explain the working of magneto ignition system
- 3.1.5 Explain the working of C.D. ignition system
- 3.1.6 Explain the working of electronic ignition system
- 4.1.0 Locate the lighting system & other Accessories**
 - 4.1.1 Identify reflectors, lenses and bulbs
 - 4.1.2 Identify dazzle and its avoidance
 - 4.1.3 Outline the importance of focusing
 - 4.1.4 Explain the working of Automatic dim & bright circuit
 - 4.1.5 Compile the different types of lights & bulbs
 - Describe the principle of operation of fuel pump, horn, wind screen wiper, indicator, gauges, central locking system, power window, solenoid operated valve, etc.
 - Familiarize the central locking system.
- 5.1.0 Locate the Electronic Components in Automobile Electrical system**
 - 5.1.1 Explain the working of different type of sensors
 - 5.1.2 Explain the working of different type of actuators
 - 5.1.3 List the application of sensors and actuators
 - 5.1.4 Discover the use of microprocessors in automobile
 - 5.1.5 Describe the working of electronic fuel injectors
 - 5.1.6 Describe the working of M.P.F.I system.

CONTENT DETAILS

UNIT – I: BATTERY

Introduction, Types of battery. Brief description of lead acid and alkaline cell, Constructional details of lead acid cell, nickel alkaline cell, Active materials of lead acid cell, Chemical action of lead acid cell, Rating of Battery, Capacity of Battery – ampere hour and watt hour, Efficiency of Battery – ampere hour and watt hour, Effect of discharge rate on voltage and capacity
 Effect of temperature on voltage and capacity, Battery charging, Constant voltage, Constant current
 Defects - Effect of over heating, Effect of over charging, Dislocation of active material, sulphation, Internal short circuits, Corrosion / sulphation of terminals.
 Testing of Battery - Polarity test, State of charge, Specific gravity test by hydrometer, High rate discharge test by cell tester, Cadmium test, Lamp test
 Care and maintenance of battery - Topping up of Battery & other maintenance schedule, Storage of lead acid battery (in dry & wet condition), Maintenance free battery

UNIT – II: GENERATOR & ALTERNATOR

Introduction, Constructional details of automobile dynamo – special features of automobile dynamo, Constructional details of alternator – special features of automobile alternator
 Care & maintenance of dynamo & alternator – Cooling, Lubrication, Setting of brush, Cleaning of commutators.
 Charging System - Introduction – necessity, Types of Regulators – circuit diagram, Cut out Voltage regulator, current regulator, cut out – 3stage, Electronic voltage regulator in alternators
Starter motor & its drive mechanism
 Introduction, Starting of I.C. Engine (Petrol & Diesel) – motor characteristics, Terms like Engine torque – motor torque – cranking speed – motor locked torque etc, Starter switch, Starter motor – constructional features – special features of automobile starters, Care & maintenance of starter motors, Dyno-start system
Starter Motor Drives
 Necessity, Types of starter motor drives – mechanisms of - Bendix drive (inboard & Outboard), Over running Clutch, Axial starter (sliding armature), Pre engaged type

UNIT – III: SPARK IGNITION SYSTEM

Introduction, Types of ignition system – coil & magneto – study of coil ignition, Component study of ignition system - Ignition coil, Contact breaker points, Cam angle, Condenser, Distributor, Spark plug – types, Spark plug specifications, Spark advance & retard mechanism (centrifugal & vacuum), Magneto ignition system - Low tension & high tension, Rotating armature & rotating magnet type, Polar inductor type

C.D. ignition system, Electronic ignition systems, Magnetic pickup type & hall effect sensor type, Transistorized ignition, Computer controlled ignition.

UNIT – IV: LIGHTING SYSTEM & OTHER ELECTRICAL ACCESSORIES

Introduction, Head light – Reflectors, lenses, Bulbs (constructional features), Dazzle and its avoidance, Focusing of head lamps, Automatic dim & Bright circuit, Other lights – parking light, side lamp, tail lamp, roof lamp, fog lamp, brake light, dash board light, Types of bulbs – vacuum, gas filled, halogen

Other Electrical Accessories

Introduction, Electrical fuel pump, electric horn, wind screen wiper – types, constructional features, working, Traffic Indicator – Electrical & Electronic, Gauges like, fuel level indicator, oil pressure gauge, temperature gauge, Electrically operated – power window, solenoid operated fuel cut off, wind shield washer, - constructional features & working, Electronically operated central locking

UNIT – V: AUTOMOBILE ELECTRONICS

Electronic Instrumentation in automobiles-Transducers-types, Use of microprocessor in automobile Electronic fuel injection, M.P.F.I system, CRDI system, Sensors in MPFI System. Temperature sensor (ECT,IAT), air flow sensor, throttle position sensor , oxygen sensor (λ sensor), level & position sensor (CKP&CMP). M.A.P sensor (manifold absolute pressure). Knock detecting sensor, Vehicle speed sensor. Sensor testing, Actuators-Linear actuators, rotary actuator, stepper motors

REFERENCES

1. Automobile Electrical Equipment : Kohli
2. Electrical Equipment of Automobiles : Parker Smith
3. Automobile Electrical Equipment : A.P.Young & Griffith
4. Automobile Electrical Equipment : Khatwate.N.R
5. Automobile Electrical Equipment : W.H.Crouse
6. Automobile Engineering : Anil Chikkara
7. Modern Petrol Engine : A.W.Judge
8. Storage Batteries : G.W.Vinal
9. Automobile Electrical & Electronic Systems : Tom Denton
10. Engineering Metrology : R.K.Jain
11. Automotive electricity , Electronics : Barry Hollembeak ,Delmar publishers
12. Mechatronics : W. Bolton Pearson India Ltd

**SUBJECT TITLE : PRODUCTION PROCESS OF
AUTOMOBILE COMPONENTS**
SUBJECT CODE : AU 403
PERIODS/WEEK : 6
PERIODS/SEMESTER : 96

TIME SCHEDULE

<u>UNIT</u>	<u>TOPICS</u>	<u>PERIODS</u>
I.	Introduction to manufacture of automobile components	
	Pattern making Foundry	10
	Casting	6
II.	Forging and Manufacture of Automobile Components	10
	Metal working process used for Chassis, Frame Spring	6
	Test -1	1
III.	Welding	16
IV.	Lathe	12
	NC and CNC Machine	9
	Test -2	1
V.	Drilling	6
	Shaping & Slotting	8
	Grinding	5
	Milling & Gear manufacturing	5
	Test -3	1
	Total	96

OBJECTIVES

Upon completion of the study of subject the student should be able to

1.1.0 Justify the process of pattern making

- 1.1.1 List the materials used in pattern making
- 1.1.2 Identify the types of moulding

1.2.0 Understand the various steps involved in the manufacture of cast iron-

- 1.2.1 Identify the different types of cast iron.
- 1.2.2 Understand the different aspects involved in casting, methods of manufacturing engine block, cylinder heads, bearing bushes, piston rings and cylinder liners
- 1.2.3 Discuss the Ferrous casting
- 1.2.4 Describe the die casting and die casting machines
- 1.2.5 Describe manufacturing of engine components like engine block, cylinder head, piston etc

2.1.0. Understand the different process of manufacture of steels

- 2.1.1 Recognize the different furnaces used in steel manufacture
- 2.1.2 Describe machine forging process used for the production of crank shaft, connecting rod, transmission gear shafts, valves, gear blanks and steering columns
- 2.1.3 List forging machines employed for the above purpose

2.2.0 Locate the different cold working operations and production process for chassis frame spring as well as suspension components

3.1.0 Explain cold working process

- 3.1.1. Summarize basic cold working like drawing, squeezing, bending, shearing, cutting

- and blanking, extruding, shot peening
- 3.1.2.Distinguish presses for cold working
- 3.1.3. Explain hot working operations rolling, drawing and extruding
- 3.1.4Describe production processes for chassis frame spring and suspension components
- 3.2.0Recognize the welding machines and the process of arc welding**
 - 3.2.1Explain the principles of arc welding
 - 3.2.2State use of arc welding
 - 3.2.3. Describe welding machines
 - 3.2.4.List function of different equipments of oxy-acetylene welding machine
 - 3.2.5.Distinguish high and low pressure welding
 - 3.2.6.Describe gas welding techniques
 - 3.2.7.Describe resistance welding
 - 3.2.8.Illustrate spot welding
 - 3.2.0Recognize the advantages and disadvantages of soldering and brazing
 - 3.2.1Distinguish between soldering and brazing
 - 3.2.2Explain the application of soldering and brazing
- 4.1.0Locate different types of lathes and operations**
 - 4.1.1List the types of lathes
 - 4.1.2Explain the lathe construction
 - 4.1.3Identify lathe function
 - 4.1.4Identify lathe parts
 - 4.1.5.Infer lathe sizes
 - 4.1.6Label lathe accessories
 - 4.1.7Identify speeds and feeds of cast iron, mild steel, alloy steel and aluminium
- 4.2.0.Demonstrate grinding, drilling, reaming etc done in lathe**
 - 4.2.1Explain chuck and face plate operations, cylindrical turning, taper calculations and measurements
 - 4.2.2Explain taper turning methods, thread standards and forms, thread calculation etc
 - 4.2.3Identify other operations on lathe such as drilling, boring, reaming, key way cutting, knurling
 - 4.2.4State limitations of the above operations
- 4.3.0Understand the fundamentals of NC and CNC machines**
 - 4.3.1Define NC and CNC machines
 - 4.3.2Distinguish between NC and CNC machines
 - 4.3.3Identify the parts and their functions of a NC and CNC machine
 - 4.3.4Outline part programming
- 5.1.0. Locate drilling machine, shaping machine, slotting machine and grinding machine**
 - 5.1.1. Distinguish drilling machines
 - 5.1.2.Identify parts of a drill press
 - 5.1.3Describe the functions of each parts of a drill press
- 5.2.0 State the use of a shaper**
 - 5.2.1Explain shaper components and their functions
 - 5.2.2Describe quick return motion arrangements
- 5.3.0 State the use of slotter**
 - 5.3.1 Describe slotter parts and their functions
 - 5.3.2Explain quick return arrangements
 - 5.3.3Enumerate slotter specifications
- 5.4.0 Distinguish different types of grinding machines**
 - 5.4.1 Explain different grinding wheels, standard marking and specifications
- 5.5.0Describe surface finishing processes**
 - 5.5.1 Describe metal spraying
 - 5.5.2Specify surface finishes
- 5.6.0Under stand gear manufacturing methods**
 - 5.6.1 Explain Gear milling process
 - 5.6.2Explain Gear hobbing process

CONTENT DETAILS

UNIT – I: Introduction to manufacture of automobile components

Foundry-Pattern making and materials – classification of patterns and pattern allowances. Types of moulding and moulding operations – green sand moulding, dry sand moulding, loan moulding, plaster moulding, metallic moulding, shell moulding. Cast iron-types ,methods of manufacture, casting methods - sand casting, permanent mould casting, centrifugal casting, special casting – die-casting. Gravity and pressure die-casting. Manufacturing of engine block and flywheel. Production of piston and cylinder heads. Centrifugal casting of bearing bushes, piston rings and liners.

UNIT - II Manufacturing methods of automobile components using Forging

Steels-different process of steels making, open hearth process,Bessemer process, L-D process, electric furnace process. Forging operations, heating furnaces in forging. Open-hearth, closed hearth, electric heating furnaces. Machine forging – types of forging machines, production of crank shaft, connecting rod, transmission gear shafts, valves, gear blanks, steering column.

UNIT – III: Metal Working Process and Welding

Cold working process: - cold working – basic cold working operation like – drawing, squeezing, bending, shearing , cutting and blanking, extruding, shot peening, presses for cold working (brief description only) – Bench, inclined, gap arch. Hot working – rolling, drawing, extruding production process for chassis frame spring – suspension components and tyres.

Welding- Arc welding: - Principles of arc welding, welding machines, and uses of arc welding, safety in welding. Gas welding – oxy acetylene welding, functions of different equipment in oxy-acetylene welding – high and low pressure welding, gas welding techniques. Gas welding techniques. Resistance welding – classification of resistance welding. TIG and MIG welding. Soldering and brazing explanation and application of soldering and brazing, advantages and limitations

UNIT – IV Machine tools

Lathe-types – Engine and tool room lathe. Lathe size – Lathe parts and functions. Lathe accessories – work holding devices, tool holding devices. Metal cutting , mach inability, tool life, tool materials and specifications. Speed and feeds for cast iron, mild steel, alloy steel, brass and aluminum- Chuck and face plate operations, cylindrical turning, taper calculations and measurements taper turning methods, thread standards and forms, thread calculations, gear train for screw cutting, multiple threads- Other operations on lathe and their limitations – drilling, boring, reaming, key way cutting, and knurling- NC and CNC machines: - Introduction – working of NC machine tool – classification of NC machine based on control system – applications of NC machines – advantages and disadvantages – computer numerical control (CNC) – advantages of CNC systems over conventional systems. CNC programming.

UNIT – V

Drilling machines: - Bench type, floor type, sensitive and radial drilling machines. Parts of a drilling machine and functions each part.

Shaping machines: - Use of a shaper – shaper components and their functions – quick return motion.– crank and slotted lever method, white worth, hydraulic method

Slotting machines: - Use of a slotter, slotter parts and their functions. Quick return arrangement

Grinding: - Grinding machines – cylindrical grinder, surface grinder, and center less grinder. Grinding wheels – types. Surface finishing processes – introduction to surface finishing, metal spraying.

Gear manufacturing methods- gear milling, gear hobbing

REFERENCES

- | | |
|--|--------------------------|
| 1. Production Technology | - R.K.Jain and S.C.Gupta |
| 2. Production Technology | - P.C.Sharma |
| 3. Elements of Workshop Technology (Vol I, II) | - Hijre Chowdhary |
| 4. A course on workshop Technology (Vol. II) | - Reghuvamshi |
| 5. Manufacturing Technology | - P.N.Rao |
| 6. Welding | - Davis |

**SUBJECT TITLE : AUTOMOBILE ENGINEERING
DRAWING**
SUBJECT CODE : AU 404
PERIODS/WEEK : 3
PERIODS/SEMESTER : 48

CONTENT DETAILS

<u>UNIT – I</u> Layout of Automobile Workshops and Services Station		- 9 periods
1. Layout of Fuel filling cum service station		
2. Layout of fully equipped modern garage		
3. Layout of inspection pit and service ramp		
4. Layout of modern paint booth		
5. Layout of road ways workshop		
6. Layout of sealing arrangement in buses		
7. Chassis specifications and drawings LMV, HCV &		
<u>UNIT- II</u> Drawing of Engine Components		-12 periods
Draw the dimensioned sketches of the following automobile engine components		
(i) 2-Stroke and 4-stroke petrol engine pistons		
(ii) Diesel engine pistons		
(iii) 4-cylinder and 6-cylinder engine crank shaft		
(iv) 4-cylinder and 6-cylinder engine cam shaft		
(v) Spark plug		
<u>UNIT – III</u> Assembly drawing of transmission and other units		-12 periods
1. Constant mesh & synchromesh Gearboxes (3&4 speed)		
2. Differential mechanism (with final drive)		
3. Full floating type □		
Semi floating } rear axles		
Three-quarter floating }		
4. Master cylinder & wheel cylinder		
5. Hydraulic & air brake circuits with all components		
<u>UNIT- V</u> Assembly drawing of Engine components		-12 periods
Assembly drawing of,		
1. Piston, connecting rod and crank shaft assembly for single and multicylinder engine		
2. Overhead & side valve mechanism with all parts		
3. Spark plug & fuel injector		
	Model Test	3 periods
	Total	48 periods

REFERENCES

- | | |
|-----------------------------------|---------------------|
| 1. Machine Drawing | - N.D.Bhat |
| 2. Machine Drawing | - P.I.Varghese |
| 3. Automobile Engineering Drawing | - R.B.Guptha |
| 4. Automobile body building | - T.T.T.I – Chennai |
| 5. Automobile Engg., Vol. 3 | - Anil Chikkara |

SUBJECT TITLE : AUTOMOBILE ELECTRICAL LABORATORY
SUBJECT CODE : AU 405
PERIODS/WEEK : 3
PERIODS/SEMESTER : 48

DETAILS OF LABORATORY WORK

1.0 Recognize Automobile Batteries – Lead Acid Cells

- 1.1 Prepare Electrolyte
- 1.2 Rebuild Battery and test
- 1.3 Charge batteries , care and maintenance of storage batteries
- 1.4 Test battery by
 1. Cell tester (High rate discharge test)
 2. Hydrometer (Specific gravity test)
- 1.5 Test battery for voltage – open volt test – polarity test

2.0 Locate complete wiring of passenger cars, commercial vehicles

- 2.1 Familiarize wiring circuits in various vehicles wiring methods – colour codes – cable specification
- 2.2 Locate instrument panel wiring. Connections to gauges and meters
- 2.3 Locate fuse box and wiring connections to accessories
- 2.4 Compute power consumption of different accessories and wattage of bulbs

3.0 Test Dynamo, Starter Motor & Alternator

- 3.1 Dismantle & clean ,commutator & brushes
- 3.2 Test for continuity of field coils – test for motoring action
- 3.3 Test armature on growler
- 3.4 Study of alternator regulators
- 3.5 Dismantle & clean commutator & brushes
- 3.6 Dismantling and assembling of starter motor & alternator
- 3.7 Dismantle & check drive mechanism of starter motors
- 3.8 Test solenoid switch
- 3.9 Discover wiring connection of starting system & charging system
- 3.10 Testing of starter motor and alternator

4.0 Locate the Wiring of Ignition System

- 4.1 Locate faults in wiring of ignition system
- 4.2 Test ignition coil (Primary & secondary) for continuity and voltage
- 4.3 Test for condenser & C.B. points – use of dwell meter
- 4.4 Spark plug- removal, cleaning & gap resetting
- 4.5 Discover wiring in magneto ignition system and magnets ignition timing – use of stroboscope in ignition timing
- 4.6 Analyze pattern of ignition using – Oscilloscope

5.0 Locate Accessories and Lights and its Wiring

- 5.1 Point out wiring connections to lights & accessories
- 5.2 Use of relay in head light circuit
- 5.3 Adjust head lights
- 5.4 Trouble shooting of horn and check for correct contact – testing of horn relay
- 5.5 Trouble shooting of wiper motor assembly – test motor field winding – inspect wiper gear assembly – removal of wiper blades
- 5.6 Test electrical & electronic type flashers and its wiring connections
- 5.7 Wiring circuit through combination switch
- 5.8 Wiring circuit for centre locking systems
- 5.9 Wiring circuit for power windows
- 5.10 Wiring circuit for three speed wiper motor

SUBJECT TITLE : DIESEL ENGINE SERVICING LAB
SUBJECT CODE : AU 406
PERIODS/WEEK : 6
PERIODS/SEMESTER : 96

CONTENT DETAILS

1. Diesel engine dismantling - 4 stroke. Inspection of various engine components and methods of reconditioning , checking of cylinder head for twist and bend and warpage and crack
2. Removal of piston and connecting rod, valve removal , checking of valves, valve lapping , refacing and grinding , removal and refitting of valve guides , checking of cylinder for ovality and taper by using bore gauge.
3. Cylinder reboring and honing . Use of dial gauge for checking crankshaft and cam shaft. Axial play adjustment in crankshaft and camshaft.
4. Oil sump removal , removal , dismantling and assembling oil pump. Engine oil and filter replacement .
5. Flushing of coolant , coolant pump removal.
6. Checking and adjustment of fan belt.
7. Dismantling , cleaning and assembling of F.I.pump . Bleeding of diesel fuel system . servicing of fuel feed pump, servicing of nozzles. Nozzle testing – pressure , spring pattern and leak off test.
8. Dismantling , cleaning and assembling of distributor type fuel pump.
9. Trouble shooting of diesel engines

SUBJECT TITLE : **MANUFACTURING PROCESS PRACTICAL - III**
SUBJECT CODE : **AU 407**
PERIODS/WEEK : **3**
PERIODS/SEMESTER : **48**

TIME SCHEDULE

<u>UNIT</u>	<u>TOPIC</u>	<u>PERIODS</u>
1.	Fitting Practice	15
2.	Welding Practice	15
3.	Machine shop practice	15
4.	Test	3
	Total	----- 48

DETAILS OF PRACTICAL WORK

1. Fitting Practice

Taping and dieing practice.

2. Welding Practice

Gas welding practice

3. Machine shop practice

Lathe work

Thread cutting practice.

Lathe tool grind practice

Work on Shaper

V-cutting and dove- tail cutting

Work on Slotter

Indexing practice, cutting key way and end splines

SUBJECTS OF STUDY AND SCHEME OF EVALUATION

SEMESTER V

Branch: AUTOMOBILE ENGINEERING

Code	Subject	Periods Per Week				Evaluation (Marks)			
		Theory	Tutorial	Practical	Total	Theory	Practical	Internal	Total
AU 501	Transport Management	5			5	75		25	100
AU 502	Automobile Chassis & Body	6			6	75		25	100
AE 503	Auto Transmission	6			6	75		25	100
AU 504	CADD Lab - I	1		2	3		75	25	100
AU 505	Chassis Servicing Lab			6	6		75	25	100
AU 506	Auto Engineering Lab			6	6		75	25	100
AU 507	Seminar & In plant Training *			3	3			100	100
	TOTAL	18		17	35	225	225	250	700

*** The students have to undergo 2 weeks in-plant training in an authorized firm by themselves**

SUBJECT TITLE : TRANSPORT MANAGEMENT
SUBJECT CODE : AU 501
PERIODS/WEEK : 5
PERIODS/SEMESTER : 80

TIME SCHEDULE

<u>UNIT</u>	<u>TOPICS</u>	<u>PERIODS</u>
I.	Introduction to M. V Act 1989	3
	Licensing, Permit and Registration	3
	Traffic signs and signals	3
	Motor transport organization	5
II.	Fundamentals of operation	10
	Bus scheduling	2
	Crew scheduling	2
	Test – 1	1
III.	Fare collection	12
	Automobile marketing	4
IV.	Road design	14
	Test –2	1
V.	Insurance surveying	7
	Fleet maintenance	12
	Test – 3	1
Total		80

OBJECTIVES

Upon the completion of the course the student must be able to

- 1.1.0. Understand the legal aspects involved with motor transportation types of fleet vehicles and organization employed in transport management
 - 1.1.1. Outline the legal aspects of motor transport
 - 1.1.2. Outline the importance of M. V. Act
 - 1.1.3. State the duties of drivers and conductors
 - 1.1.4. Explain the method of obtaining driving license for two wheeler / light passenger vehicle / heavy goods transport vehicles
 - 1.1.5. State the testing procedure and reasons for disqualification for driving
 - Explain the various traffic signs and signals
 - 1.1.6. Explain the registration procedure for the vehicle
 - 1.1.7. State the necessity of permit
 - 1.1.8. Identify the pollutant emitted by a motor car
 - 1.1.9. List the specific type of operations such as passenger transport, goods transport, municipal transport, ambulance etc and to know the requirements of these transports
 - 1.1.10. Prepare the organizational structure of motor transport organization
 - 1.1.11. Outline the importance of motor transport organization
 - 1.1.12. Classify the motor transport organization

- 1.1.13 Differentiate between passenger transport and goods transport, public transport and private transport
- 1.1.14 Classify the transport carriers
- 1.1.15 Explain the different types of owners types of motor transport organization
- 1.1.16 Describe the functional wings of transport system
- 1.1.17 Draw the organizational charts for the transport organization its regional and district branches and also for various departments
- 1.1.18 Explain the criteria and mode of staffing
- 1.1.19 Fix up the chain of responsibilities
- 1.1.20 Outline the need and type of training programmer to be given to the staff
- 1.1.21 State the facts to be considered for deciding the fleet strength, selecting the site for depot
- 1.1.22 State the facilities required at a depot

2.1.0. Recognize operation of goods vehicles / buses

- 2.1.1 Outline the fundamentals of operations
- 2.1.2 Identify the type of operation
- 2.1.3 Distinguish – city; city – suburban and inter – city operations
- 2.1.4 State the operating characteristics
- 2.1.5 State the factors such as utility, capacity dependability, safety, distance, speed, road condition fuel economy, traffic interference
- 2.1.6 State the function to be considered for fuel economy and traffic interference
- 2.1.7 Define the terms flexibility, trip generation, factors to be considered for trip generation
- 2.1.8 Understand the different types of para transit in Indian cities
- 2.1.9 State the characteristics of para transit
- 2.1.10 Explain other modes of transportation such as LRT, MAGLEV, ETB, and TOFC
- 2.1.11 Explain traffic data – published data and field surveying
- 2.1.12 Prepare time – table for the vehicles and for operational staff
- 2.1.13 Defend the inter-carrier co-ordination, correlation of schedules and inter change of equipment
- 2.1.14 Explain the methods of correlations in the operations of transport
- 2.1.15 Explain the procedure in Bus and Crew scheduling
- 2.1.16 State the factors to be considered in Bus scheduling
- 2.1.17 Explain the calculation of number of buses required for different frequencies
- 2.1.18 Explain how to make a bus schedule
- 2.1.19 State the factors to be considered in crew schedule
- 2.1.20 Explain how to make crew scheduling
- 2.1.21 Explain the uses of computer in scheduling
- 2.1.22 Explain how the productivity can be increased in scheduling
- 2.1.23 Explain motor transport workers

3.1.0. Design fare collection system

- 3.1.1 Explain the term demand – identify the peak hour demand slack hour demand for various types of transport
- 3.1.2 Explain the term route survey and significance of it
- 3.1.3 Describe the following terms duty roasters – trip sheet, way bill
- 3.1.4 Relate route planning, stages and fare structure
- 3.1.5 Explain the need for trip sheet or way bill
- 3.1.6 State the meaning of trip generation and explain the factors, to be considered for trip generation
- 3.1.7 Explain the trip distribution (Trip distribution mathematical models not necessary)
- 3.1.8 Explain the various incentive schemes for accident prevention and efficient operation
- 3.1.9 Distinguish the components of vehicle operational cost
- 3.1.10 Compute the total cost specific type of operation
- 3.1.11 State the requirements of a good fare system
- 3.1.12 Explain the method of drawing of fare tables with examples

- 3.1.13.Explain the traffic and fare system in transport organization
- 3.1.14.State the traffic investigation to improve services
- 3.1.15.Explain peak hours demand, express, limited stop service, relief service
- 3.1.16.Explain the fare structure
- 3.1.17.State the requirements for good fare system
- 3.1.18.Explain different services, fares relating to distances
- 3.1.19.State the different fare methods
- 3.1.20.Explain the term fare stage
- 3.1.21.Explain how to design a fare stage
- 3.1.22.Explain the fare collection system
- 3.1.23.Explain the documentation involved in consignment shipment.
- 3.2.0.Understand the features of automobile marketing**
 - 3.2.1.Explain the organization of automotive business in the world
 - 3.2.2.Recognize a customer
 - 3.2.3.Outline the background of marketing
 - 3.2.4.Identify the functions of marketing activities
 - 3.2.5.Describe workshop management
 - 3.2.6.Suggest the responsibilities of dealer
 - 3.2.7.Compile the duties and responsibilities of workshop manager, supervisor, cashier, mechanic etc
 - 3.2.8.Defend warranty procedures
- 4.1.0.Recognize the various design considerations involved in road construction**
 - 4.1.1.Identify the different types of roads
 - 4.1.2.Identify the specification for gradient of road
 - 4.1.3.Explain road sections in Hilly tracks and Hair pin bends
 - 4.1.4.Distinguish super elevation and sight distance
 - 4.1.5.Describe road intersection and traffic lights
 - 4.1.6.Recognize the methods of collecting traffic data
- 5.1.0Appreciate the importance of insurance coverage**
 - 5.1.1.Describe the functions of insurance companies
 - 5.1.2.Identify the types of Policies
 - 5.1.3.Explain the factors involved in assessing
 - 5.1.4.Prepare an estimation for a maintenance programme and draw a follow up method
 - 5.1.5.Defend the need of diagnostic centers in fleet maintenance
 - 5.1.6.Prepare a list of equipment required in a diagnostic center and regional workshop or central workshop
 - 5.1.7.Discuss computerized maintenance, scanning and computerized wheel balancing
 - 5.1.8.Compile the fleet maintenance programme of a M. T. D
 - 5.1.9.Explain the methods of accidental repairing
 - 5.1.10.Prepare service records, job cards, report form and completion notes

CONTENT DETAILS

UNIT – I

Features of M. V. Act – definition of terms – test for drivers and conductors – registration of vehicles – duties of drivers and conductors – traffic signs – mode of staffing in a depot – site selection and facilities in a depot – M. T. O. and functional wings – organization chart – type of co-ordination and co-coordinating factors. .

UNIT – II

Bus operation – Factors governing bus schedule – making a bus schedule – operating characteristics – trip generation and trip distribution – No. of bus required for operation – preparation of time table for bus and crew – factors governing crew scheduling – making a crew scheduling. Intermediate public transport in Indian cities(IPT)/Para transit, Characteristics of IPT modes, Light rail transit(LRT/Tram), electric trolley bus (ETB), Magnetic levitation (MAGLEV) system, container freight station, Trailer on flat car, Automatic Guided Vehicle(AGV)

UNIT – III

Fare collection – Route planning – Fare structure and table – trip sheet and way bill – ticket system – accident prevention – operational cost – fare methods – fare stage – organization of automotive business – marketing back ground – functions of marketing activities – workshop management – responsibilities of dealer – duties of workshop staff – warranty. Consignment shipment.

UNIT – IV

Importance of roads – traffic studies and high way planning – Road geometry – width of high way – gradient – cross section of road – super elevation and sight distance – road intersection – traffic lights – location of bus stop, bus bay, zebra crossing and parking positions – traffic census.

UNIT – V

Insurance surveying – companies – classification of policies – third party insurance – factors involved in assessing – MACT – fleet maintenance programme – diagnostic centers – equipment required in a center – regional and central workshops – computerized maintenance programme – scanning and wheel balancing – accidental repair – service records and job cards.

REFERENCES

1. M. V. Act (1988)
2. Motor Transport organization - P. R. K. Sharma
3. Bus operation - L. D. Kitchen
4. Bus operation, Bus & crew scheduling - C. I. R. T, Pune
5. Transport Engg. , and Transport planning - L. R. Kadiyali
6. Garage and service station hand book - J. Queens borough
7. Transportation Engineering - V.N. Vazirani & S. P. Chandola
8. Automobile Engineering Vol. III - Anil Chhikara
9. Transportation Management - T T T I
10. Automation & Production Systems - Mikell P. Groover

SUBJECT TITLE : AUTOMOBILE CHASSIS AND BODY
SUBJECT CODE : AU 502
PERIODS/WEEK : 6
PERIODS/SEMESTER : 96

TIME SCHEDULE

<u>UNIT</u>	<u>TOPICS</u>	<u>PERIODS</u>
I	1. Introduction	1
	2. Chassis Frame	6
	3. Front Axle	12
II	1. Suspension system	6
	2. Shock Absorbing Devices	12
	Test – 1	1
III	1. Steering system and Wheel alignment	19
IV	Brake System	18
	Test –2	1
V	Automobile Body	19
	Test –3	1
	Total	96

OBJECTIVES

Upon the completion of the course the student should be able to

1.1.0 Recognize different types of Chassis Frames and Front Axles

- 1.1.1 Distinguish different parts of automobile chassis
- 1.1.2 Explain the constructional details of a typical chassis frame
- 1.1.3. Describe different types of frames used in two-wheelers, three-wheelers, and others
- 1.1.4 Distinguish various sections used in automobile chassis frames
- 1.1.5 Outline the different materials used for construction of chassis frame
- 1.1.6 Describe the method of testing the chassis frame alignment with using plumb bob
- 1.1.7 Distinguish front axle of a vehicle
- 1.1.8 Identify various types of front axles
- 1.1.9 Explain the construction details such as materials, cross section and process
- 1.1.10 Defend the checking of alignment of front axle using mandrels and protractor
- 1.1.11 Distinguish stub axles, wheel assembly and different arrangements of stub axles such as Elliot types, Reverse Elliot, Lamoine Reverse Lamoine
- 1.1.12 Appreciate suspension system and shock conventional and independent

2.1.0 Describe various type of independent suspensions used in absorbing devices

- 2.1.1 Outline the importance of suspension
- 2.1.2 Describe two types of front suspension system – two wheeler and three wheeler and other vehicle suspensions parallel link, wish born arc, McPherson – torsion bar – air suspension system
- 2.1.3 Explain types of rear suspension system - conventional method – independent suspension
- 1.1.4 State the function of spring as shock absorber device
- 2.1.5 Explain different types spring used in automobiles - leaf and coil springs
- 2.1.6 Describe different type of leaf springs used in Automobiles, quarter elliptic, half elliptic, three quarter elliptic, cantilever, helper spring

- 2.1.7 Identify spring shackles and pins and their functions
- 2.1.8 State the function of shock absorbers as vibration damper
- 2.1.9 Demonstrate different types of shock absorbers – hydraulic, direct acting and indirect acting
- 2.1.10 Explain air suspension and hydro – elastic suspension

3.1.0 Analyse the parts and working of steering system

- 3.1.1 Describe the steering system Define steering geometry and directional stability and study the principles of steering system, a clear time – Davis fifth wheel steering
- 3.1.2 Predict instantaneous center and turning angle
- 3.1.3 Explain different types of steering gear boxes – worm roller, worm and gear, re-circulating bell type, rack and pinion
- 3.1.4 Distinguish different arrangements of steering linkages – and their components such as tie rod, tie rod ends
- 3.1.5 Explain power steering and its types, integral and linkage type
- 3.1.6 Define collapsible type steering column
- 3.1.7 Analyse wheel alignment – castor, camber, king pin inclination and toe – in and toe – out

4.1.0 Comprehend the details of braking systems used in automobiles

- 4.1.1 Describe the function of the brake and brake system
- 4.1.2 Explain type of brakes and braking system – mechanical, hydraulic, pneumatic servo brake system, air brake – vacuum brake, fail safe brake, dual brake, and anti-lock brake system. Drum and disk brake system – internal expanding and bend brake systems
- 4.1.3 Reproduce the layout of brake system
- 4.1.4 Explain different types, working principle of master cylinder, wheel cylinder and brake shoe
- 4.1.5 Explain constructional details and working of components of air brake
- 4.1.6 Describe servo brake, types of servo brakes, vacuum and air working of servo brakes
- 4.1.7 Explain mechanical brake and its types of arrangements
- 4.1.8 Describe constructional details and working of disk brake
- 4.1.9 Describe fail safe brake, dual brake and anti lock brake system
- 4.1.10 State function and different arrangements of hand brake
- 4.1.11 Explain application and working of exhaust brake
- 4.1.12 Define testing of brakes and brake efficiency

5.1.0 Appreciate Automobile body construction

- 5.1.1 Define automobile body construction and stream lining
- 5.1.2 Classify the groups of automobile body – passenger and commercial body work
- 5.1.3 Explain the constructional details of body frame and panel
- 5.1.4 Identify materials used for automobile body construction
- 5.1.5 Generalize the materials of construction for type of vehicle
- 5.1.6 Select the tools and equipments for body construction
- 5.1.7 Define automobile body styling and stream lining – sketch passenger car, pick up van, trucks, bus
- 5.1.8 Describe internal constructional details such as seating arrangements in buses, pick up vans – door and door locking methods
- 5.1.9 Explain construction details of upholstery works and materials required
- 5.1.10 Summarize painting methods – brush and spray – painting materials – types of paint, painting equipment – spray gun – compressor
- 5.1.11 Explain procedure of spray painting, coating, puttying, leveling, finishing and polishing.

CONTENT DETAILS

UNIT – I

Chassis -Introduction, Constructional details, Types of frame. Frame for 2 wheeler, 3wheelers, and 4 wheeler , frame sections, bumpers, sub frames. Materials used, Testing of chassis -Front Axle-Introduction, Types – dead & live axle, Construction – material – cross section-Checking the alignment of front axle, Stub axle – different arrangements.

UNIT – II

Introduction to Suspension systems, Types of front suspension for Two, three & four wheeler suspension, Air suspension, Hydro-elastic suspension.
Rear Suspension system, Types-Introduction to springs and Shock absorbing devices, Types – leaf – coil, Leaf springs & their arrangements, Helper spring, Spring shackle – shackle pin , Shock – absorber, Mechanical, Hydraulic, gas filled type, rocking vane type, Piston type, Telescopic type (double acting), Twin tube type, Replacement cartridge, Electro – rheological type. Basic suspension movements- pitching, bouncing, rolling etc.

UNIT – III

Introduction to Steering system & steering geometry, Principles of steering, Ackerman , Davis fifth wheel , Steering gear box – types, Worm & roller, worm & sector, Re-circulating ball, Rack & pinion, Steering linkages – arrangement – components
Power steering – integral – linkage type, Collapsible type steering column
Wheel alignment –Factors affecting wheel alignment.

UNIT – IV

Introduction to Brake Systems , principle of operation, weight transfer principle, types of brakes–mechanical, hydraulic, pneumatic, servo brake, Air brake – vacuum brake – fail safe brake – dual brake – anti lock brake, Drum and disc brake system – Internal expanding and externally contracting-Layout of brake system, mechanical Components, hydraulic – master cylinder, types – working principle – wheel cylinder – brake bleeding, brake shoe. Air brake – construction details – working – details components – servo brakes -working of servo brake – types, vacuum and air - types of arrangements – disc brake – constructional details and working engine exhaust brake –testing of brake – brake efficiency.

UNIT – V

Introduction to automobile Body , Classification of Automobile body, Materials for body
Constructional details of – frame – panel ,– stream lining of body, Internal construction – seating arrangement, door, door locking, Upholstery material, safety aspects in vehicle body design. Painting types, brush painting, spray painting, paint materials .Spray gun , compressor. Procedure for painting, puttying, leveling, coating, finishing, polishing. Modern painting methods and paint booth.

REFERENCES

- | | |
|---|-----------------------|
| 1. Automobile Chassis & body | - P.L.Kohli |
| 2. Body Engineering | - S.F. Page |
| 3. Automotive Chassis | - P.M.Holdt |
| 4. Automobile Engineering | - Anil Chhikara |
| 5. Automotive technology | - Aehell |
| 6. Vehicle body Engineering | - J.Powlaskic |
| 7. Body design and construction | - Giles |
| 8. Body Engineering | - Sydney.F.Pag |
| 9. Body constructions | - Braithwaite |
| 10. Automobile Body building | - TTTI, Chennai |
| 11. Automobile Engineering | - K.M.Guptha |
| 12. Steering ,suspension, and tyres | - J.G.Giles |
| 13. Automobile Steering ,suspension and alignment | - James D Halderman & |

Chase D Mitchel

SUBJECT TITLE : AUTOMOBILE TRANSMISSION
SUBJECT CODE : AU 503
PERIODS/WEEK : 6
PERIODS/SEMESTER : 96

TIME SCHEDULE

<u>UNIT</u>	<u>TOPICS</u>	<u>PERIODS</u>
I.	Introduction – Clutch	1
	Principle of Friction Clutches	2
	Different types of Clutches	8
	Clutch Disc, pressure plate	6
	Operating Mechanism	2
II	Introduction – Gearbox	1
	Types of Gearboxes	6
	Gear Selector & shifting mechanism	3
	Power transmission in 2 & 3 wheelers	3
	Progressive type Gearbox	5
	Test – I	1
III.	Introduction – Propeller shaft & Universal joints	1
	Torque tube & Hotchkiss drive	3
	Variable velocity & constant velocity joints	6
	Front wheel drive	2
	Differential mechanism	4
	Rear Axles	3
IV.	Introduction – wheels & tyres	2
	Wheels, tyres	9
	Treads, inflation pressure effects	6
	Test – II	1
V.	Introduction – transmission special vehicles	1
	Tractors	5
	Trailers & semi trailers	3
	Road rollers	4
	Excavators & Bulldozers	7
	Test – V	1
	Total	96

OBJECTIVES

- 1.1.0 Recognize the various transmission members of the automotive vehicle
 - 1.1.1 Identify types of Transmission
 - 1.1.2 Review need for transmission
 - 1.1.3 State various components in transmission
 - 1.1.4 List the functions of clutch
 - 1.1.5 Explain the principle of operation of clutch
 - 1.1.6 Draw the line diagram and explain single plate clutch – multiplate clutch – diaphragm clutch
 - 1.1.7 Recognize the working principle of vacuum and hydraulically operated clutch
 - 1.1.8 Describe the details of fluid coupling
 - 1.1.9 Describe the constructional features of clutch disc, pressure plate and clutch operating mechanism

2.1.0 Understand the working construction of various types of gear boxes used in vehicle

- 2.1.1 State the objectives of gear box in transmission
- 2.1.2 Explain the working of sliding mesh gearbox, constant mesh gearbox, synchro mesh gearbox, epicyclic gearbox
- 2.1.3 Describe the principle and working of torque converter, overdrive mechanism and automatic transmission
- 2.1.4 Distinguish the type of manual, automatic, electronic gear shifting mechanism
- 2.1.5 Explain the type of power transmission in 2, 3 & wheelers
- 2.1.6 Describe the construction and working of progressive type gearbox.

3.1.0 Understand the types and working of universal joints and propeller shaft

- 3.1.1 List the functions of propeller shaft and universal joints
- 3.1.2 Explain the working of torque tube drive, Hotchkiss drive
- 3.1.3 Identify the types of constant velocity joints and variable velocity joints
- 3.1.4 Describe the working of differential mechanism
- 3.1.5 Distinguish the working of locking differential and limited slip differential
- 3.1.6 Identify the method of operation in Rear Axles

4.1.0 Understand the specifications, tread patterns

- 4.1.1 Specify wheels like, spoked wheel, disc wheel, alloy cast wheel & composite wheel
- 4.1.2 Designate a wheel
- 4.1.3 Specify the types of tyres
- 4.1.4 Designate a tyre
- 4.1.5 Identify the tread patterns and its skeletons
- 4.1.6 Differentiate the merits and demerits of under inflation and over inflation in tyres
- 4.1.7 List the factors affecting tyre performance

5.1.0 Understand the type of transmission in tractors, road rollers and excavators

- 5.1.1 Identify the features of special vehicles
- 5.1.2 Explain the constructional feature of power transmission in tractors, trailers, road rollers and excavators

CONTENT DETAILS

UNIT – I

Introduction - Various components in transmission required for a good transmission system. Principle of friction clutches. Constructional features and working of-Single plate dry clutch-Diaphragm clutch-Cone clutch-Centrifugal clutch-Semi centrifugal clutch-Vacuum clutch-Hydraulic clutch-Electro magnetic clutch-Over running clutches-Multiplate clutch (dry & wet)-Fluid fly wheel-Clutch disc – constructional details and functions of each part, Pressure plate – constructional details and functions of each part. Clutch operating mechanism

UNIT – II

Introduction – Necessity and functions of gearbox -Gearbox constructional features & working of - Sliding mesh gearbox-Constant mesh gearbox-Synchro mesh gearbox- Progressive type gearbox - Epicyclic gearbox- Torque converter -Gear selector and shifting mechanism, Manual, Automatic, Electronic Power transmission system for 2, 3 & 4 wheelers-Gear drive-Chain drive-V matic transmission ,CVT& ECVT-Automatic transmission

UNIT – III

Introduction of Propeller shaft and universal joint-Torque tube drive-Hotchkiss drive-Variable velocity joints-Constant velocity joints-Front wheel drive-Differential mechanism-Locking differential -Limited slip differential-Rear Axles

UNIT – IV

Introduction of wheels & tyres-Wheels – wire – spoked wheel, disc wheel, and alloy cast wheel, composite wheel-Wheel specification-Tyres-Tyre specification-Tyre skeletons tubeless tyre-Tyre

treads patterns-Inflation pressure and its effects (both over & under inflation)-Factors affecting tyre performance

UNIT – V

Introduction – transmission system in other special vehicles-Tractors- Constructional layout – general features-Novel features – hydraulic system- Traction control - Power take off unit

Trailers & semi trailers – constructional features-Road rollers – constructional features & transmission-Excavators & bulldozers - Constructional features & Transmission system

REFERENCES

- | | |
|--|-----------------------------|
| 1. Automobile Chassis & Body | - P.L. Kohli |
| 2. An Introduction to Automobile Engineering | - N.R. Khatawate |
| 3. Automotive Mechanics | - Joseph Heitner |
| 4. Automobile Engineering Vol. I | - Kripal Singh |
| 5. Automobile Engineering Vol. II | - Anil Chikkara |
| 6. Truck and Tractor Guide And Handbook | - Audel |
| 7. Automobile Engineering Vol. II | - K.M.Guptha |
| 8. Manual transmission and trans axles | - Jack Earjavec |
| 9. IC Engines Theory and Practice | - K K Ramalingam |
| 10. Tractor mechanicms | - K N Guptha & J P Kaushish |
| 11. Special types of Vechiles | - S Sreenivasan |

SUBJECT TITLE : CADD-I
SUBJECT CODE : AU 504
PERIODS/WEEK : 3
PERIODS/SEMESTER : 48

TIME SCHEDULE

<u>UNIT</u>	<u>TOPICS</u>	<u>PERIODS</u>
I.	Introduction to computer aided drafting	3
II.	Working with CAD	12
III.	Editing, adding dimensions and text	9
IV.	Section and sectional views with CAD	9
V.	Assembly drawing	12
	Test	3
	Total	48

CONTENT DETAILS

UNIT – I Introduction to computer aided design drafting

CAD basics – main menu, starting a new drawing, drawing editor, entering commands using mouse, pull down menu, getting help, data entry, entity selection, error correction.

UNIT – II Working with CADD

Setting limits of drawing, grid, snap, co-ordinates, ortho modes, zooming drawing lines, arc, circles.. Commands for erase, undo, oops, save and end.

UNIT – III Editing, adding dimensions and text

Editing drawings using various modifying commands. Copy, mirror, array, fillet, chamfer, trim, extend, break, changing object properties from command line, creating object drawings. Add dimensions and text on drawing.

UNIT – IV Section and sectional views with CAD

Sectional view with CAD. Hatching the sectional views. Thread and thread fasteners, Key and cotter joints, Developing simple line diagrams and dimensions it with text

UNIT – V Assembly drawing

Ortho graphic projection using CAD. Developing detailed views with all features of the following

Piping lay out, Couplings, Poppet valve, Piston, Differential, Isometric drawing of the above

NOTE: The drawings mentioned in this topic should be drawn with the help of CAD, Pro E package. The public examination of this subject should be conducted as a practical CAD lab. External examiner should conduct the practical examination. For internal examination a maximum of 25 marks should be awarded.

REFERENCE

- | | |
|-----------------------------------|-------------------------------|
| 1. Automobile Engineering Drawing | - R. B. Gupta |
| 2. Engineering Drawing using CADD | - P. Dayanithi, TTTI, Chennai |
| 3. Machine drawing with CADD | - Goutan Pohit &Goutham Ghosh |

SUBJECT TITLE	: AUTO CHASSIS LABORATORY
SUBJECT CODE	: AU 505
PERIODS/WEEK	: 6
PERIODS/SEMESTER	: 96

CONTENT DETAILS

1. **Dismantling of clutches** – different types – coil spring, diaphragm spring – single plate, multiplate etc. Study the parts and their function, assemble it and adjust it – refit it to the vehicle by using clutch aligns. Clutches of 2 wheelers and 3 wheelers, tractors and tillers.
2. **Dismantling different types of gearboxes** – and over drive, sliding mesh, constant mesh and synchromesh progressive type etc. Study different parts and their functions
Calculate gear ratios
Assemble and refit it to the vehicle
3. **Dismantle the universal joint and propeller shaft** – study the slip and universal joint refit to the vehicle
4. **Dismantle the differential assembly** – study the purpose and working of differential – assemble and adjust back lash
5. **Dismantle the front axle and transaxle** – replace king pin and bushes – study the parts – check the alignment of the axle and refit
6. **Dismantle different types of rear axles** – full floating, semi floating, and $\frac{3}{4}$ floating – study
7. **Study different type suspension systems by dismantling and assembling** – dismantle rigid spring type and torsion bar type. Dismantle the Mac Pherson strut type – assemble and refit to the vehicle
8. **Dismantle leaf spring** – adjust the camber and refit – study the shock – absorbers of different types
9. **Identification of steering linkages** – dismantle worm and roller type, recirculating ball type, rack and pinion type etc. Adjust steering play. Checking and adjusting of wheel alignment
10. **Dismantle the hydraulic brakes system** including master cylinder, wheel cylinders, brake shoes, retracting spring etc. Assemble the system and bleed the brake and adjust. Study the different units of vacuum serve and air brakes units and their functions
11. **Study different tools and accessories** of brake relining machine removing old lining and reline with new lining materials
12. **Removal of tyre and tube** and testing, vulcanising, filling air and refitting
13. **Checking the braking efficiency** of a vehicle
14. **Cleaning and servicing** of a vehicle in a service station
15. **Familiarize grease points** of various vehicles
16. **Driving practice** – Able to drive and test the vehicle

SUBJECT TITLE : AUTOMOBILE ENGINEERING LABORATORY
SUBJECT CODE : AU 506
PERIODS/WEEK : 6
PERIODS/SEMESTER : 96

DETAILS OF LABORATORY WORK

1. Study the working of viscometer
2. Determine the viscosity and viscosity index of a given lubricating oil
3. Study the working of flash point apparatus
4. Determine the flash point of a given fuel
5. Study the a working of different calorie meters
6. Determine the calorific value of a solid, liquid and gaseous fuels
7. Determine the fuel consumption, of a petrol engine at various levels
8. Determine the fuel consumption of a diesel engine at various levels
9. Determine the heat balance account of an I.C. engine
10. Conduct Morse test
11. Tests on air compressor – efficiency, performance characteristic curves

SUBJECT TITLE	: SEMINAR & INPLANT TRAINING
SUBJECT CODE	: AU 507
PERIODS/WEEK	: 3
PERIODS/SEMESTER	: 48

CONTENTS

Every student is expected to make a presentation for a minimum of 30 minutes on a topic in the classroom related to the curriculum or on advanced topic in automobile engineering. 50 marks will be allotted as internal evaluation marks for the presentation

Every student has to undergo 2 weeks in-plant training in an authorized firm, by himself / herself. He / she will have to submit a report of the training he / she had undergone. He /she also have to submit a certificate issued by the concerned firm regarding his training. A maximum of 50 marks will be awarded as internal marks for the same. The award of the internal marks can be done based on the report of training and also on a viva-voce conducted by the staff member in-charge, regarding the training.

SUBJECTS OF STUDY AND SCHEME OF EVALUATION

SEMESTER VI

Branch: AUTOMOBILE ENGINEERING

Code	Subject	Periods Per Week				Evaluation (Marks)			
		Theory	Tutorial	Practical	Total	Theory	Practical	Internal	Total
GE 601	Industrial Management & Entrepreneurship	6			6	75		25	100
AU 601	Auto Servicing & Maintenance	6			6	75		25	100
AU 602	Auto Design	5	1		6	75		25	100
AU 603	Advanced Automobile Engineering	5			5	75		25	100
AU 604	CADD Lab – II			3	3		75	25	100
AU 605	Vehicle Testing Lab			6	6		75	25	100
AU 606	Project work			3	3		75	25	100
	TOTAL	22	1	12	35	300	225	175	700

SUBJECT TITLE : INDUSTRIAL MANAGEMENT & ENTREPRENEURSHIP
SUBJECT CODE : GE 601 (COMMON TO ALL)
PERIODS/WEEK : 5 + 1 Tutorial
PERIODS/ SEMESTER : 80 + 16

TIME SCHEDULE

<u>UNIT</u>	<u>TOPIC</u>	<u>PERIODS</u>
I	1.1 Principles of Management	10
	1.2 Human Resource Management	5
II	2.1 Quality Planning and Control	5
	2.2 ISO-9000 & Installation	5
	2.3 TQM and Organizational Excellence	5
	Test – I	2
III	3.1 Project Management PERT / CPM	6
	3.2 Marketing & Sales	2
	3.3 Wages & Incentives	4
	3.4 Material Requirement Planning (MRP)	3
IV	4.2 Operations Research and Applications	10
	4.3 Management by Objectives (MBO)	3
	4.4 Management Information System (MIS)	2
	Test – II	2
V	5.1 Industrial Psychology	3
	5.2 Entrepreneurship Development	4
	5.3 Industrial Safety	4
	5.4 Environmental Pollution & Control	4
	Test – III	1
Total		80 + 16

OBJECTIVES

UNIT – I

1.1.0

Understand the Principle of Management

- 1.1.1 Explain the meaning and concepts of management
- 1.1.2 Outline the characteristics of management
- 1.1.3 Illustrate the development of management theory
- 1.1.4 Illustrate the Taylor’s scientific management and contributions
- 1.1.5 Illustrate Henry Fayol’s principles of management
- 1.1.6 Compare the contributions of Taylor and Fayol
- 1.1.7 State the functions of management
- 1.1.8 Explain various administrative steps of each function
- 1.1.9 Describe different types of ownership
- 1.1.10 Explain different types of organization structure
- 1.1.11 Explain the concept of Leadership, Motivation & communication.

1.2.0 Appreciate the functions of Human Resource Management

- 1.2.1 Outline the importance of HRD
- 1.2.2 Explain the process of man power planning
- 1.2.3 Explain Job analysis, job evaluation, merit rating, performance appraisal
- 1.2.4 Training & Methods of Training

UNIT – II

2.1.0 Understand quality planning & control

- 2.1.1 Define quality
- 2.1.2 List the dimensions of quality
- 2.1.3 List the objectives of quality planning
- 2.1.4 Describe various quality control measures in brief
- 2.1.5 Explain quality assurance concept and definition
- 2.1.6 Describe in brief the Three Prong Approach to Quality Planning
- 2.1.7 Explain the need for quality management system
- 2.1.8 Draw quality loop

2.2.0 Understand the elements of ISO 9000, its Installation and audit

- 2.2.1 Describe the concept and role of ISO 9000
- 2.2.2 List the elements of ISO 9000
- 2.2.3 List the steps for installing quality system
- 2.2.4 Explain different ways of quality audit
- 2.2.5 Identify the agencies who give ISO certification
- 2.2.6 Discuss the role of accreditation board
- 2.2.7 Explain various stages of ISO 9000 implementation
- 2.2.8 Describe briefly the benefits of becoming an ISO 9000 company

2.3.0 Understand the concept of TQM and Organizational Excellence

- 2.3.1 Explain the concept of TQM
- 2.3.2 Outline the ten “Manthras” of TQM
- 2.3.3 Discuss in brief the link between ISO 9000 and TQM with TQM model
- 2.3.4 Draw the organizational structure of TQM
- 2.3.5 Explain the different techniques of TQM
- 2.3.6 Discuss the concepts and characteristics of Quality Circle
- 2.3.7 Discuss the brain storming technique used in quality circle for arriving at solutions
- 2.3.8 Explain the organizational excellence by TQM approach and through “SWOT” analysis
- 2.3.9 Write mission statement

UNIT – III

3.1.0 Apply the principles of CPM & PERT

- 3.1.1 Outline the network technique
- 3.1.2 List different applications of CPM & PERT
- 3.1.3 Outline scope of PERT & CPM
- 3.1.4 Define the terms used in CPM & PERT
- 3.1.5 Explain the procedure for finding the critical path
- 3.1.6 Compute the project duration, slack and critical path by using AON & AOA
- 3.1.7 Distinguish between CPM & PERT
- 3.1.8 Define the terms used in PERT
- 3.1.9 Explain the procedure for PERT
- 3.1.10 Estimate activity time
- 3.1.11 Compute the project duration slack and mark the critical path
- 3.1.12 Solve the problems in PERT & CPM

3.2.0 Understand various steps in Marketing & Sales planning

- 3.2.1 Define marketing
- 3.2.2 List the objectives of marketing
- 3.2.3 Outline the core marketing concepts with the help of block diagrams
- 3.2.4 Discuss in brief the marketing mix, buying process and behaviour
- 3.2.5 Outline the importance of sales of products and services
- 3.2.6 List the functions of sales department
- 3.2.7 Explain the steps in market planning, market segmentation
- 3.2.8 Discuss the importance and functions of sales management
- 3.2.9 Discuss sales planning

- 3.2.10 Explain the market research and market information system
- 3.3.0 Understand the Principles of a good Wage Payment System**
 - 3.3.1 Outline the importance of a good wage plan
 - 3.3.2 Define the different types of wages
 - 3.3.3 List the requirements of a good wage plan
 - 3.3.4 Define Incentives
 - 3.3.5 Identify financial, non financial and semi financial incentives
 - 3.3.6 Discuss different types of financial incentives plan
 - 3.3.7 Compute the wages under different incentive plans with examples
 - 3.3.8 Understand the concept of MRP
 - 3.3.9 Understand the application of MRP

UNIT – IV

4.1.0 Understand various methods in Operations Research and its application

- 4.1.1 Outline the concept of optimization
- 4.1.2 Outline the scope of O.R
- 4.1.3 List the phases and processes of O.R
- 4.1.4 List the different methods of O.R.
- 4.1.5 Explain Linear programming graphical method & analytical method
- 4.1.6 Compute maximization of profit by linear programming - graphical method and analytical method (simple problems only)
- 4.1.7 Compute minimization of total cost by Linear programming - graphical method and analytical method (simple problems only)
- 4.1.8 Explain the transportation problem
- 4.1.9 Compute the initial feasible solution by north west corner rule and Vogel approximation method (simple problems only)
- 4.1.10 Explain the game theory
- 4.1.11 Compute the saddle point of the game two – person – zero sum using maximize and minimize principle (simple problems only)
- 4.1.12 Explain the queuing theory
- 4.1.13 List information required for formulating a mathematical model

4.2.0 Understand the concept of Management By Objective (MBO)

- 4.2.1 Outline the nature and purpose of MBO
- 4.2.2 Identify sequential MBO processes
- 4.2.3 List the merits and demerits of MBO
- 4.2.4 List the steps required for MBO
- 4.3.5 List the guidelines for setting objectives for MBO

4.3.0 Appreciate Management Information System (MIS)

- 4.3.1 Define MIS
- 4.3.2 Distinguish between data and information, data processing & MIS
- 4.3.3 State the need for information
- 4.3.4 Discuss the systems concept of management
- 4.3.5 Discuss a firm and its environment
- 4.3.6 List the objectives and inputs of an effective MIS
- 4.3.7 Explain the integrated MIS
- 4.3.8 List major functional and activity subsystems in MIS
- 4.3.9 Describe MIS development (system development) with the help of a line diagram
- 4.4.10 List applications of MIS

UNIT – V

5.1.0 Justify the concept of Industrial Psychology

- 5.1.1 Describe the meaning of Industrial Psychology
- 5.1.2 Outline the importance of good working conditions and environment
- 5.1.3 Explain the concept of Behavioural dynamics
- 5.1.4 Distinguish the interpersonal behaviour and interpersonal needs

- 5.1.5 Discuss the development of interpersonal relationship
- 5.1.6 Describe the development of better qualities (personality traits)
- 5.2.0 Formulate the feasible project report to start a small scale industry**
 - 5.2.1 Explain the concept of entrepreneurship
 - 5.2.2 Describe the profile of an entrepreneur
 - 5.2.3 List the functions of an entrepreneur
 - 5.2.4 List the risk taking qualities of an entrepreneur
 - 5.2.5 Explain the concept of entrepreneurial development
 - 5.2.6 List the different factors contributing to the failure of entrepreneurial ventures
 - 5.2.7 Identify industrial support needed programs existing in India
 - 5.2.8 State the concept of small scale and ancillary industrial undertaking
 - 5.2.9 List the steps involved in starting small-scale industry
 - 5.2.10 Describe the procedure of registration of SSI
 - 5.2.11 Identify the net work of financial assistances given to SSI
 - 5.2.12 Identify the different constituents of feasibility study
 - 5.2.13 Prepare the feasibility report / project report
- 5.3.0 Recognize the features of Industrial Safety**
 - 5.3.1 Explain the importance and need for safety measures in industries
 - 5.3.2 Define the meaning of the term – factory, accident, frequency rate, security rate, accident pronnes, unsafe acts, unsafe conditions, job safety analysis, plant safety inspections
 - 5.3.3 Identify the various accident factors, mechanical factors, environmental factors, personal factors
 - 5.3.4 Discuss the 4 E’s of accident prevention technique
 - 5.3.5 List the precautions to be observed while working in an hazardous environment
 - 5.3.6 Explain briefly the artificial respiration methods
- 5.4.0 Recognize the causes of environmental pollution and steps to be taken to control the pollution**
 - 5.4.1 Define the terms Ecology and Ecosystem
 - 5.4.2 Explain the impact of industrial development on environment
 - 5.4.3 Explain the causes and effects of air and water pollution on plant, animal life and materials
 - 5.4.4 Identify the characteristics of industrial and municipal waste
 - 5.4.5 Outline the various treatment processes
 - 5.4.6 Identify the sources of air pollutants
 - 5.4.7 State the effects of air pollution
 - 5.4.8 Outline the methods of prevention and control of air pollution
 - 5.4.9 Explain the term solid waste management
 - 5.4.10 List the salient features of environmental pollution control legislation
 - 5.4.11 State the functions of pollution control board
 - 5.4.12 Define NOISE
 - 5.4.13 Identify the causes of noise pollution
 - 5.4.14 Explain the various methods of noise control

CONTENT DETAILS

UNIT – 1

1.Principles of management

Introduction – meaning of management: - Management as an art of getting things done, management as a process, management as an activity

Management and administration – Development of management theory: - Taylor’s scientific management, contributions of F.W. Taylor, Henry Fayols principles of management (Brief description), compare F.W. Taylor & Henry Fayol’s contributions

Functions of management: -

- a) Planning: - concept, steps in planning
- b) Organizing: - concept and process steps, steps in organizing

- c) Staffing: - concept, list functions of staffing
- d) Directing: - concept, list the elements of directing
- e) Controlling: - Concept, list the steps in controlling process
- f) Decision making: - concept, steps in decision making, scientific approach to decision making

Different types of ownership: - Sole proprietorship, partnership, private Ltd., company, public Ltd., company, co-operative society (brief description only)

Organizational structure: - Definition of organization, different types of organizational structure: - line, functional, line & staff organization (brief description with advantages & disadvantages)

Leadership - Define leadership, different types of leadership, qualities of a good leader

Motivation - characteristic of motivation, importance, Maslow's need hierarchy theory, Techniques of motivation

Communication - Types of communication, Barriers in communication.

2. Human Resource Management

Concept of HR Management – Development of HR Management – Components of HRD – Job analysis – Job description – Job specification, Manpower planning – Requirements of manpower planning – Factors affecting the manpower planning – Job evaluation – Steps required for job evaluation – Methods for job evaluation – Merit rating – objectives and methods – performance appraisal. Training – Importance of training – Methods of training – advantages of training (Brief description only)

UNIT - II

1. Quality Planning and Control

Definitions of quality, Requirements of quality, list objectives of quality planning – quality control: - operator's quality control, inspectors quality control, Managers quality control, total quality control.

Quality Assurance: - Concept, definition, responsibility of quality assurance department, planning for quality assurance – three prong approach to quality planning: - (1) Product planning (2) Managerial & Operational planning (3) Documentation. Quality management system, quality loop.

2. ISO 9000 & Installation

Concept and role of ISO 9000, what is ISO 9000, whom does it help, elements of ISO 9000, steps for installation of quality system - preparatory step, implementation step, registration & certification step. Quality Audit - objectives, types of audits: - Adequacy audit, compliance audit, system audit, product audit, first party audit, second party audit, third party audit. Steps required to apply for ISO – 9000 Registration. Benefits of becoming an ISO 9000 company.

3. Understand the concept of TQM and Organizational Excellence

Concept, ten mantras of TQM, the link between ISO 9000 and TQM with the help of TQM Model – organization of TQM. Techniques of TQM - PDCA, Total Employee Involvement (TEI), POKA – YOKA – Failure proofing, JIT manufacturing.

Quality Circles - concept, characteristics, Brain storming method for solving Q.C. Problems. Organizational excellence through TQM - List the strength, weakness, opportunity and threat (SWOT analysis) of an organization by an example and analyse the current status – mission statement.

UNIT – III

1. Management Techniques – CPM & PERT

Introduction to Network analysis, application of CPM & PERT, scope of CPM & PERT commonly used terms in CPM: - Operation, pre-operation, post operation, concurrent operation, earliest finish time (EFT), latest finish time (LFT), Critical activities, critical path, EVENT, SLACK or FLOAT, Dummy activity, - procedure for CPM, problems on CPM, projects duration, slack, mark critical path (by AOA and AON method).

PERT - comparison between CPM & PERT, procedure for PERT, Estimation of activity time, commonly used terms in PERT, Event, Activity, successor Event, Predecessor event, Earliest Expected Time, Latest allowable time, slack – problems in PERT.

2. Marketing & Sales

Marketing - introduction, definitions, objectives, core concepts: - block diagram, distinguish between marketing and sales, marketing MIX. Buying process & behaviour of consumer, steps in market

planning – market segmentation. Sales - importance of sales, functions of sales management, market research, market information system. Forecasting related to marketing and sales

3. The Principles of a good wage payment system

Importance of good wage plan, types of wages - nominal, real, living, fair, minimum wages – requirement of a good wage payment system. Incentives - definitions, types of incentive plan for direct workers - non financial and semi financial incentives – financial incentive plans - straight piece rate system, straight piece rate with guaranteed minimum wage, differential piece rate system, Halsey plan, Rowan plan, Gantt (simple illustrative problems)

4. Material requirement planning (MRP)

MRP objectives & functions – Terminology – MRP systems – MRP outputs – Management information from MRP – Lot sizing considerations – Examples – applications – introduction to MRP – II - Just in time (JIT). (Brief description only)

UNIT – IV

1. Operations Research & Application

Concepts of OR, scope of OR, phases and process of OR, methods of OR -

1. Linear programming: - a) graphical & analytical method b) transportation method: - North west corner rule, Vogel approximation method
2. Waiting line or Queuing theory
3. Game theory

Linear programming: - concepts, formulation of LPP, Do problems on maximization of profit, minimum of total cost (by graphical & analytical method)

Transportation problem: - meaning, compute the initial feasible solution by northwest corner rule & Vogel approximation method (simple problems)

Game theory: - concept, two-persons zero sum game, the maxi-min- mini-max principle –optimal strategy, saddle point, example problems to compute saddle point – waiting line or queuing theory - concept, the information required for formulating a mathematical model (simple problems)

2. Management by objectives (MBO)

Concepts & definition, contents of MBO, sequence of MBO process with block diagram, steps required for MBO, guidelines for setting objectives

3. Management Information Systems (MIS)

Definition of MIS, Data, Information, management, systems concepts of management, a firm and its environment, objectives, contents of MIS, need for information, integrated MIS, functional and activity subsystems, MIS development - line diagram, application of MIS - inventory management, Human resource management, personal decision making.

UNIT – V

1. Industrial Psychology

Meaning, importance of good working conditions and environment: - physical working conditions, psychological working conditions, working conditions related to time, related to social situation. Behavioural dynamics: - self concept and self understanding, inter personal needs, developing interpersonal relationship: - framing first impression, developing mutual expectations, honouring psychological contracts, developing trust & influence, projecting positive qualities and hiding negative points – developing better behaviour and qualities a TQM approach: - conducting ‘SWOT’ analysis for self understanding, prepare incremental projects to reduce weakness and threats - mission statement

2. Small Scale Industries – Entrepreneur

List steps required to start small scale industry, procedure for registration (provisional and permanent registration) – sources of financial assistance, govt., assistance for development of SSI, preparation of project report, Tax: - an overview of income tax – excise duty, sales tax – procedure to be followed for sales tax

3. Industrial Safety

Define Accident, Frequency rate, severity rate, and accident proneness.

List the causes of accidents: - Mechanical, Environmental, personnel factors accident prevention techniques – 4 E’S of Accident prevention technique

4. Environmental Pollution and control

Ecology and Eco system, Impact of industrial development on environment, Causes and effects of air and water pollution on plant, animal life and material, Characteristics of industrial and municipal waste, Treatment processes:- Primary, secondary and tertiary, Sources of air pollutants on human beings, Effects of air pollutants on human beings, Prevention and control of air pollution, Solid waste management, Environment pollution control legislation and functions of pollution control boards, Causes of noise pollution and its control

Special Instruction to Question Setters

1. All units should be given equal weightage of marks
2. Problems from wage plan, CPM-PERT, and O.R should be included in every question paper in order to measure the application capability of students

REFERENCE BOOKS

- | | |
|---|---|
| 1. Industrial Engineering & production management | – Martand.T.Telsang
S.chand & Company |
| 2. Industrial Engineering & Management | - O. P. Khanna |
| 3. Operations Research | - Premkumar Guptha, D.S. Hira |
| 4. TQM | - Productivity Council |
| 5. ISO | - Tapan.P.Bagachi |
| 6. Entrepreneurship Development | - Jagmer Singh Saihi |
| 7. Industrial Management & Engineering Economics | - Banga & Sharma |
| 8. TQM | - B. Senthil Arasu & J.Praveen Paul
Scitech Publications |

SUBJECT TITLE : VEHICLE MAINTENANCE
SUBJECT CODE : AU 601
PERIODS/WEEK : 6
PERIODS/SEMESTER : 96

TIME SCHEDULE

<u>UNIT</u>	<u>TOPICS</u>	<u>PERIODS</u>
I.	Introduction	1
	Engine overhauling	18
II.	Petrol engine	9
	Diesel engine	6
	Two stroke engine	2
	Testing of gauges	2
	Test – 1	1
III.	Clutch	3
	Gear box	3
	Propeller shaft	1
	Differential and Rear axle	7
	Tyre	4
IV.	Suspension system	6
	Steering system	4
	Brake system	6
	Automobile maintenance	3
	Test – 2	1
V.	Costing	6
	Estimating	6
	Overheads	3
	Depreciation and obsolescence	3
	Test –3	1
	Total	96

OBJECTIVES

Upon completion of the study of this subject, the student should be able to:

1.1.0 Apply procedures of overhauling of engines

- 1.1.1 Distinguish between servicing and maintenance
- 1.1.2 Indicate the signs showing the necessity of engine overhauling
- 1.1.3 Recognize decarbonizing methods like oxygen decarbonizing, chemical decarbonizing, scraping methods etc
- 1.1.4 Conduct compression test, vacuum test and cylinder leakage test
- 1.1.5 Explain the procedure for engine dismantling and assembling
- 1.1.6 Check piston, cylinder, connecting rod, crank shaft, flywheel, valves and valve operating mechanism
- 1.1.7 Describe the servicing of different engine components

2.1.0 Apply the procedures of servicing ignition system and fuel system of petrol engines

- 2.1.1 Predict the need for servicing and testing of components of coil ignition system
- 2.1.2 Locate the correct ignition timing
- 2.1.3 Locate the defects in the fuel system components and suggest the servicing

2.2.0 Apply the procedures of servicing fuel system components of diesel engine

- 2.2.1 Outline the procedures of servicing F.I. system of Diesel engine

- 2.2.2 Write the procedures for bleeding and testing of F.I. pump, and testing of nozzles
- 2.3.0 Recognize the troubles of two Stroke Engines**
 - 2.3.1 Trouble shoot two stroke engines
- 2.4.0 Apply procedures of testing of Gauges used in Vehicles**
 - 2.4.1 Conduct testing of fuel gauge, oil pressure gauge and temperature gauge
- 3.1.0 Servicing of transmission system**
 - 3.1.1 Perform the servicing and adjustment of clutch
 - 3.1.2 Write the procedure for dismantling and assembling of Clutch
 - 3.1.3 Locate defects of clutch
- 3.2.0 Apply the procedure for dismantling and assembling of gear box**
 - 3.2.1 Write the procedure for dismantling and assembling of gear box
 - 3.2.2 Locate the defects of gear box
- 3.3.0 Apply the procedures of rectifying defects in propeller shaft**
 - 3.3.1 Write the procedure for dismantling and assembling Propeller Shaft
 - 3.3.2 Locate the defects of Propeller Shaft
- 3.4.0 Apply the procedure for servicing of differential and rear axle**
 - 3.4.1 Suggest the procedure for removal of axle in full floating, three quarter floating and semi floating types
 - 3.4.2 Discuss the troubles and adjustment of differential
- 3.5.0 Maintain tyres and tubes**
 - 3.5.1 Explain the tyre replacing method
 - 3.5.2 Draw the tyre rotation
 - 3.5.3 Show tube repair
 - 3.5.4 Discuss the causes of rapid tyre wear
 - 3.5.5 Describe the methods of tyre retreading
 - 3.5.6 Perform the balancing of tyres
- 4.1.0 Servicing of suspension, steering and brake systems**
 - 4.1.1 Distinguish between the functions of leaf spring and vibration dampers**
 - 4.1.2 Demonstrate the adjustment of front height of cars by setting torsion bars
 - 4.1.3 Rewrite the points for replacing suspension rubber bushes
 - 4.1.4 Explain the adjustment of front wheel alignment
 - 4.1.5 Discuss the care and maintenance of vibration dampers
 - 4.2.0 Understand the adjustment of free play and end play in various steering gear boxes like worm and roller, re-circulating ball, and rack and pinion types**
 - 4.2.1 Write the procedure for centralizing steering wheel
 - 4.2.2 Discuss the troubles in steering system
 - 4.3.0 Apply the procedure for brake shoe removal and retiming**
 - 4.3.1 Show brake adjustment and brake bleeding
 - 4.3.2 Write the procedure for servicing wheel cylinder and master cylinder
 - 4.3.3 Explain the checking of braking efficiency
 - 4.3.4 Discuss the troubles in hydraulic and air brake systems
 - 4.4.0 Apply the procedure for the maintenance of automobiles**
 - 4.4.1 Explain the types of maintenance – preventive and breakdown
 - 4.4.2 Prepare maintenance schedule of automobiles
 - 4.4.3 Outline the cleaning of vehicles in a service station
 - 4.4.4 Explain the equipment used in a service station
- 5 .1.0 Understand the method for finding cost of a product/job work**
 - 5.1.1 State the objectives of costing
 - 5.1.2 Explain the elements of costing
 - 5.1.3 Describe the costing methods
 - 5.1.4 Compute the cost of a product from the given data
- 5.2.0 Estimate cost of a product/job work**
 - 5.2.1 State the objectives of estimating
 - 5.2.2 Explain the components of estimation
 - 5.2.3 Discuss the errors in estimating

5.2.4 Estimate the cost of a product from the given data

5.3.0 Justify different over heads

5.3.1 Explain various methods of allocating overheads

5.3.2 Compute different overheads

5.3.3 Recognize depreciation and obsolescence

5.3.4 Distinguish between depreciation and obsolescence

5.3.5 Explain the cause of depreciation

5.3.6 Discuss various methods of calculating depreciation

5.3.7 Calculate depreciation of an asset or product from the given data

CONTENT DETAILS

UNIT – I

Introduction to servicing and maintenance of Automobiles - various signs showing the necessity of overhauling engine decarbonizing, vacuum test, compression test and cylinder leakage test. Causes of excessive lubricating oil consumption engine dismantling and assembling. Checking of engine components – causes of cylinder wear- cylinder reboring and honing – linear replacement. Servicing of valves. Valve adjustment and defects of valves. Piston defects and reconditioning methods. Testing of connecting rods. Defects and reconditioning methods. Measurement of bearing clearance and adjustment of connecting rod bearings. Crank shaft balancing and machining processes. Renewal of flywheel ring gear.

UNIT – II

Servicing of petrol engine – defects in coil ignition system like ‘No spark’, weak spark, intermitted spark and spark at some wires. Testing of ignition system component setting of ignition timing. Checking of advancing units. Servicing of spark plug. Trouble shooting of fuel system. Testing of A.C. mechanical pump. Tuning of carburetor. Causes of excessive fuel consumption and defects of carburetor. Engine tuning procedure. Servicing of diesel engine – F.I. pump timing and bleeding of diesel fuel system. Testing of Nozzles. Phasing and calibration of F.I. pump. Defects of F.I. pump and Nozzles. Trouble shooting chart for two stroke engines. Testing of fuel gauge, oil pressure gauge and temperature gauge. Troubles and diagnosis in MPFI and CRDi systems

UNIT – III

Servicing of clutch assembly. Fitting of clutch, clutch adjustments. Removal and refitting of trans-axle. Dismantling of propeller shaft and universal joint. Defects in propeller shaft. Servicing of differential and rear axle. Removal of axles in full floating, semi floating and three quarter floating types. Differential troubles and adjustments. Tube repair. Causes of tyre wear. Tyre rotation, retreading and balancing of wheels.

UNIT – IV

Servicing of suspension system. Checking of wheel alignment. Adjustment of torsion bars. Care and maintenance of vibration dampers. Replacement of suspension rubber bushes. Play adjustment in steering gear boxes. Centralizing steering wheel. Troubles in steering system. Brake shoe removal and re-lining. Brake bleeding and adjustment. Servicing of master cylinder and wheel cylinder checking of braking efficiency. Troubles in hydraulic and air brake systems. Periodic and break down maintenances. Maintenance schedule. Cleaning of vehicle in a service station. Equipment used in a service station.

UNIT – V

Costing – objectives and elements of cost. Components of cost and costing methods – problems. Estimating – objectives and constituents. Errors in estimating. Allocation of overheads. Problems – depreciation and obsolescence – causes of depreciation and methods of calculating depreciation – problems.

REFERENCES

- | | |
|--|----------------------------------|
| 1. Practical Automobile Engineering | - N. Selvarajan |
| 2. Practical Automobile Engineering | - Staton Abbey |
| 3. Auto Mechanics | - Anglin And Crouse |
| 4. Automobile Engineering vol. I, II & III | - Anil Chhikara |
| 5. Mechanical Estimating and Costing | - Banga and Sharma |
| 6. Automotive engines-theory and service | - James D Halderman |
| 7. Automotive service basics | - Donald W Patten & John Remling |
| 8. Maintenance& repair of Motor vehicles | - ILO Manual |

SUBJECT TITLE : AUTO DESIGN
SUBJECT CODE : AU 602
PERIODS/WEEK : 6
PERIODS/SEMESTER : 96

TIME SCHEDULE

<u>UNIT</u>	<u>TOPICS</u>	<u>PERIODS</u>
I.	Introduction	1
	Basic Link Mechanism	6
	Bearings	2
	Clutch	8
II.	Shafts	6
	Keys and Couplings	10
	Test – 1	1
III.	Piston	6
	Connecting Rod	6
	Cams	12
IV.	Gear and Gear Trains	10
	Belt Drive and Chain Drive	10
	Test – 2	1
V.	Vehicle Performance	8
	Front Axle	7
	Test – 3	1
	Total	96

OBJECTIVES

Upon the completion of the study of this subject, the student should be able to

1.1.0 Understand the factors governing design of machine elements

- 1.1.1 List the factors governing design of machine elements
- 1.1.2 Extend those factors in the design of machine elements

1.2.0 Understand the working of basic link mechanism define the terms like link, pair, kinematics pair, chain, inversion, mechanism, machine, constraint motion

- 1.2.1 Explain the inversions of four bar chain
- 1.2.2 Explain the working of coupling rod, Ackerman steering gear, beaus engine,
- 1.2.3 Explain the inversions of single slider crank chain – oscillating cylinder engine mechanism, reciprocating steam engine mechanism, gnome engine.
- 1.2.4 Explain the inversions of double slider crank chain – scotch yoke, Oldham coupling, ellipsoid trammel

1.3.0 Recognize the appropriate bearing for a given situation

- 1.3.1 Discuss the advantages and disadvantages of antifriction bearings

1.4.0 Understand the design of a single and multiplate clutch

- 1.4.1 Design single plate and multiplate clutches including the size of pressure springs

2.1.0 Design of shafts subjected to twisting and bending moments

- 2.1.1 Design shafts subjected to twisting moment, bending moment, combined twisting and bending moments
- 2.1.2 Design shafts considering torsion rigidity
- 2.1.3 Design shafts subjected to fluctuating loads
- 2.1.4 Compare the weight and strength of solid shaft with hollow shaft
- 2.1.5 Design keys and coupling
- 2.1.6 Discuss the various types of keys
- 2.1.7 Discuss the effect of keyways
- 2.1.8 Compute the proportions of keys, considering shearing and crushing

- 2.1.9 Discuss the requirements of shaft coupling
- 2.1.10 Design muff coupling and flange coupling
- 3.1.0 Design of I.C. Engine Piston**
 - 3.1.1 Design I.C. Engine Piston from the given data
- 3.2.0 Design of I.C. Engine connecting Rod**
 - 3.2.1 Design I.C. Engine connecting Rod, considering weight of Reciprocating parts
- 3.3.0 Recognize cam profile for a given application**
 - 3.3.1 Discuss the cam terminology
 - 3.3.2 Draw cam profile when the follower moves with uniform velocity, simple harmonic motion, uniform acceleration and retardation, cycloidal motion etc
- 4.0.0 Appreciate different gear trains**
 - 4.0.1 Discuss different types of gears
 - 4.0.2 Compute the proportions of gear
 - 4.0.3 Discuss the terminology of spur gears
 - 4.0.4 Differentiate the types of gear trains like simple, compound, reverted and epicyclic
 - 4.0.5 Find the number of teeth on gears using velocity ratio
- 4.1.0 Understand the application of belt drive and chain drive**
 - 4.1.1 Discuss the types of belt like flat belt, v-belt and rope
 - 4.1.2 Specify the materials used for making belt
 - 4.1.3 Derive the equation for length of open belt drive and crossed
 - 4.1.4 Find the belt thickness, face width etc
 - 4.1.5 Discover the condition for maximum power transmission
- 5.1.0 Evaluate the performance of automobile**
 - 5.1.1 Calculate power required for propulsion – different resistances
 - 5.1.2 Explain traction and tractive effort
 - 5.1.3 Discuss the road performance curves
 - 5.1.4 Discuss distribution of weights
 - 5.1.5 Compute stability of a vehicle on a slope
 - 5.1.6 Calculate weight transfer during acceleration and braking
 - 5.1.7 Distinguish loads acting on the front axle.

CONTENT DETAILS

UNIT – I

Introduction – factors governing the design of machine parts, general procedure in design. Basic link mechanism – definitions – link, pair, kinematic pair, kinematic chain, constraint motions, mechanism, machine, inversions, four bar chain, single slider crank chain, double slider crank chain.

Bearing: - Function and types – journal, footstep, collar, thrust.

Clutch: - Design of single and multiplate clutch – design of pressure springs.

UNIT – II

Shafts, keys and couplings: - Design of shafts subjected to twisting, bending, and combined twisting and bending, and shaft subjected to fluctuating loads. Effect of keyways on shaft. Function of keys – types of keys – sunk, saddle tangent, round and splines. Empirical proportions of key – design of key against shearing and crushing – **Couplings:** - Functions – requirements – classifications – design of sleeve coupling and flange coupling.

UNIT – III

Design of piston from the data like bp, revolutions/second, and explosion pressure Design of connecting rod considering inertia forces, cams – terminology – cam profile – uniform velocity, simple harmonic motion, uniform acceleration and retardation, cycloidal motion, types of followers

UNIT – IV

Gear and gear trains: - Types of gear – terminology gear trains – simple, compound, reverted and Epicyclic, design of spur gears, design of back gear of lathe headstock and automobile gearbox .

Belt drive and chain drive: - Types of belt and materials - flat belt drives – length of open and crossed belts (derivations) centrifugal tension, initial tension, belt speed, thickness of belt – condition for maximum power transmission – problems – v-belt and rope – Brief explanation. Types of chain – roller type and silent type – simple problems – length of chain and number of teeth on sprocket wheels

UNIT – V

Vehicle performance: - Power for propulsion – air resistance, rolling resistance, grade resistance – traction and tractive effort. Relation between engine revolutions N and vehicle speed V.

Road performance curves: - Acceleration, gradability, drawbar pull. Distribution of weight – case of three – wheeled vehicle and four-wheeled vehicle. Stability of a vehicle on a slope. Calculation of maximum acceleration, maximum tractive effort, and reactions for different drive, simple problems

Front Axle: - Front axle subjected to bending and shear stresses. Design of front axle.

REFERENCES

- | | |
|----------------------------------|--------------------------------|
| 1. Machine design | - R.S. Khurmi |
| 2. Theory of machines | - Thomas Bevan |
| 3. Design of machine elements | - Pakirappa or Lakshminarayana |
| 4. Automobile mechanics | - N.K. Giri, Khanna Publishers |
| 5. Automobile Engineering Vol. 2 | - Anil Chhikara |
| 6. Auto design | - R.B.Guptha |
| 7. Auto engine design | - J G Giles |

SUBJECT TITLE : ADVANCED AUTOMOBILE ENGINEERING
SUBJECT CODE : AU 603
PERIODS/WEEK : 5
PERIODS/SEMESTER : 80

TIME SCHEDULE

<u>UNIT</u>	<u>TOPICS</u>	<u>PERIODS</u>
I.	Fuels and Alternative energy options in Automobile Engineering	15
II.	Theory of combustion in SI and CI engines	15
	Test 1	1
III.	Super charging& A/C in cars	15
IV.	Automobile emission &controlling methods	17
	Test 2	1
V.	Modern vehicle accessories & safety devices	15
	Test3	1
	TOTAL	80

OBJECTIVES

Up on the completion of study of this subject the student should be able to

- 1.0 Understand the different types of fossil and non fossil fuels
 - 1.1 State the various properties of SI and CI engine fuels
 - 1.2 Discuss the effect of fuel additives
 - 1.3 Discuss the properties and performances of LPG,CNG, Alcohol, Hydrogen and Bio-diesel as automobile engine fuels
 - 1.4 Discuss Bi-fuel and Dual fuel systems
 - 1.5 Explain the working of electric cars and hybrid vehicles
 - 2.0 Discuss the combustion phenomenon in SI and CI engines
 - 2.1 State the stages in combustion of SI engines
 - 2.2 Explain the effects of engine variables in ignition lag and flame propagation
 - 2.3 Explain abnormal combustion process such as detonation , pre-ignition, and surface ignition in SI engines
 - 2.4 Explain the stages in combustion of CI engines
 - 2.5 Identify the various air fuel ratios in diesel engines
 - 2.6 Distinguish the delay period and variables affecting the delay period
 - 2.7 Define the Diesel knock and its control
 - 2.8 Identify the CI engine combustion chambers
 - 3.0 Define supercharging process
 - 3.1 State the objectives of supercharging
 - 3.2 Explain super charging in SI and CI engines
 - 3.3 Compare the performance of supercharged engines
 - 3.4 Explain the methods of supercharging and turbo charging
 - 4.0 Describe the various pollutants from automobile engines
 - 4.1 Mention the effect of pollutants
 - 4.2 Explain the causes of automobile pollution
 - 4.3 Discuss the fuel economy of automobile engines
 - 4.4 Explain different systems adopted to improve fuel economy
 - 5.0 Discuss the emission control techniques used in petrol engines
 - 5.1 List and explain different methods adopted to control petrol engine emissions
 - 5.2 Discuss emission control techniques used in diesel engines
 - 5.3 List and explain different methods adopted to control diesel engine emissions
 - 5.4 Discuss automotive emission control norms- EURO and BHARATH STAGE standards.
-
- 5.1.0 Explain the working of different accessories and safety devices of a modern vehicle
 - 5.1.1 Familiarize the students with modern vehicle accessories and safety devices.
 - 5.1.2 Identification of the position of them in the vehicle.

SUBJECT TITLE : CADD LAB - II
SUBJECT CODE : AU 605
PERIODS/WEEK : 3
PERIODS/SEMESTER : 48

TIME SCHEDULE

<u>UNIT</u>	TOPICS	PERIODS
I	Revision of computer aided drafting	3
	Working with layer property manager	3
II	Creating blocks with CAD	6
	Test -1	3
III	Basic Solid Modeling, standard solids, solid operation, Boolean operations, exercise using them	9
IV	Drawing Orthographic Views from simple solid models. Solids of revolution-creation of automobile components. Popet valve .Piston, Bearing supports etc	9
	Test -2	3
V	Drawings of automobile components	9
	Test -3	3
Total		48

The drawings mentioned in this topic should be drawn with the help of CAD/ pro E software. The Public Examination in this subject should be conducted as a practical CAD lab.

SUBJECT TITLE : **VEHICLE TESTING LAB**
SUBJECT CODE : **AU 606**
PERIODS/WEEK : **6**
PERIODS/SEMESTER : **96**

CONTENT DETAIL

- 1 Study the different units of vacuum servo and air brake units, Dismantling and assembling of air brake units (brake valve, unloader valve , brake chamber)
- 2 Wheel balancing and wheel alignment testing . Automatic Tyre changer.
- 3 Head light beam alignment.
- 4 Fuel injection pump calibration and phasing
- 5 M. P F I sensor identification and testing
- 6 Testing of car A.C.
- 7 Dismantling and assembling of two wheeler transmission
- 8 Student must be able to drive and test the vehicle

SUBJECT TITLE : **PROJECT**
SUBJECT CODE : **AU 607**
PERIODS/WEEK : **3**
PERIODS/SEMESTER : **48**

CONTENT DETAILS

This course is intended to familiarize the students, with the various aspects of Project & Entrepreneurship development programme in general and applied to automobile field in particular. It consists of 4 parts.

- I. Informing the student about the following
- a) Concept of project, Entrepreneurship and project report
 - b) Cottage industry, small scale industry and large scale industry
 - c) Small scale industry – Role and scope, how to start small scale industry, assistance from government, helps of service organization available, assistance to educated unemployed, factory rules and regulations.
- Test - 1
- II. Informing the student about the factors involved in setting up an industry to manufacture automobile components
- a) Licensing and legal obligations
 - b) Raw materials supply
 - c) Labour required – skilled and semi-skilled
 - d) Market survey for finished items
 - e) Banking and other commercial facilities
 - f) Technical expertise – small industry service institute, entrepreneurship development programmes of banks, industries department
 - g) Purchase of equipment
 - h) Basic accounting procedure
- III. Informing the student about the factors involved in setting up a service and maintenance organization for automobile units
- a) Types of service and Maintenance set up
 - 2-wheelers and 3-wheelers
 - Passenger cars
 - Heavy vehicles
 - Agricultural and farm equipment
 - b) Preliminary survey before setting up
 - c) Facilities required before setting up – Availability of other auxiliary services, like welding, machine shop
- Test - 2
- IV. Project presentation & evaluation of working models.
- Test – 3

Note: -

1. The students should visit local industries and service setup, and familiarize themselves with the various aspects listed above
2. Internal assessment is done on the basis of the tests conducted, 20 marks for the first two tests and 30 marks for the third test

3. Lectures by eminent people, may be arranged and seminars may be arranged to impart latest information in the field
4. Following is the list of feasible project works
 - (i) Gas conversion of petrol vehicles
 - (ii) Alternate fuels
 - (iii) Brake lock
 - (iv) Automatic dippers
 - (v) Shaft drive two wheelers
 - (vi) Air suction valve (for reducing pollution)
 - (vii) Air wiper
 - (viii) Solenoid operated valves
 - (ix) FOUR wheel steering
 - (x) Engine re-conditioning and re-setting
 - (xi) Introduction of petrol injectors in place of carburetors
 - (xii) Fitting of turbo chargers in old diesel engines
 - (xiii) Conversion of water cooling system in to liquid cooling
 - (xiv) Fitting of remote controlled central locking system for doors
 - (xv) Conversion of coil – ignition system in to electronic ignition system in old petrol engines
 - (xvi) Fitting EGR valve and air injection systems
 - (xvii) Battery re-building
 - (xviii) Working models of Electric circuits
 - (xix) Shock absorber re-conditioning.
 - (xx) Safety monitoring of gas converted vehicle
 - (xxi) Automatic climate control
 - (xxii) Air bags

List of Faculty who made Contributions to the Curriculum Revision 2006

Sl. No	Name	Designation
1	Sri. Aathipagavan	Scientist, VSSC
2	Sri. Philip Kurian	Asst. Professor&Head in Charge, NITTTR Extn Centre, Kalamassery
3	Sri. Ramachandran	Principal
4	Sri. Hemachandran	Head of Section in Mechanical Engg
5	Sri. Samuel	Head of Section in Mechanical Engg
6	Sri. N. Vijayakumar	Head of Section in Mechanical Engg
7	Sri. Nasarudeen B	Head of Section in Mechanical Engg
8	Sri. George Joseph	Head of Section in Mechanical Engg
9	Sri. Sreenivasan	Head of Section in Mechanical Engg
10	Sri. Sebastian Thomas	Head of Section in Automobile Engg
11	Sri. V.M. Venukuttan	Lecturer in Mechanical Engg
12	Sri. Chandranganathan	Lecturer in Tool & Die Engg
13	Sri. S.R. Rajendranathan Nair	Lecturer in Automobile Engg
14	Sri. Hamsha Koya K	Lecturer in Automobile Engg
15	Sri. V.V. Jayaprasad	Lecturer in Automobile Engg
16	Sri. V. Ramachandran	Lecturer in Automobile Engg
17	Smt. Cisy Simon	A/L in Wood & Paper
18	Sri. Prabhakaran	A/L in Wood & Paper
19	Sri. Karunakaran C.K	A/L in Tool & Die Engg
20	Sri. Sudheer	Demonstrator in Wood & Paper