GOVERNMENT OF KERALA
DEPARTMENT OF TECHNICAL EDUCATION

CURRICULUM DEVELOPMENT CENTRE
KALAMASSERY

CURRICULUM OF
DIPLOMA COURSE

IN

INSTRUMENT TECHNOLOGY

SEMESTER SYSTEM
(Revision 2006)

Prepared at

CURRICULUM DEVELOPMENT CENTRE, KALAMASSERY

RULES AND REGULATIONSOF 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 X^{th} 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 1 ½ (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 with in 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: Electronics, Electronics Production Technology, Electronics & Instrumentation, Electronics & Communication, Instrument Technology and Biomedical engineering

First Year (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
IT 101/ EC101/ EP101/ EI 101/ EL101/ BM101	Basic Electrical & Electronics	4	-----	4	100	----	25	125
	PRACTICAL:							
GE106	Applied Science Lab							
A	Physics	----	2	2	----	50	25	75
B	Chemistry							
IT102/ EC102/ EP102/ EI 102/ EL102/ BM102	Basic Electronics Lab	-----	2	2	----	50	25	75
IT103/ EC103/ EP103/ EI 103/ EL103/ BM103	Workshop Practice	-----	4	4	----	50	25	75
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	100 marks

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

TIME SCHEDULE

UNIT	TOPIC	PERIODS
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

1.2.3 Find the minors and cofactors of the elements in a determinant

1.2.4 Solve simultaneous linear equations in 3 unknowns using Cramer's rule.

1.2.5 Elimination of three linear equations in to unkowns.

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 nCr 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± B), cos (A± B), tan (A ±B).

2.1.2 Solve the problems of the types

(1) Prove that $\frac{\text{Cos A - Sin A}}{\text{Cos A + Sin A}} = \tan(45^\circ - A)$

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 SinA, CosA, tanA 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) $\frac{\text{Sin A + Sin 3A+ Sin 5A}}{\text{Cos A+Cos 3A+ Cos 5A}} = \tan 3A$

(2) $\text{Sin } 10^\circ \text{ Sin } 50^\circ \text{ Sin } 70^\circ = 1/8$

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) $\lim_{x \to a} f(x) = l$

2) $\lim_{x \to \alpha} 1/x = 0$

3.1.3 Find the limit of the following type

1) $\lim_{x \to 1} \frac{2x + 1}{3x - 2}$

2) $\lim_{x \to \alpha} \frac{2x^2 + 3x}{5x^2 + 4x + 1}$

3) limit $\frac{x^2 - 3x}{x^2 - 9}$ as $x \to 3$

3.1.4 verify the following results

1) limit $\frac{x^n - a^n}{x - a} = n a^{n-1}$, when n is rational as $x \to a$

2) limit $\frac{\sin ø}{ø} = 1$, is in radian as $ø \to 0$

3.1.5 Solve problems of the type

1) Limit $\frac{\sqrt{x} - \sqrt{a}}{x - a}$ as $x \to a$

2) limit $\frac{\sin mø}{ø}$ as $ø \to 0$

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 $\lim_{\Delta x \to 0} \frac{\Delta y}{\Delta x}$

3.2.2 Show the geometrical concept of derivatives

3.2.3 Find the derivatives of x^n, Sinx, and Cosx 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

$e^{\sin x}$, $\log \sin x$, $(x^2+1)^{10}$ $\operatorname{Sec} 5x$, $\frac{\sin 2x}{1+\cos 2x}$, $\operatorname{Cot}^5 (x^3)$, $\log (\sec x + \tan x)$

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
$x = f(x)$, $y = g(t)$

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 $S = 2/3t+ \text{Cos}t$ 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 $y = x^3 – 18 x^2 + 96 x$
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, sinx, cos x, e^x, etc

4.3.3 Find the integrals using the rules
1) $\int (u \pm v)\, dx = \int udu \pm vdx$
2) $\int kudx = k\int udx$

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) $\int ex^2\, x\, dx$

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

$$\int_a^b f(x)\,dx = f(b) - f(a) \text{ where } F^1(x) = f(x)$$

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 predicator.

UNIT – III

3.1 Function and Limits

Definition, some problems for finding limits, Properties

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

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 $\int f(g(x)\, g^1(x)\, dx$, $\int f(ax + b)^n\, dx$

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, $\int_0^{\pi/2} \text{Sin}^2 x\, dx$, $\int_0^{\pi/2} \frac{\text{Sin}x}{\sqrt{1-\cos x}}\, dx$

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 SHEDULE

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	1.2 Dynamics	14
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II	2.1 Statics	10
	2.2 Elasticity	4
	2.3 Fluid Flow	5
	2.4 Viscosity	3
	2.5 Surface Tension	3
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III	3.1 Optics	7
	3.2 Electricity	12
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	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 $Sn = u+a (n – ½)$
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 Scale 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 rotting 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 Poiseusilles 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 issued 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 formuls $1/f= (n-1)(1/R1 - 1/R2)$, 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 $S_n = U + a (n – ½)$ - 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 enemy, 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 (Qualitaive 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 $1/f = 9n-1)[1/R1 - 1/R2]$, 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 SHEDULE

UNIT	TOPIC	PERIODS
I	**INORGANIC AND THEORECTICAL CHEMISTRY**	
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	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 oxidisation & reduction
1.4.8 Illustrate redox reactions taking the reactions in Daniel Cell as example

P^H & 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 NaCI as example anode reaction & cathode reaction as oxidisation & 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 & ^E
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 & ^H b) entropy S & ^S
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 & ^G
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 Fe(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, plastizisers, 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 THEORECTICAL 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, Aufban, Hundi, Paul's Principle – Electric configuration – Modern Periods Law - classification of elements based on electronic configuration.

Chemical Bonding - theory of valency – Inertness of Zero group elements - Ionic bond, Co-ordinate 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 – (Arrherius, & 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).

Ironic 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, Morality & 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 balling, (Constructional details – charging & discharging) Electrochemical senis – 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) Barrur 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, Adrabalie, Isobaric, Isochoric Process.

First Law of Thermodynamics – (statement)

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

Concept of Work & heat

Mathematical expression for the 1^{st} Law of thermodynamics

Application of 1^{st} Law (Hess's Law)

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

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

Second Law of Thermo dynamics (statement & Mathematical Expression)

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

Gibbs-Helzmotz 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. Bredic'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 wish 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 octave 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

UNIT	TOPIC	PERIODS
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 Identity 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 || to HP
2.1.5 Project lines inclined to HP and || to VP
2.1.6 Project lines inclined to VP and || 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 path 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 path 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 place 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 appropriate 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

UNIT	TOPIC	PERIODS
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 if 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 soft ware, 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, out put 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 /out put 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/out put 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 : BASIC ELECTRICAL AND ELECTRONICS
SUBJECT CODE : IT 101/EC 101/EP 101/EI 101/EL 101/BM 101
PERIODS/WEEK : 4
PERIODS/YEAR : 128

TIME SCHEDULE

UNIT	TOPIC	PERIODS
I	Passive Components, A.C. Fundamentals, Poly-phase circuits & Network Theorems	28
	Test 1	1
II	Semi conductors, PN junction Diodes Different types of diodes	20
	Test 2	1
III	Diode circuits, Introduction to Transistors	25
	Test 3	1
IV	Transistor configuration & Biasing Techniques	25
	Test 4	1
V	Special type of Transistors, Power devices & Opto-Electronic devices	25
	Test 5	1
	Total	128

OBJECTIVES

UNIT – I

1.1.0 Understand the different types of resistors and their uses

1.1.1 Define the property of resistance
1.1.2 List the specifications of resistors and state their importance
1.1.3 Classify types of resistors
1.1.4 List the applications of fixed resistors, variable resistors in electronic circuits.
1.1.5 Explain the working of PTC and NTC resistors and their application.

1.2.0 Familiarize with capacitors used in electronic circuits and their applications

1.2.1 State the charging and discharging of capacitors
1.2.2 List the specification of a capacitor and state their importance
1.2.3 Classify capacitors
1.2.4 Explain the working of capacitors
1.2.5 State the application of each type of capacitors
1.2.6 List the use of gang condensers, trimmers, padders.

1.3.0 Familiarize with different types of inductors, transformers and their applications

1.3.1 List the different types of inductors and their applications
1.3.2 Explain the working principle of a transformers
1.3.3 List the types and applications of transformers

1.4.0 Understand the basic network theorems

1.4.1 Explain superposition theorem, Thevenin's theorem, Norton's theorem, reciprocity theorem and maximum power transfer theorem

1.5.0 Understand the fundamentals of alternating current

1.5.1 Define waveform, time period, frequency and amplitude, phase difference, r.m.s. value, average value
1.5.2 Derive the equation of sinusoidal voltage and current
1.5.3 Explain A.C. through resistors, inductors and capacitors
1.5.4 Define Q-factor of a coil
1.5.5 Define resonance in R-L-C -Series & parallel circuits
1.5.6 State the inductive reactance, capacitive reactance and impedance
1.5.7 Explain the generation of 3phase voltage equations, phase difference and vector representation
1.5.8 Define line voltage and current, phase voltage and current in 3 Ø system
1.5.9 Explain circuits the use of star & delta connections.

UNIT – II

2.1.0 Recognize the semiconductor materials & devices

2.1.1 Sketch Energy Band diagrams of conductors, insulators & semiconductors
2.1.2 Distinguish between intrinsic & extrinsic semiconductors
2.1.3 State the majority & minority carriers in P, N type materials
2.1.4 Explain the term doping
2.1.5 Explain the formation of PN junction diode, depletion region
2.1.6 Distinguish between drift & diffusion currents
2.1.7 Describe potential barrier
2.1.8 Sketch V-I characteristics of diode
2.1.9 Describe Zener & Avalanche Breakdown of diodes
2.1.10 Explain the determination of static & dynamic resistance of diode
2.1.11 Explain the specifications of diodes

2.2.0 Recognize different types of diodes

2.2.1 Explain the working & V-I characteristics of Power, Zener, Varactor & Tunnel diodes
2.2.2 Describe important specifications of diodes
2.2.3 Describe applications of Power diodes, Zener diodes, Varactor diodes & Tunnel diodes

UNIT – III

3.1.0 Appreciate the principle of rectification and filtering

3.1.1 State the working of a diode and a rectifier
3.1.2 Draw half wave and full wave rectifier circuits including bridge rectifier and explain their working
3.1.3 Draw the relationship between DC output and AC input voltage
3.1.4 Define the terms rectification efficiency, ripple factor
3.1.5 Calculation of average and r.m.s values of voltages and currents for various rectifiers
3.1.6 Draw the filter circuits, different types, shunt capacitor, series inductor and π section filters and explain their working
3.1.7 Draw the different wave shapes
3.1.8 Draw the voltage Doublers and Tripler circuit and state principle of working

3.2.0 Understand the concept of transistor

3.2.1 Explain the working of PNP & NPN transistor
3.2.2 Draw the mechanism of current flow and current relation $I_E = I_B + I_C$
3.2.3 State the meaning of leakage current and effect of temperature

UNIT – IV

4.1.0 Understand different configurations of transistors

- 4.1.1 Draw the different configuration of transistor
- 4.1.2 Sketch the input and output characteristics of CB & CE Configuration
- 4.1.3 Determination of i/p & o/p resistance from characteristic curves
- 4.1.4 Compare the different configurations of transistor
- 4.1.5 Define and relate the term Gama and Beta factors

4.2.0 Understand different biasing techniques of transistors

- 4.2.1 Sketch DC Load line
- 4.2.2 Define operating point
- 4.2.3 Explain the need for stabilization of operating point
- 4.2.4 Study the different biasing circuits
- 4.2.5 Study the behavior of CE amplifier with potential divider biasing.

UNIT – V

5.1.0 Understand the operation of UJT

- 5.1.1 Study the operation of UJT, VI characteristics & symbol
- 5.1.2 Equivalent circuit of UJT & its Application

5.2.0 Translate the principle of operation of FET

- 5.2.1 Draw the Basic construction of JFET, P-channel and N-channel
- 5.2.2 State the principle of operation and the characteristics of JFET
- 5.2.3 Compare FET with Bipolar Transistor
- 5.2.4 List the advantages and disadvantages
- 5.2.5 List the parameters of JFET
- 5.2.6 Applications of JFET
- 5.2.7 Classify MOSFET such as depletion and enhancement modes
- 5.2.8 Compare JFET and MOSFET
- 5.2.9 Application of MOSFET

5.3.0 Appreciate the concept of integrated circuit

- 5.3.1 Study the basics of integrated circuits
- 5.3.2 List the advantages
- 5.3.3 State the needs for SMD & list the advantages

5.4.0 Recognize the different types of opto electronic devices

- 5.4.1 State the working principles of photo resistors, photodiodes, phototransistors, photovoltaic cells, LEDs, LCDs, and Opto couplers
- 5.4.2 Explain simple application of Opto electronic devices.

CONTENT OUTLINE

UNIT – I:

PASSIVE COMPONENTS, A.C FUNDAMENTALS, POLY-PHASE CIRCUITS & NETWORK THEOREMS

Fixed resistors, variable resistors and their specifications – PTC and NTC resistors, High precision resistors, applications. Capacitors – charging & discharging specification, different types of capacitors, variable capacitors, application of capacitors. Inductors – AFC & RFC, Transformers, pulse transformer, applications.

Equations of sinusoidal voltage & current, waveforms, time period, frequency, amplitude, phase difference, r.m.s value, average value, A.C. through Resistors, Inductors and Capacitor, inductive reactance, capacitive reactance and impedance. Q-factor, resonance in R.L.C. (Series & parallel).

Network theorem's – Superposition theorem, Thevenin's theorem, Reciprocating theorem, Norton,s theorem, Maximum power transfer theorem.

Poly-phase circuits – generation of poly phase voltage, equations, phase difference, e m f vector representation, comparison between single & 3 phase systems, star & delta connections, relations of voltage & current in star/delta connections, expression for power in 3 phase systems – simple problems.

UNIT – II:

SEMI CONDUCTORS, PN JUNCTION DIODES, DIFFERENT TYPES OF DIODES.

Energy band diagram of conductors, insulators, semiconductors, intrinsic & extrinsic semiconductors, doping, P&N type, majority & minority carriers. PN junction, drift & diffusion current, depletion layer, potential barrier, behaviour of PN junction under forward & reverse bias, break down on diodes, Zener & avalanche breakdown. VI characteristic of PN junction diode, determination of static and dynamic resistance, specification of diode

Different types of diodes – brief description, working & VI characteristics of power, zener, varactor and tunnel diodes. Important specification & applications

UNIT – III:

DIODE CIRCUITS, INTRODUCTION TO TRANSISTORS

Working of the diode as a rectifier, half wave & full wave rectifiers, bridge rectifiers. Relation between D.C output and A.C output voltage, rectification efficiency & ripple factor, average & r.m.s values of voltage & current for various rectifiers. Filter circuits, shunt capacitor, series inductance and π section filter circuits, applications. Voltage Doubler & Tripler circuits operations.

Concept of bipolar transistor PNP & NPN transistor – Mechanism of current flow, current relation ($I_E = I_B + I_C$). Concept of leakage current (I_{CBD}) and effect of temperature on leakage current.

UNIT – IV:

TRANSISTOR CONFIGURATION AND BIASING TECHNIQUES

CB Configuration leakage current, input & characteristics, determination of dynamic input & output resistance, CE configuration, current relation (Collector current in terms of base current & leakage current I_{CED}), Input & output characteristics, determination of input & output resistance.

CC configuration – expression of emitter current in terms of base current and leakage current

Comparison of CB, CE & CC with regards to input & output impedances, current gain, voltage gain & leakage current.

Transistor biasing techniques – DC load line – Fixing the operating point, Need for stabilization.

Different biasing methods – Working of a single stage CE transistor amplifier.

UNIT – V:

SPECIAL TYPE OF TRANSISTORS, POWER DEVICES & OPTO ELECTRONICS DEVICES.

UJT, Operation, VI characteristics, Equivalent circuit, Applications. FET, advantages and disadvantages, Basic construction of JFET, Principle and operation of JFET, Parameters of JFET, Applications.

MOSFET, Depletion MOSFET, Enhancement MOSFET, Application.

Difference between JFET & MOSFET

Power devices – SCR, diac & triac

Introduction to Integrated ckt technology, Advantages, SMD's and its advantages

Opto electronic devices – working principles of photo resistors, photodiodes, phototransistors, photovoltaic cell, LED, LCD & Opto couplers – simple application of opto electronic devices.

REFERENCE BOOKS

1. Basic Electrical Engineering. : V.N. Mittle
2. Basic Electronics and Linear circuits : Kulshreshtha, Bhargava N.M. & S.C.Gupta TTTI Chandigarh
3. Electronic Devices and circuits : Milman and Halkias
4. Electronic Principles : Malvino
5. Electronic Devices and Circuit Theory : Robert Boylestad and Nashelsky
6. Electronic Devices and Circuits : Allen Mottershead
7. Electronic circuits : Floyd

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 HCI 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 : BASIC ELECTRONICS LAB
SUBJECT CODE : IT 102/EC 102/EP 102/EI 102/EL 102/BM102
PERIODS/WEEK : 2
PERIODS/YEAR : 64

EXERCISES

1. Identification of Passive Components: Resistors, Capacitors, Inductors, Transformers, Thermistors, and LDR & familiarization with Breadboards.
2. Identification of various types of Electronic Instruments: Ammeters, Voltmeters, Multimeters (Analog and Digital), Function Generators, Power Supply and CRO.
3. To observe a Sine wave on a CRO and draw it indicating all its values: Amplitude, Time Period and Frequency.
4. Measurement of voltage at various setting (Low and high voltage) of regulated Power supply by using Analog & Digital Multimeters
5. Measurement of voltage and current by loading the regulated Power Supply.
6. Measurement of Resistors by Multimeters and Compare with Colour code value
7. Check an Electrolytic Capacitor using a Multimeter
8. Identification of Package type and Terminal familiarisation with characteristics & Rating using data book for various types of Diodes.
9. Checking of Diode using a Multimeter
10. Draw the V-I characteristics (Forward and Reverse) of a silicon Diode. Determine the static and dynamic resistance
11. Draw the V-I characteristics (Forward) of a Germanium Diode. Determine static and dynamic resistance.
12. Plot the V-I characteristics of Zener diode. Determine the Breakdown voltage
13. Measure and Plot the Input/Output voltages of a half wave rectifier with and without filters. Calculate Ripple Factor
14. Measure and plot the Input/Output voltages of a full wave rectifier with and without filters. Calculate Ripple Factor.
15. Measure and Plot the Input/Output voltages of Bridge Rectifier with and without filters. Calculate Ripple Factor
16. Plot the wave shapes of a full wave rectifier with shunt capacitor, series inductor and π section filter. Measure voltages
17. Setup a voltage regulator using Zener Diode.
18. Construct a voltage doublers and observe the output
19. Construct a voltage Trippler and observe the output
20. Identification of Package Type & Terminals familiarization with characteristic & Rating using data books for transistors
21. Plot the Input and Output characteristics for a transistor in common base configuration and determine current gain, Input and Output resistance

22. Plot the input and output characteristics for a transistor in common emitter configuration and determine current gain, input and output resistance.
23. Plot the V-I characteristics of UJT
24. Plot the V-I characteristics of a JFET
25. Familiarization of ICs and SMD

SUBJECT TITLE : WORKSHOP PRACTICE
SUBJECT CODE : IT 103/EP 103/EC 103/EI 103/EL 103/BM103
PERIODS/WEEK : 4
PERIODS/YEAR : 128

TIME SCHEDULE

UNIT	TOPIC	PERIODS
I	Sheet metal and Aluminium fabrication	40
	Test – I	4
II	Fitting	20
	Test – II	3
III	Welding	16
	Test – III	3
IV	Carpentry	16
	Test – IV	3
V	Machine shop practice	20
	Test – V	3
	Total	128

OBJECTIVES

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

1.0 Perform various exercises as per the given drawing and specifications
- 1.1 Identify the required tools from a given number of tools
- 1.2 Select particular tool for a specified operation
- 1.3 Locate the functional part of equipments and tools
- 1.4 Explain the use of tools and equipment
- 1.5 Prepare the edges/work piece as per drawing standard
- 1.6 Set up the job as per the procedures of operation
- 1.7 Perform various steps as per the procedure
- 1.8 Inspect the job for achievement of accuracy and finish
- 1.9 Clean the tools, instruments and work place
- 1.10 Return the tools, instrument as per regulations
- 1.11 Exhibit safety precautions

CONTENT DETAILS

UNIT – I:
SHEET METAL AND ALUMINIUM FABRICATION

Sheet Metal

Study of tools - Different types of punches, shears, snips, cutters, hand drills, taps, dies and tools used for cutting bending and making holes for mounting electronic Hardware and components.

Exercise

Marking, measuring, cutting of sheets

Formation of joints like grooved joint, locked grooved joints, corner joints, bending, punching, drilling of sheets to make cabinets and chassis and panels

Aluminium Fabrications

Introduction – Aluminium fabrication and its scope, Study of tools - Different types of files, hacksaw, screwdriver, hammer, drill bits etc, Measuring tools – Steel tapes, try square, bevel square, combination set etc

Exercise

Cutting, filing, drilling with portable drill, making keyholes, making of different types of joints such as straight joints, corner joints, cut joint with different aluminum sections.

UNIT – II:

FITTING

Study of tools - Marking tools – scriber, compass, divider, outside and inside calipers, center punch, tri square, bevel square, straight edge, surface plate, v – block, Cutting tools – Flat chisels, flat, cross cut, half round, diamond, point side.

Files – single cut & double cut, rough, second cut, smooth and dead smooth files, safe edge file, flat, square, pillar, round, triangular, half round knife and needle files, Scraper – Flat, Triangular and half round, Hacksaw – Solid and adjustable frames, Power hacksaw, Striking tools – Ball peen, straight pen, cross peen, sledge hammer, Holding devices – Bench vice, leg vice, hand vice, pin vice and toolmakers vice, Drills & Taps – Hand drill, power drill, various types of taps B.S.W. & Metric

Miscellaneous tools – Screwdriver, spanners (double end spanner, ring spanner, box spanner)

Exercise

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

Preparation of joints, making of utility articles

UNIT – III:

WELDING

Identification of various tools, equipment and accessories used in welding. Study of ac-arc welding, DC-generators, rectifier welding set, spot welding equipments.

Exercise

Horizontal and vertical welding

Welded joints after edge preparation – 'V' and double 'V'

UNIT – IV:

CARPENTRY

Study of tools - Marking and measuring tools such as straight edge, miter square, tri square, bevel square, marking knife, marking gauge, mortise gauge, cutting gauge, wing compass, trammel, dividers, outside and inside calipers, spirit level and plumb bob.

Cutting tools such as rip 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, smoothing plane, rebate plane, plough plane, spok shave, Boring tools such as bradawl ratchet brace, wheel brace etc, Holding devices – bench vice, sash clamp, g-clamp and miscellaneous tool like Rasp file, scraper, pincers

Exercise

Preparation of carpentry joints like cross halving joints, single side dove tail joint, double side dove tail joint, mortise and tenon joint. Practice on cabinet making (Electronic units such as Radios, TV, Amplifiers etc)

UNIT – V:

MACHINE SHOP PRACTICE

Exercise on lathe, shaper, planer, surface grinder, Lathe work – Plane, taper, step turning

Shaper – Shaping flat surface and grooving practice, Surface grinder – Grinding flat and inclined surfaces, Planning machine – Planning on flat and inclined surface

Computer aided manufacture with the help of CNC Machine (study only)

Identify various parts of a CNC Machine. Descriptive study of various codes used NC/CNC machine. Demonstration showing the working of CNC Machine with manual programming, with CAD as wells as CAD/CAM designer software

SUBJECTS OF STUDY AND SCHEME OF EVALUATION

SEMESTER III

Branch : Instrument Technology

Code	Subject	Periods Per Week			Evaluation (Marks)			
		Theory	Practical/ Tutorial	Total	Theory	Practical	Internal	Total
IT301/ EL301 EP301/EI301 EC301/BM301	Electrical Technology	5		5	75		25	100
IT302/EL302 EP302/EI302 EC302/BM302	Electronic Circuits	5	1	6	75		25	100
IT303/EL303 EP303/EI303 EC303/BM303	Digital Electronics	5	1	6	75		25	100
IT 304	Measurement System	5	1	6	75		25	100
IT305/EL305 EP305/EI305 EC305/BM305	Electronic Circuit Lab		3	3			25	100
IT306/EL306 EP306/EI306 EC306/BM306	Digital Electronics Lab		3	3		75	25	100
IT 307	Electrical Measurement Lab		3	3		75	25	100
	ISAP Skills Development		3	3				
	TOTAL	20	15	35	300	225	175	700

ISAP: - Information Search Analysis and Presentation

SUBJECT TITLE : ELECTRICAL TECHNOLOGY
SUBJECT CODE : IT 301 / EC 301 / EP 301 /EI 301 / EL 301 / BM 301
PERIODS/WEEK : 5
PERIODS/SEMESTER : 80

TIME SCHEDULE

UNIT	TOPIC		PERIODS
I	Transformers		14
		Test - I	1
II	DC Generators		16
		Test - II	1
III	DC Motors		14
		Test - III	1
IV	Alternators		14
		Test - IV	1
V	AC Motors		17
		Test - V	1
		Total	80

OBJECTIVES

UNIT – I

1.1.0 Review the working principle of transformers

1.1.1 Write the e.m.f equation of a transformer
1.1.2 Understand the losses in a transformer
1.1.3 Calculate the efficiency and regulation from O.C & S.C test
1.1.4 Understand the working principle of Auto transformer
1.1.5 Know the ratings and types of power transformers used in electronic circuits
1.1.6 Compare different type of transformers.

UNIT – II

2.1.0 Understand the Working Principle of DC Generator

2.1.1 Understand the generation of torque due to alignment of magnetic filed
2.1.2 Understand the principle of DC generator
2.1.3 Know the emf equation of DC generator
2.1.4 Know the construction of DC generator
2.1.5 Know the building up of voltage in DC shunt generator
2.1.6 Understand the load characteristic of DC shunt generator
2.1.7 Know the function of commutator in DC machines

UNIT – III

3.1.0 Understand the Working Principle of DC Motors

3.1.1 Understand the principle of operation of DC motors
3.1.2 Understand Fleming's left hand rule
3.1.3 Understand the shunt, series, compound motors
3.1.4 List the factors affecting the speed of DC motors
3.1.5 Understand the speed control using field control and armature voltage control
3.1.6 Illustrate the method of starting DC motor
3.1.7 List the application of DC motors

UNIT – IV

4.1.0 Understand the Working Principle of Alternators

- 4.1.1 Understand the principle of operation of alternator
- 4.1.2 Understand the construction of alternator
- 4.1.3 Know how the frequency of generated AC is determined
- 4.1.4 Know the relationship between frequency and number of poles
- 4.1.5 Know about the cooling of turbo alternators
- 4.1.6 Understand the load characteristic of alternator
- 4.1.7 Understand the parallel operations of alternators

UNIT – V

5.1.0 Understand the Working Principle of a Motors

- 5.1.1 Describe the working principle of 3 phase induction motor
- 5.1.2 Compare case and slip ring induction motors
- 5.1.3 Know about the starting of AC Motors
- 5.1.4 List the applications of 3 phase induction motors

5.2.0 Understand the Working Principle of Single Phase Motors

- 5.2.1 Identify the different types of motors used in electronic equipment's
- 5.2.2 Explain the principle of operations of single phase induction motor, universal motor, stepper motor
- 5.2.3 List the applications of universal motor, stepper motor
- 5.2.4 Understand the working principle of AC and DC servo motors
- 5.2.5 List the applications of servo motors

CONTENT DETAILS

UNIT - I: TRANSFORMERS

Working principle and elementary theory of ideal transformer – emf equations – turns ratio, losses, and efficiency of a transformer.

Autotransformer – working principle. Rating and types of transformers used in electronic circuits

Rating and types of transformers used in electronic circuits. Rating and types of transformers used in electronic circuits

UNIT - II: DC GENERATOR

Electromagnetic dynamic induction – generation of DC using split rings – principle of DC generator – constructions of DC generator – field systems – armature windings – emf equations – building up of voltage in DC shunt generator – load characteristics of DC shunt generator – armature reactions – process of commutations

UNIT - III: DC MOTOR

Principle of operations of DC motor – Fleming's left hand rule – back emf - torque equation - load characteristics of shunt and series motors – speed control of DC motor using filed control and armature voltage control. 3 point and 4 point starters – applications of DC Motors

UNIT - IV: ALTERNATORS

Basic principle of alternators - stationery armature and rotating field – constructions – emf equations- frequency and number of poles- excitation – cooling of turbo alternators – load characteristics of alternator - necessity and condition for parallel operations of alternators

UNIT - V: AC MOTORS

Rotating magnetic field – principle of operations of 3 phase induction motors – slip and slip frequency comparison between case and slip ring induction motors – direct online starter – star delta starter - applications of 3 phase induction motor – single phase induction motor.

Universal motor- application of single phase Induction motor – stepper motors – principle – applications – servo motors

REFERENCE BOOKS

1. Hugh's Electrical Technology : Edward Hughs
2. A Text Book of Electrical Engg : B.L. Theraja
3. Electrical Machines : Battacharya

SUBJECT TITLE : ELECTRONIC CIRCUITS
SUBJECT CODE : IT 302 / EC 302 / EP 302/ EI 302 / EL 302/BM302
PERIODS/WEEK : 6
PERIODS/SEMESTER : 80+16(Tutorial)

TIME SCHEDULE

UNIT	TOPIC		PERIODS
I	Single stage & Multi-stage Amplifiers	15	
		Test - I	1
II	Tuned Voltage amplifiers & Audio power amplifiers		15
		Test - II	1
III	Feedback Amplifiers & Oscillators		15
		Test - III	1
IV	Multi-vibrators and Time base circuits		15
		Test - IV	1
V	Wave shaping circuits & Passive filters		15
		Test – V	1
		Total	80 +16

OBJECTIVES

UNIT – I

1.1.0 Understand the concept of a transistor amplifier

1.1.1 State the principle of transistor amplifier in CE configuration
1.1.2 Study the behavior of the CE amplifier with potential divider type of biasing
1.1.3 Determine the AC load line of CE amplifier
1.1.4 Calculate the voltage gain, current gain, power gain and I/O impedance
1.1.5 Understand the terms " frequency response" and "bandwidth" of amplifiers
1.1.6 Understand the characteristics and applications of Emitter Follower
1.1.7 Study the circuit of a single stage amplifier using MOSFETs
1.1.8 Identify the need of multistage amplifier
1.1.9 Understand the working of multistage amplifiers
1.1.10 Discuss the different methods of inter stage coupling
1.1.11 Study the working Principles and features of RC coupled, Transformer coupled and direct coupled multistage transistor amplifier
1.1.12 Understand the frequency response and identify the band width of RC coupled, transformer coupled and direct coupled amplifiers
1.1.13 Describe the approximate calculation of voltage gain of a two stage RC coupled amplifier
1.1.14 Mention the applications of RC coupled, transformer coupled and direct coupled amplifiers
1.1.15 Compare the performance of RC coupled, transformer coupled and direct coupled amplifier
1.1.16 Understand the operations and characteristics of a Darlington pair transistor

UNIT – II

2.1.0 Understand the operation of tuned voltage amplifier

2.1.1 Explain the series and parallel resonance circuit, expression for resonance frequency
2.1.2 Recognize the relation between resonance frequency "Q" and band width
2.1.3 Explain with circuit the operation and frequency response of single tuned, double tuned and stagger tuned amplifiers
2.1.4 List the applications of tuned amplifiers
2.1.5 State the need for neutralization in tuned amplifiers

2.2.0 Understand the working of Audio power amplifiers

2.2.1 Distinguish between the voltage amplifier and power amplifier
2.2.2 Illustrate the importance of impedance matching in power amplifier
2.2.3 Classify the different types of power amplifier class A, Class B, Class AB and class C
2.2.4 Explain the operation of a single ended power amplifier circuits
2.2.5 Derive the expression for collector efficiency by graphical method
2.2.6 State the importance of heat sinks and heat dissipation in power amplifiers
2.2.7 Explain the principle of push pull amplifiers circuit
2.2.8 Explain the operation of class B push pull power amplifier using output transformer
2.2.9 Explain the operation of complementary symmetry push pull amplifier circuit
2.2.10 List the advantages, disadvantages and applications of the above push pull amplifier circuit

UNIT – III

3.1.0 Understand the concept of feed back amplifier

3.1.1 Describe the positive and negative feed back in amplifier
3.1.2 Derive the expression for the gain of feed back amplifier
3.1.3 State the types of negative feed back in amplifiers
3.1.4 Explain the operation of a typical feed back amplifier circuit
3.1.5 Explain the effect of negative feed back on gain stability, distortion, band width, input and output impedance

3.2.0 Understand the principle of oscillator circuits

3.2.1 State the Barkhausan criterion for oscillation
3.2.2 Describe the working of RC oscillators – RC phase shift oscillator and wein bridge oscillator
3.2.3 List the applications of RC oscillators
3.2.4 Explain the basic principle of LC oscillators
3.2.5 Explain the working of Hartley and colpitt's oscillators
3.2.6 List the applications of LC oscillators
3.2.7 Explain the operation of crystal oscillator
3.2.8 List the advantages and applications of crystal oscillator

UNIT –IV

4.1.0 Understand the operation of Multivibrators

4.1.1 Name the types of multivibrators
4.1.2 Describe the operation of Bistable multivibrator using transistors
4.1.3 Describe the synchronous and Asynchronous methods of triggering Bistable multivibrator
4.1.4 Explain the operation of monostable multivibrator using transistors
4.1.5 Study the expression for pulse width, factors affecting pulse width
4.1.6 Explain triggering methods of monostable multivibrators
4.1.3 Explain the operations of astable multivibrators using transistors
4.1.7 Derive the expression for the frequency of oscillation
4.1.8 Solve simple problems in multivibrators
4.1.9 List the applications of multivibrators

4.2.0 Understand the operation of Schmitt trigger

4.2.1 Explain the operation of Schmitt trigger circuit
4.2.2 Explain UTP and LTP
4.2.3 List the applications of Schmitt trigger

4.3.0 Understand the time base circuits

4.3.1 Identify the need for time base wave form.
4.3.2 Explain the basic saw tooth generation circuit using charging and discharging of a capacitor
4.3.3 List the applications of time base circuits

UNIT V

5.1.0 Understand the linear wave shaping circuits

5.1.1 Identify the different wave shapes
5.1.2 Define the characteristics of pulse wave form - rise time, fall times and tilt
5.1.3 Study RC differentiating and Integrating circuits.
5.1.4 State the conditions for proper integration and differentiation
5.1.5 List the applications of integrator and differentiator circuits

5.2.0 Understand the non-linear wave shaping circuits

5.2.1 Classify the diode clipping circuits
5.2.2 Explain the operation of series shunt and biased type clipping circuits with wave forms
5.2.3 Explain the operation of Zener diode clipper circuits
5.2.4 Define the term clamping
5.2.5 Explain the operation of various types of diode clamping circuits
5.2.6 List the applications of clamping circuits

CONTENT DETAILS

UNIT - I: **15**

Single stage transistor amplifier and multistage transistor amplifiers

Action of transistor as an amplifier – single stage C.E amplifier circuit with voltage divider biasing – graphical analysis of the small signal CE amplifier – AC load line – Gain, frequency response and bandwidth of BJT amplifier - calculation of voltage gain, input impedance, and output impudence – Emitter follower

Multistage Amplifiers

Need for multistage amplifier–frequency response of cascaded stages – inter-stage coupling methods-classification of multistage amplifiers – two stage RC coupled amplifier using BJT - frequency response - band width - advantages and disadvantages - applications – calculation of voltage gain, input impedance, and output impedance - Two stage transformer coupled and direct coupled multistage amplifier –frequency response – advantages and disadvantages – applications –Darlington pair transistor – expression for current gain

UNIT - II: **15**

Tuned Voltage Amplifiers and Power Amplifiers

Series and parallel resonant circuits, expression for resonant frequency – relation between resonant frequency, Q factor and bandwidth – single tuned, double tuned, and stagger tuned voltage amplifiers - working principles - frequency responses - applications–concept of neutralization

Need for power amplifier – difference between voltage and power amplifiers – importance of impedance matching in power amplifiers, transformer impedance matching - classification of power amplifiers – Class A, Class B, Class AB and Class C – expression for efficiency of class B push pull power amplifier – push pull power amplifier with output transformer – complementary symmetry push pull power amplifier – advantages and disadvantages - cross over distortion in Class B power amplifier – importance of heat sinks and heat dissipation curves in power amplifiers

UNIT - III:

Feed Back Amplifier and Oscillators

Types of feed back – derivation for the expression of gain of a feed back amplifier – types of negative feed back amplifiers – explanation with block diagram – typical circuit diagrams of voltage shunt & current series negative feed back amplifier – effect of negative feed back on voltage gain, stability, distortion, bandwidth and input & output impedance

Oscillators

Classification– Barkhausan criteria–RC Oscillators: RC phase shift oscillator, Wein bridge oscillator - expression for frequency of oscillation (no derivation) – LC oscillators. Hartley oscillator, Colpitts oscillator, applications of RC and LC oscillators – crystal oscillator - applications

UNIT – IV:

Multivibrators

Types of multivibrators – Bistable Multivibrator using transistor- triggering methods- monostable multivibrator using transistor - working and wave form – expression for pulse width (no derivations), factors affecting pulse width - triggering methods - astable multivibrator using transistor - working and wave form – expression for frequency – simple numeric problems on astable and monostable multivibrators .

Schmitt trigger circuit using transistor- explanation with waveform – U.T.P, L.T.P, and hystersis – applications of multivibrators and Schmitt trigger

Time base circuits- need for time base circuits –simple method of generation of saw tooth waveform – Boot strap circuit

UJT Relaxation oscillator-principle- period of oscillation -applications

UNIT – V :

Wave Shaping circuits

Types of wave forms – ideal pulse wave form – rise time, fall time, and tilt - linear and non linear wave shaping circuits- transient phenomena in RC and RL circuits – RC differentiating and integrating circuits

Clipping circuits – diode clippers – series, shunt, biased and combinational clipper circuits - Zener diode clipper circuits – clamping circuits - diode clampers – positive, negative, and biased type – explain with sine and square wave input

REFERENCE BOOKS

1. Electronics devices and circuit theory - Robert Boyelsted, Louis Nashelsky
2. Electronics Devices and Circuits - Bogart
3. Introduction to Electronic Circuit Design- Spencer and Ghausi
4. Electronics devices and circuit theory - Floyd
5. Electronics and circuits - David A Bell
6. Solid state pulse circuits - David A Bell
7. Amplifiers with discrete components - R.S Moni.
8. Basic Electronics and Linear circuits - Kulshreshtha, D.C. Bhargava, S.C . Guptha
9. Electronic Principles - Malvino.

SUBJECT TITLE : DIGITAL ELECTRONICS
SUBJECT CODE : IT 303 / EC 303 / EP 303 /EI 303 / EL 303/ BM 303
PERIODS/WEEK : 6
PERIODS/SEMESTER : 80+16 (Tutorial)

TIME SCHEDULE

UNIT	TOPIC		PERIODS
I	Number system, Boolean algebra		15
		Test - I	1
II	Logic families and Combinational logic circuits		15
		Test - II	1
III	Sequential logic circuits		15
		Test - III	1
IV	Memories		15
		Test - IV	1
V	Programmable Logic Devices		15
		Test - V	1
		Total	80 +16

OBJECTIVES

UNIT – I

1.1.0 Understand number systems

1.1.1 State and explain the need for a best suited number system based on which the modern digital technology is built up.
1.1.2 Give the features of a decimal number system with examples and compare binary number system.
1.1.3 Explain the conversion from decimal to binary by actual division and tabulation with suitable example.
1.1.4 Discuss decimal and binary fractions and conversion of decimal fraction into binary with suitable examples.
1.1.5 Give the features of octal number system with suitable examples for conversion of decimal into octal and octal into binary.
1.1.6 Discuss octal fractions and conversion of decimal fraction into octal.
1.1.7 Give the features of Hexadecimal number system with suitable examples for conversion of decimal into Hexadecimal and Hexadecimal into binary.
1.1.8 Discuss Hexadecimal fraction and conversion of Hexadecimal into direct binary and back.
1.1.9 State the need for binary codes and list different types of binary codes.
1.1.10 Discuss the BCD codes, excess-3 code, Gray code and binary weighted codes with suitable examples.
1.1.11 Discuss ASCII code and its application with suitable examples.
1.1.12 Give the idea of EBCDIC and error detecting and correcting codes.
1.1.13 With suitable examples give the idea of binary arithmetic such as addition, subtraction, multiplication and division.

1.2.0 Understand Boolean algebra and logic simplifications

1.2.1 State the importance of logic theory and its applications.
1.2.2 Give the circuit diagram and explain the switching functions of AND, OR, XOR, and give their logic symbols
1.2.3 Draw symbols for NAND, NOR, NOT operation and discuss the advantages of using universal logic gates.
1.2.4 Know about the sum of product (SOP) expression, product of sum expression (POS.) minters and max terms.
1.2.5 Give an idea of switching circuits and tables
1.2.6 State the need for simplifying Boolean expression
1.2.7 Discuss the straight simplification with the help of logic rules and truth tables.
1.2.8 Give the basic principle of Karnaugh map..
1.2.9 Discuss two variables, three variables and four variables K-maps with the help of suitable examples and its reductions.
1.2.10 Give an idea of Don't care terms.
1.2.11 Discuss reduction of Boolean expressions using K-map.
1.2.12 Give the idea of simplification in both SOP and POS form with the help of example
1.2.13 List the advantages and disadvantages of Karnaugh map.

UNIT – II

2.1.0 Understand logic families

2.1.1 Classify digital logic gates on the basis of number of components incorporated with examples.
2.1.2 Give an idea of existing logic families.
2.1.3 Distinguish between positive and negative logic.
2.1.4 Describe how to represent logic gates by switches.
2.1.5 Give the detailed circuit description of transistor transfer logic and TTL inverter.
2.1.6 Identify the terms V_{IL}, V_{IH}, V_{OL}, V_{OH}, Noise margin, noise immunity propagation delay.
2.1.7 Give an idea of open collector gate and state logic, high threshold logic.
2.1.8 Explain the working principle of emitter coupled logic.
2.1.9 Describe in detail, the CMOS logic family.
2.1.10 Give the features of CMOS logic gates.
2.1.11 Identify the term current sourcing and current sinking, fan-in, fan-out, power dissipation, speed power product.

2.2.0 Understand combinational logic circuits

2.2.1 Give the idea of combinational logic circuits.
2.2.2 Design half adder, full adder, half subtractor, and full subtractor.
2.2.3 Design BCD adders.
2.2.4 Study the applications of adder IC 7483 for implementing binary adders and subtractors and BCD adders.
2.2.5 Study the importance of Look-ahead carry adder with examples.
2.2.6 Explain the various methods of binary multiplication and realize the logic diagram of a 2-bit multiplier.
2.2.7 Give the basic idea of a multiplier.
2.2.8 Discuss the operation of Multiplexers and demultiplexers.
2.2.9 List and explain the various applications of multiplexers and demultiplexers.
2.2.10 Understand operation of encoders and decoders.
2.2.11 Explain various decoders such as BCD to decimal, binary to excess 3 code, binary to gray code and BCD to 7 segment with suitable examples.
2.2.12 Give an idea of digital comparators.

UNIT – III

3.1.0 Understand sequential logic circuits

- 3.1.1 Give the idea of sequential logic circuits
- 3.1.2 Distinguish between synchronous and asynchronous sequential logic circuits
- 3.1.3 Construct SR flip flop using NAND gates
- 3.1.4 Explain JK flip flop with the help of truth table and timing diagram.
- 3.1.5 Study the need for preset and clear inputs
- 3.1.6 Analyze the race around condition
- 3.1.7 Give the idea with diagram and truth table of master slave JK flip flop
- 3.1.8 Explain D flip flop, T flip flop with the help of diagram and truth table
- 3.1.9 Discuss the working of shift registers serial in serial out parallel in parallel out parallel in serial out and serial in parallel out
- 3.1.10 Differentiate between right shift and left shift registers
- 3.1.11 Give the application of shift registers
- 3.1.12 Give the working of ring counter and its applications
- 3.1.13 Explain Johnson counter and its applications
- 3.1.14 Give an introduction to Binary counters
- 3.1.15 Differentiate between synchronous and asynchronous counters
- 3.1.16 Give the idea of asynchronous ripple counter with the help of flip flop states of the outputs and wave forms
- 3.1.17 Design and implement modulo- N asynchronous counter
- 3.1.18 Study the design procedure of modulo N synchronous counter and its realization.

UNIT – IV

4.1.0 Understand different types memories

- 4.1.1 Explain semi conductor memory
- 4.1.2 List various types of memory
- 4.1.3 Distinguish between ROM and RAM
- 4.1.4 Explain basic principle of working of ROM
- 4.1.5 State different types of ROM
- 4.1.6 List different ROM and RAM ICs
- 4.1.7 Explain the working of dynamic memory
- 4.1.8 Compare Static RAM, Dynamic RAM
- 4.1.9 State the difference between Flash ROM and NVRAM
- 4.1.10 Differentiate SD RAM and EDO RAM
- 4.1.11 Specify the speed of DIMM used in computer system
- 4.1.12 Define a secondary memory
- 4.1.13 Optical memory
- 4.1.14 Magnetic bubble memory

UNIT – V

5.1.0 Understand programmable logic devices

- 5.1.1 Give the principles of PLA with the help of a diagram
- 5.1.2 With the help of the appropriate diagram explain PLA arrays and a PLA structure with five input variables and four R functions
- 5.1.3 Give the advantages and disadvantages of PLA
- 5.1.4 Explain with the help of suitable diagram, the working of Programmable Array Logic (PAL)
- 5.1.5 Give the structure of FPLA circuit and describe its working
- 5.1.6 Understand the Basic Principle of FPLD, CPLD & FPGA
- 5.1.7 Understand the architecture of FPGA

CONTENT DETAILS

UNIT – I

Number System and Boolean algebra

Number systems - decimal, binary, octal, Hex number system – conversion from one system to another system – Fractions in all the number systems and its conversions - use of binary codes, different types of binary codes, binary coded decimal, self complementing codes, ASCII Code, EBCDIC error detecting and correcting codes, binary addition, subtraction, multiplication and division. 1'st complement and 2's complement method of subtraction

Introduction to logic theory, switching functions AND, OR, NOT, NOR, NAND, EX-OR operations. The sum of products (SOP) expression, product of sum (POS) expression, switching circuits, truth tables, Boolean theorems and postulates - simplifications of Boolean expressions - simplifications using postulates and Karnaugh map.

UNIT – II

Logic families

SSI, MSI, LSI, VLSI and ULSI, existing logic families, positive and negative logic - Transistor Transistor Logic- standard TTL and Schottky TTL, TTL inverter, Emitter Coupled Logic, CMOS logic family, features of CMOS logic gates, V_{IL}, V_H, V_{OL}, V_{OH}, noise margin, noise immunity, propagation delay, current sourcing and current sinking, fan in, fan out, power dissipation, speed power product, Comparison of advantages and disadvantages of various logic families

Combinational Logic Circuits

Introduction – Design half adder, full adder, half subtractor, full subtractor, BCD adder- implementation using gates and Adder IC 7483.

Look ahead Carry adder, multiplexer/data selector - basic 2 to 1MUX, 4 to 1 MUX, applications of the MUX, demultiplexer, 1 to 2 demultiplexer, 1 to 4 demultiplexer, – multiplexer and demultiplexer Ics-

Encoders and decoders, encoder and decoder Ics.

BCD to decimal, BCD to 7 segment decoder – encoder – digital comparators

UNIT – III

Sequential Logic Circuits

Introduction - SR flip flop, SR latch - SR flip-flop using NAND gates, JK flip- flop with preset and clear inputs, D flip-flop, T flip-flop, Master Slave flip-flop – Flip flop ICs

Binary counters-design and implementation of asynchronous modulus N counter, up down counters-examples

Design and implementation of mod N synchronous counters, and random sequence generators-examples.

Study of counter ICs, implementation of mod N counters.

Shift registers, serial in serial out, parallel in parallel out, serial in parallel out, parallel in serial out shift registers, left shift and right shift registers applications of shift registers, ring counter, Johnson counter and applications.

UNIT – IV

Memories

Semi conductor memory- Non-volatile memories – ROM – PROM – EPROM – EEROM – Flash ROM Volatile memories– RAM – static RAM - dynamic RAM – EDO RAM - SD RAM – DD RAM – SIM module – DIM module – related ICs -– specifications of memory like speed, access time, capacity, type – timing diagram for RAM. Optical memory – Magnetic bubble memory.

UNIT – V

Programmable Logic Devices

Introduction – PLD architecture – PLA (FPLA) operation – PLA design and programming – Different PLAs and their specifications

Combinational circuit using PAL – PLD programming cycle - designing 74138 using PAL – working with PALASM assembler software – Creating JEDEC file – Programming PAL using PAL Programmer / Universal Programmer – Testing the programmed PAL for its design – traffic light controller using PAL – Basics of FPGA, FPLD, CPLD – Architecture of FPGA

REFERENCE BOOKS

1. Digital system principles and applications - Ronald J. Tocci
2. Digital Integrated Circuits - Bogart
3. Digital Logic Applications and Design - John M Yarbrough
4. Digital fundamentals - Floyd & Jain
5. Fundamentals of digital circuits - A. Anand Kumar
6. Digital computer fundamentals - Thomas. C. Bartee
7. Digital electronics- An introduction to theory and practice - Gothman
8. Digital design - Mano
8. Digital Electronics - Green

SUBJECT TITLE : MEASUREMENT SYSTEM
SUBJECT CODE : IT 304
PERIOD/WEEK : 6
PERIOD/SEMESTER : 96

TIME SCHEDULE

UNIT	TOPIC	PERIODS
I	Introduction to measurement systems	15
	Test - I	1
II	Characteristics of measurement systems	15
	Test - II	1
III	Primary Detectors and Intermediate Elements	15
	Test – III	1
IV	Data Display Devices	15
	Test – IV	1
V	Recorders	15
	Test – V	1
	Total	80

OBJECTIVES

UNIT I

1.1.0 Introduction to Measurement system
1.1.1 Explain Direct and Indirect methods of measurement,
1.1.2 Explain aims of measurement,
1.1.3 Explain method of measurements,
1.1.4 Describe the functional elements of measurement system
1.1.5 Explain the function of measurement systems,
1.1.6 Show the input, output, configuration of measurement systems,
1.1.7 Define interfering and modifying inputs
1.1.8 Describe the method of correction for interfering and modifying inputs,
1.1.9 Explain the basic classification of instruments, analog, digital, null, deflection, contacting, non-contacting, & manual and automatic

UNIT II

2.1.0 Introduction to Characteristics of measurement system
2.1.1 Define Static characteristics
2.1.2 Define static calibration, static error, scale range, span, repeatability,reproducibility,drift,accuracy,precision,sensitivity, linearity & hysteris
2.1.3 Define threshold, dead time, dead zone, resolution & loading effect
2.2.0 Introduction to Dynamic characteristics
2.2.1 Describe the dynamic inputs, step, ramp, parabolic, impulse inputs
2.2.2 Define order of a system
2.2.3 Explain zero, first and second order system with examples
2.2.4 Explain the Classification errors
2.2.5 Explain Noise & source of noise
2.2.6 Describe the method of reducing effects noise and interference

UNIT III

3.1.0 Introduction to Primary Detectors and Intermediate Elements
3.1.1 Explain different Primary detectors used in measurement system
3.1.2 Explain Mechanical devices
3.1.3 Study the principle of mechanical devices
3.1.4 Describe Pressure sensitive devices
3.1.5 Explain the working principle of Bourden tube – and its classification
3.1.6 Explain the working principle of bellows – and its classification
3.1.7 Explain the working principle of diaphragms – and its classification
3.1.8 Describe Intermediate elements like amplifiers in
   a) Mechanical
   b) Hydraulic
   c) Pneumatic
   d) Optical
   e) Electrical systems
3.1.9 Introduction to bridges
3.1.10 Draw and explain Dc bridge- wheastons bridge-Kelvins double bridge
3.1.11 Draw and explain AC Bridge- Maxwells bridge- Hays bridge-shering bridge

UNIT IV

4.1.0 Introduction to Data Display Devices
4.1.1 Explain Indicating instruments – classification
4.1.2 Explain analog and digital Display Devices
4.1.3 Define scales and pointers
4.1.4 Explain Light emitting diodes (LED)-characteristics
4.1.5 Explain seven segment LED
4.1.6 Explain LED bar graph displays
4.1.7 Explain 5x7 dot matrix displays
4.1.8 Explain Liquid Crystal Display (LCD)- characteristics
4.1.9 Explain TFT LCD
4.1.10 Explain Dynamic scattering LCD
4.1.11 Explain vacuum fluorescent displays (VFD) - characteristics
4.1.12 Explain Electro Luminescent Display (ELD) - characteristics
4.1.13 Explain Plasma displays – their characteristics and applications

UNIT V

5.1.0 Introduction to Recorders
5.1.1 Classification of recorders
5.1.2 Explain single point and multi point recorders
5.1.3 Describe graphic recorders with suitable diagram
5.1.4 Describe Strip chart recorders with suitable diagram
5.1.5 Describe circular chart recorders with suitable diagram
5.1.6 Describe XY recorders with suitable diagram
5.1.7 Explain Recording mechanism
5.1.8 Describe Galvanometric recorders with suitable diagram
5.1.9 Describe inkjet recorder with suitable diagram
5.1.10 Describe ultra violet recorders with suitable diagram
5.1.11 Describe potentiometric recorder with suitable diagram
5.1.12 Describe electrostatic recorder with suitable diagram

CONTENT DETAILS

UNIT I

Introduction to Measurement system

Aims of measurement- Direct, Indirect method of measurements, functional elements, function of measurement systems, applications – input, output, configuration of measurement systems, interfering and modifying inputs- method of correction for interfering and modifying inputs, classification of instruments, analog, digital, null, deflection, contacting, non-contacting, manual and automatic

UNIT II

Characteristics of measurement system

Static characteristics – static calibration – static error, scale range, span, repeatability, reproducibility, drift, accuracy, precision, sensitivity, linearity, hysterisis, threshold, dead time, dead zone, resolution, loading effect

Dynamic characteristics – dynamic inputs , step, ramp, parabolic, impulse inputs, order of a system, zero, first and second order-

Classification of errors – Noise & source of noise - method of reducing effects noise and interference

UNIT III

Primary Detectors and Intermediate Elements

Primary detectors—Mechanical devices- study the principle of mechanical devices

Pressure sensitive devices- Bourden tube – bellows –diaphragms-classification

Intermediate elements of –amplifiers-mechanical-hydraulic-pneumatic-optical –electrical

Bridges- Dc bridge- wheastons bridge-Kelvins double bridge-

AC Bridge- Maxwells bridge- Hays bridge-shering bridge

UNIT IV

Data Display Devices

Indicating instruments – classification – analog and digital – scales and pointers – different types

Light emitting diodes (LED), seven segment LED,LED bar graph displays,5x7 dot matrix displays-Liquid Crystal Display (LCD) , TFT LCD , Dynamic scattering LCD,vacuum fluorescent displays (VFD), Electro Luminescent Display (ELD) – Plasma displays – their characteristics and applications

UNIT V

Recorders

Classification – single point and multi point recorders- graphic recorders, strip chart recorders, and circular chart recorders – XY recorders

Recording mechanism – galvanometric recorders – inkjet recorder, ultra violet recorders – potentiometric recorder – electrostatic recorder'

REFERENCE BOOKS

1. Instrumentation measurement and analysis - BC Nakra and KK chouwdary
2. Electrical & Electronic Measurement System - AK sawhney
3. Electronic display device - Richard a perez
4. Measurements & Instrumentation - Ramaredy
5. Principle of instrumentation - D.Patranabis
6. Industrial Instruments - Donald P Eckman

SUBJECT TITLE : ELECTRONICS CIRCUITS LAB
SUBJECT CODE : IT 305/EC305/BM305/EI305/EP305/EL305
PERIODS/WEEK : 3
PERIODS/SEMESTER : 48

LIST OF EXPERIMENTS

At least 10 experiments of the following type to be completed

1. Design and construct
   (i) RC differentiator circuit
   (ii) RC integrator circuit
   and study its pulse response
2. Design, construct and test shunt diode clipper circuits
   (i) Positive clipper
   (ii) Negative clipper
   (iii) Biased clipper
3. Zener diode clipper circuit
4. Design, construct and test various diode clamping circuits
   (i) Positive clamper
   (ii) Negative clamper
   (iii) Biased clamper
5. Design single stage RC coupled CE amplifier for a given gain
   (i) Observe the phase difference between input and output wave forms
   (ii) Measure mid band gain
   (iii) Plot its frequency response and determine the band width
6. Design an emitter follower circuit and measure the gain.
7. Design a RC phase shift oscillator for a given frequency of oscillation.
8. Design, construct and test a transistor astable multivibrator for
   (i) a specified frequency
   (ii) a specified duty cycle
9. Design a simple sweep circuit and observe its output wave form for a square wave input.
10. Assemble a boot strap sweep generator circuit & plot its output wave form for square wave input.
11. Design a BJT monostable multivibrator and plot the wave forms at base and collector of the transistors.
12. Design a Schmitt trigger circuit using BJT for specified UTP and LTP and observe the output with a sine wave input. Plot its transfer characteristics.
13. Design a UJT relaxation oscillator for a specified frequency of oscillation.

SUBJECT TITLE : DIGITAL ELECTRONICS LAB
SUBJECT CODE : IT 306/EI 306/EC 306/EL 306/EP 306/BM 306
PERIODS/WEEK : 3
PEIODS/SEMESRER : 48

LIST OF EXPERIMENTS

At least 15 experiments of the following type to be completed.

1. Familiarization of
   (i) TTL and CMOS Logic IC's by Verification of Truth Tables
   (ii) Universal gates for implementing other logic functions
2. Design a binary to gray and gray to binary converter.
3. Design, setup and verify the
   (i) Half and full adder circuits
   (ii) Half and full subtractor circuits
4. Design of combinational logic circuits from word statements.
5. Four bit adder and subtractor using ICs 7483
6. Design BCD adder using IC 7483.
7. Design BCD to Seven Segment Decoder using 7447 and Display
8. Design 4 to 1 MUX using NAND Gates
9. Study the multiplexer IC 74151
10. Implement combinational logic using multiplexer ICs
11. Verify the truth table RS, D, JK, T Flip flops using NAND gate
12. Design and construct asynchronous mod- N counter using flip-flops.
13. Design and construct synchronous mod - N counters flip-flops.
14. Design and construct random sequence generators.
15. Study of counter ICs.
16. Design and construct astable and monostable multivibrators using CMOS NOR gates
17. Design and construct 4 bit shift register using flip flops.
18. Study the operation of shift register ICs.
19. Construct Johnson counter and Ring counter.

SUBJECT TITLE : ELECTRICAL MEASUREMENT LAB
SUBJECT CODE : IT 307
PERIODS/WEEK : 3
PERIODS/SEMESTER : 48

LIST OF EXPERIMENTS

ELECTRICAL

1. Calibration of ammeter and voltmeter using potentiometer
2. Calibration of energy meter by direct loading
3. Calibration of wattmeter by phantom loading
4. Extension of the range of D.C Voltmeter using multipliers.
5. Extension of Ammeter using shunt
6. Verification of superposition theorem
7. Measurement of power & power factor in 3 – phase circuit using 2 wattmeters method
8. Measurement of power and power factor in single-phase circuit by 3 ammeters method and 3 voltmeters method.
9. Polarity test by connecting two transformers in series and parallel
10. Determine the efficiency of transformer by conducting O.C and S.C test.
11. Determine hysteresis loss and Eddy current loss of single-phase transformer
12. Wiring up of star-delta starter.
13. Series and parallel wiring practice
14. load test of 3-phase induction motor
15. Load test of D.C shunt generator
16. Speed control of a.c shunt motor using flux control and armature control method

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.

SUBJECTS OF STUDY AND SCHEME OF EVALUATION

SEMESTER IV

Branch : Instrument Technology

Code	Subject	Periods Per Week			Evaluation (Marks)			
		Theory	Practical/Tutorial	Total	Theory	Practical	Internal	Total
IT 401	Electrical & Electronic Measuring Instruments	5	1	6	75		25	100
IT 402	Instrument Transducer	5	1	6	75		25	100
IT 403	Micro controller & Interfacing	5		5	75		25	100
IT 404	Mechanical Instruments	5	1	6	75		25	100
IT 405	Instrument Workshop		3	3		75	25	100
IT 406	Micro controller and interfacing Lab		3	3		75	25	100
IT 407	Measurement System Lab		3	3		75	25	100
	ISAP Skill Development		3	3				
	TOTAL	**20**	**15**	**35**	**300**	**225**	**175**	**700**

SUBJECT TITLE : ELECTRICAL & ELECTRONIC MEASURING INSTRUMENTS
SUBJECT CODE : IT 401
PERIODS/WEEK : 6
PERIODS/SEMESTER : 96

TIME SCHEDULE

UNIT	TOPIC	PERIODS
I	1.1 Permanent Magnet Moving Coil Ammeters & Voltmeter	8
	1.2 Permanent Magnet Moving iron Ammeters & Voltmeter	7
	Test – I	1
II	2.1 Dynamometer type ammeters & voltmeters	6
	2.2 Electrostatic type ammeters & voltmeters	6
	2.3 Rectifiers type ammeters & voltmeters	3
	Test - II	1
III	3.1 Watt meters &Energy meters	15
	Test - III	1
IV	4.1 Cathode Ray Oscilloscope	15
	Test - IV	1
V	5.1 Digital Instruments	6
	5.2 Universal timer/counter	6
	5.3 Logic Analyzer	3
	Test - V	1
	Total	80

OBJECTIVES

UNIT – I

1.1.0 Moving Coil & Moving Iron Ammeter and Voltmeter

- 1.1.1 Explain the construction & working Moving Coil & Moving Iron Ammeter and Voltmeter
- 1.1.2 Explain the production of deflecting, controlling and damping Torque in moving system and the effect of control and damping force on measuring instrument.
- 1.1.2 Describe the Torque equation of PMMC meter.
- 1.1.3 Describe the constructional details and the principle of working attraction type Moving Iron Instrument
- 1.1.4 Describe the constructional details and the principle of working repulsion type Moving Iron Instrument
- 1.1.5 Comparison of attraction type and repulsion type moving iron instrument
- 1.1.6 Method of increasing range of ammeters and Voltmeters.

UNIT – II

2.1.0 Explain operating principle Dynamometer type Ammeters
2.2.0 Explain construction and working of Dynamometer type Ammeters
2.3.0 Explain operating principle of Dynamometer type Voltmeters
2.4.0 Explain construction and working of Dynamometer type Voltmeters
2.5.0 Explain operating principle of Electrostatic type Ammeters
2.6.0 Explain construction and working of Electrostatic type Ammeters
2.7.0 Explain operating principle Electrostatic type Voltmeters
2.8.0 Explain construction and working of Electrostatic type Voltmeters

2.9.0 Explain operating principle of Rectifier type Voltmeter
2.10.0 Explain construction and working of Rectifier type Voltmeter
2.11.0 Explain operating principle of Rectifier type Ammeter
2.12.0 Explain construction and working of Rectifier type Ammeter
2.13.0 Compare the different type Voltmeter & Ammeter

UNIT – III

3.1.0 Understand the Watt meters & Energy meters
- 3.1.1 Explain with suitable diagram the constructional details of dynamometer type Wattmeter
- 3.1.2 Explain the Operating principle of dynamometer type Wattmeter
- 3.1.3 Describe with suitable circuit diagram procedure of measuring power in three phase using
  1) three wattmeter
  2) 2 wattmeter

3.2.0 State the purpose of an energy meter
- 3.2.1 Describe with suitable diagram the construction of induction single phase energy meter
- 3.2.2 Describe Operating principle of induction single phase energy meter
- 3.2.3 Explain the principle of measuring energy using single phase energy meter

UNIT – IV

4.2.0 Understand Cathode Ray Oscilloscope
- 4.2.1 Explain the Block diagram
- 4.2.2 Brief CRT, Electron gun, Focusing, Electrostatic deflection, Deflection sensitivity
- 4.2.3 Explain the measurement of amplitude using CRO
- 4.2.4 Explain the measurement of frequency using CRO
- 4.2.5 Explain the measurement of phase using CRO
- 4.2.6 Describe dual beam and dual trace types
- 4.2.7 Explain function generator
- 4.2.8 Explain pulse generator

UNIT – V

5.1.0 Understand Digital instruments
- 5.1.1 Explain digital voltmeter
- 5.1.2 Describe digital multimeter and measurement of voltage, current and resistance
- 5.1.3 Know digital Oscilloscope
- 5.1.4 Explain sampling Oscilloscope
- 5.1.5 Explain storage Oscilloscope
- 5.1.6 Explain the properties, applications and specifications
- 5.1.7 Explain special type CRO probes

5.2.0 Understand Universal timer/counter
- 5.2.1 Explain the block diagram and principle of measurement of Time & Frequency

5.3.0 Understand Logic Analyzer
- 5.3.1 Describe the block diagram and principle of operation.

CONTENT DETAILS

UNIT – I

Ammeters & Volt Meters

Permanent magnet Moving coil-Constructional details- Magnet system-Moving system- control Damping, pointer and scale Torque equation- ammeter shunt-voltmeter multipliers- simple problems. Moving iron type- attraction and repulsion type-scale shapes- advantages and disadvantages

UNIT – II

Dynamometer type -ammeter and voltmeter- operating principle-constructions details-operation as AC and Dc ammeters and Voltmeters- errors- advantages and disadvantages
Electrostatic type meter- operating principle-
Rectifier type ammeter and voltmeter-operating principle using potentiometers
Calibration of ammeter and voltmeter using potentiometers

UNIT – III

Wattmeter-Dynamometer type theory- construction- errors-correction factors-wattmeter connections for single-phase measurement, three phase measurements by 3 wattmeter and 2 wattmeter method
Induction type-single phase energy meter.
Theory of operation-errors and compensation

UNIT – IV

Cathode Ray Oscilloscope – Block diagram explanation
CRO - Electron gun – Focusing – Electro static defletion – Defletion sensitivity – measurement of amplitude, frequency & phase.
Dual beam & Dual trace CRO – specifications
Function generator – Pulse generator.

UNIT – V

Digital voltmeter – digital multimeter – measurement of voltage, current & resistance – specifications –
Digital Oscilloscope, Sampling and storage Oscilloscope – types – properties – applications – specifications , Special purpose CRO probes., Universal timer/counter, Time & Frequency measurement , Logic Analyzer.

REFERENCE BOOKS

1. Engineering Metrology – R.K.Jain
2. Mechanical and Industrial Instrumentation – A.K.Sawhney
3. Engineering Measurement and Instrumentation – L.F.Adams
4. Principles of Measurement and Instrumentation – Alan.S.Morris
5. Modern Electronic Instrumentation & Measurement Techniques – Albert.D.Helfricr, William.D.Cooper

SUBJECT TITLE : INSTRUMENT TRANSDUCERS
SUBJECT CODE : 402
PERIODS/WEEK : 6
PERIODS/SEMESTER : 96

TIME SCHEDULE

UNIT	TOPIC		PERIODS
I	1.1 Introduction		3
	1.2 Classification		4
	1.3 Resistive Transducers		8
		Test - I	1
II	2.1 Variable Inductance transducers		10
	2.2 Hall Effect transducers		5
		Test - II	1
III	3.1 Piezo electric Transducers		7
	3.2 Capacitive Transducer		8
		Test - III	1
IV	4.1 Photo Electric Transducers		10
	4.2 Magnetic Transducer		5
		Test - IV	1
V	5.1 Radiation detectors		15
		Test - V	1
		Total	80

OBJECTIVES

UNIT – I

1.1.0 Define Transducers
- 1.1.1 Compare active and passive transducers
- 1.1.2 Know the classification of transducer – analog and digital type – Null and Deflection type –primary & secondary- contacting and non contacting type –with examples

1.2.0 Understand variable Resistance transducers - potentiometer
- 1.2.1 Explain the principle of operation
- 1.2.2 Derive the sensitivity of linear and rotary potentiometer
- 1.2.3 Understand the loading effect
- 1.2.4 Derive for minimum loading error
- 1.2.5 Explain the static and dynamic characteristics

1.3.0 Know strain gauges
- 1.3.1 Explain the principle of operation
- 1.3.2 Derive the expression for gauge factor
- 1.3.3 Solve simple problems
- 1.3.4 Explain the types of strain gauges
- 1.3.5 List the advantages & disadvantages of semiconductor strain gauges
- 1.3.6 Explain the temperature compensation techniques
- 1.3.7 Describe the bridge circuit
- 1.3.8 Explain the application

UNIT – II

2.1.0 Know Variable Inductance Transducer
- 2.1.1. Specify different types
- 2.1.2. Self Inductance
- 2.1.3. Explain the construction and working variable reluctance

2.2.0 Know Variable Mutual Inductance Transducer
- 2.2.1. Know LVDT
- 2.2.1 Explain the construction and working
- 2.2.2 Describe the operation of LVDT
- 2.2.3 List the advantages and disadvantages
- 2.2.4 state the application

2.3.0 Know RVDT
- 2.3.1 Explain the construction and working
- 2.3.2 Describe the operation of RVDT
- 2.3.3 List the advantages and disadvantages
- 2.3.4 State the application

2.4.0 Understand Hall effect transducer
- 2.4.1 Explain the principle of operation
- 2.4.2 Explain the applications

UNIT – III

3.1.0 Understand Capacitive transducers
- 3.1.1 Explain the principle of operation
- 3.1.2 Derive the reactivity
- 3.1.3 List the advantages and disadvantages
- 3.1.4 Explain the application

3.2.0 Understand Piezoelectric transducers
- 3.2.1 Know the principle of Piezo electric transducer
- 3.2.2 List the materials and characteristics
- 3.2.3 Compare the properties
- 3.2.4 Understand the equivalent circuit
- 3.2.5 Define charge sensitivity and voltage sensitivity
- 3.2.6 Obtain the relation d = Eg
- 3.2.7 Describe the expression for O/P voltage when loaded with R&C
- 3.2.8 State the applications

UNIT – IV

4.1.0 Understand photo electric transducers
- 4.1.1 Know the constructional details and working of photo conductive
- 4.1.2 Know the constructional details and working of Photo emissive
- 4.1.3 Know the constructional details and working of photo voltaic cell
- 4.1.4 Know the constructional details and working of PhotoMutiplier tube
- 4.1.5 Explain the characteristics and application of photoelectric transducer.

4.2.0 Magnetic Transducer
- 4.2.1 Search coils - Principle- working – construction – properties - application
- 4.2.2. Magneto resistive transducers – principle – materials – properties-applications
- 4.2.3. Magneto strictive transducers – principle – materials - properties - applications

UNIT – V:

5.1.0 Radiation detectors

static detection – dynamic detection-Types- comparison- Advantages of
- 5.1.1 Ionization chamber – Principle-working-construction -application
- 5.1.2. Proportional counter- Principle-working-construction -application
- 5.1.3 Geiger – Muller counter- Principle-working-construction -application
- 5.1.4. Scintillation counter- Principle-working-construction -application

5.1.5. Gas Filled detectors- Principle-working-construction -application
5.1.6. Semi conductor detectors- Principle-working-construction -application

CONTENT DETAILS

UNIT – I:

Resistive Transducers

Introduction – Definition – Classifications of Active & Passive – Primary & Secondary, Analog and digital, Null & Deflection and contacting & non- contacting type ----with examples.
Variable Resistance transducers – Resistance potentiometer –Principle-working- sensitivity – Loading error – minimum loading effect – types – linear & rotary – static & dynamic Characteristics
Strain gauges - principal – working- construction-gauge factor (derivation) – problems
Types – bonded & un bonded – advantages – applications – temperature compensation – bridge circuit

UNIT – II:

Variable Inductance Transducers

Self Inductance Transducers- Reluctance Transducer- construction and working principle – characteristics – sensitivity-advantages and disadvantages – application.
Mutual Inductance Transducers -LVDT – construction and working principle – characteristics – sensitivity-advantages and disadvantages – applications.
RVDT – principle-characteristic- construction and working- advantages& disadvantages-applications
Hall Effect Transducers -Principle – working– advantages and disadvantages - applications

UNIT – III:

Variable Capacitance & Piezoelectric Transducers

Variable Capacitance Transducers – General principle of operation – variable gap – Variable area - variable permittivity – differential arrangement – sensitivity – advantages and disadvantages –Problems- applications
Piezoelectric Transducer - Principle – materials – desirable characteristics – comparison – equivalent circuits – output voltage – sensitivity – static and dynamic characteristics – problems-application

UNIT – IV:

Photo Electric & Magnetic Transducer

Photo electric Transducer-

a. Photo conductive cell- Principle- working – construction - application
b. Photo emissive cell- Principle- working – construction - application
c. Photo voltaic cell – Principle- working – construction – application
d. Photo multiplier - Principle- working – construction - application

Magnetic Transducers

a.. Search coils - Principle- working – construction – properties - application
b. Magneto resistive transducers – principle – materials – properties-applications
c. Magneto strictive transducers – principle – materials - properties - applications

UNIT – V:

Radiation detectors
Static detection – Dynamic detection-Types- Comparison- Advantages

a. Ionization chamber – Principle-working-construction -application
b. Proportional counter- Principle-working-construction -application
c. Geiger – Muller counter- Principle-working-construction -application
d. Scintillation counter- Principle-working-construction -application
e. Gas Filled detectors- Principle-working-construction -application
f. Semi conductor detectors- Principle-working-construction -application

REFERENCE BOOKS

1. Instrument Technology Vol. I, II, III – E.B.Jones
2. Mechanical and Industrial Measurement – R.K.Jain
3. Measurement Systems Application and Design – Earnest O Doebelin
4. Electrical & Electronic Measurements and Instrumentation -A.K.Sawhney
5. Principle of Measurement & Instrumentations – Allen.S.Morris
6. Instrumental Methods of Analysis – Nakra Chowdhari
7. Transducers and Instrumentation – Morthy

SUBJECT TITLE : MICROCONTROLLER & INTERFACING
SUBJECT CODE : IT 403
PERIODS/WEEK : 5
PERIODS/SEMESTER : 80

TIME SCHEDULE

UNITS	TOPIC	PERIODS
I	Intel 8085 Microprocessors	15
	Test	1
II	Micro Controller Architecture	15
	Test – I	1
III	Micro Controller Programming	15
	Test – II	1
IV	Micro controller Applications & Interfacing	15
	Test – III	1
V	Advanced Microprocessors	15
	Test – V	1
	Total	80

OBJECTIVES

UNIT – I

1.1.0 Understand Intel 8085 microprocessors
- 1.1.1 Explain architecture of 8085
- 1.1.2 Explain addressing modes of 8085
- 1.1.3 understand the instructions
- 1.1.4 Know the assembler directives
- 1.1.5 Discuss the instruction cycle fetch cycle
- 1.1.6 discuss various signals like ALE,SO,SI,OF,IOR,IOW,MEMR,MEMW
- 1.1.7 Explain timing diagrams for memory read,memory write,I/O read and I/O write.
- 1.1.8 Discuss types of interrupts in 8085

UNIT –I I

2.1.0 Understand micro controller architecture
- 2.1.1 Give introduction to micro controllers
- 2.1.2 Explain features of micro controllers
- 2.1.3 Describe 8051 architecture
- 2.1.4 Explain register structure of 803
- 2.1.5 Explain special function register 8051
- 2.1.6 Describe internal & external memory of 8051
- 2.1.7 Describe input output pins & ports of 8051
- 2.1.8 Explain counters & timers in 8051
- 2.1.9 Explain serial input/output of 8051
- 2.1.10 Explain interrupt in 8051
- 2.1.11 Explain timing diagram
- 2.1.12 Describe modes of operation

UNIT – III

3.1.0 Understand micro controller programming

- 3.1.1 Explain instruction set of 8051
- 3.1.2 Explain logical operation
- 3.1.3 Describe arithmetic operations
- 3.1.4 Describe Jump and call instructions
- 3.1.5 Describe timing & subroutines
- 3.1.6 Explain look up tables
- 3.1.7 Describe serial data transmission

UNIT – IV

4.1.0 Understand micro controller applications and interfacing

- 4.1.1 Describe peripheral chips
- 4.1.2 Describe 8255 PPI
- 4.1.3 Describe 8259 PIC
- 4.1.4 Describe 8279, key board/display interface
- 4.1.5 Describe 8251 USART
- 4.1.6 Describe 8253 timer/counter
- 4.1.7 Describe 8237 DMA controller

4.2.0 Understand applications of micro controllers

- 4.2.1 Describe application in keyboard
- 4.2.2 Explain application in displays
- 4.2.3 Explain application in pulse measurement
- 4.2.4 Describe application in D/A & A/D converters
- 4.2.5 Describe application in stepper motor control
- 4.2.6 Describe application in DC motor control
- 4.2.7 Explain serial data communication using micro controller

UNIT – V

5.1.0 Understand advanced microprocessors

- 5.1.1 Discuss the features and architectures of 8086
- 5.1.2 Compare the features of Intel 80286, 80386, 80486 and Pentium processors
- 5.1.3 Explain architectures of Pentium and P-II processors
- 5.1.4 Compare P-II, P-III and P-IV processors
- 5.1.5 Study Itanium processor

CONTENT DETAILS

UNIT – I

Introduction to Microprocessors

Architecture of 8085 – registers-addressing modes – instruction set – assembler directives - types of interrupts – timing diagrams – various signals-control signals

UNIT – II

Introduction to micro controllers – Difference between Microprocessor and micro controller - Main features of micro controllers – Micro controller family – 8051 architecture – register structure – special function register – Internal memory – External memory – Input/output pins, ports, and controls – Counters and Timers – Serial data Input/Output – Interrupts – timing diagram – modes of operation.

UNIT – III

Instruction set of 8051 – Addressing modes – Data transfer – Logical operations – Arithmetic operations – Jump and Call instructions – Timing subroutines – Look up tables – Serial Data Transmission-Simple programs

UNIT – IV

Study of peripheral chips – 8255 programmable peripheral interface – 8253 Timer/Counter - 8279 key board/display interface - 8251 USART - 8259 programmable interrupt controller – 8237 DMA Controller.

Applications of micro controllers – Matrix keyboard – Seven segment displays – Pulse measurement – A/D converters – Stepper motor control – DC motor controller – Serial data communication.

UNIT – V

Comparative study of the features of Intel 8086,80286, 80386, 80486 and Pentium processors – Architecture of Pentium and P-II processors – Comparative study of P-II, P-III and P-IV processors – Features of Itanium processor.

REFERENCE BOOKS

1. The 8051 Micro controller and embedded systems - Mazidi and Mazidi
2. The 8051 Micro controller - Kenneth.J.Ayala
3. Microprocessors and interfacing (Programming and Hardware) - Douglas V.Hall
4. Intel Microprocessors - Barry Brey
5. 0000 to 8085: Introduction to microprocessors for engineers and scientist. - Ghosh & Sridhar

SUBJECT TITLE : MECHANICAL INSTRUMENTS
SUBJECT CODE : IT 404
PERIODS/WEEK : 6
PERIODS/SEMESTER : 80 + 16

TIME SCHEDULE

UNIT	TOPIC		PERIODS
I	1.1 Introduction		2
	1.2 Mechanical Components		8
	1.3 Limit gauges		5
		Test - I	1
II	2.1 Linear Measurements		8
	2.2 Slip Gauges		7
		Test - II	2
III	3.1 Comparators		15
		Test - III	1
IV	4.1 Force Measurement		8
	4.2 Torque Measurement		7
		Test - IV	1
V	5.1 Speed measurement		7
	5.2 Vibration and Acceleration measurement		8
		Test - V	1

		Total	80
			=====

OBJECTIVES

UNIT – I

1.1.0 Understand the components used in mechanical instruments

1.1.1 Study the different orders of levers of their sketches
1.1.2 With sketches, describe the different types of gears
1.1.3 Understand the arrangement of rack & pinion
1.1.4 Explain ratchet drive mechanism & cams
1.1.5 With a sketch explain Geneva mechanism
1.1.6 With a sketch explain the different types of bearing – bush – journal – antifriction bearings and pivot & jewel bearings
1.1.7 Study their applications

1.2.0 Understand the terms limit, fit and tolerance

1.2.1 Define limits & fits as per Indian standards
1.2.2 Understand Go and No Go principle
1.2.3 Describe the different types of limit gauges with sketches
1.2.4 Study the checking methods
1.2.5 With figure explain combined limit gauge

UNIT – II

2.1.0 Understand the different standards of length measurements

2.1.1 Know the definition of line standard, end standard & wave length standard
2.1.2 Understand the classifications of instruments under line stand & end standard
2.1.3 With sketches, explain the construction and working of vernier height gauge and vernier depth gauge
2.1.4 Describe the construction & working of micrometer depth gauge
2.1.5 Study the requirement of a dial gauge
2.1.6 Explain the working of dial indicator with suitable sketch
2.1.7 Understand the application & advantages of dial gauge

2.2.0 Understand the use of slip gauges

2.2.1 understand Johansons guage
2.2.2 study the arrangement of slip gauges for a specified length and explain the process of ringing

UNIT – III

3.1.0 **Understand the characteristics & working of comparators**

3.1.1 Study the uses of comparator
3.1.2 Explain the construction & working of Reed type mechanical comparator
3.1.3 Explain the construction & working of Johansson's Mikrokater mechanical comparator
3.1.4 Explain the construction & working of Pnuematic type-Solex comparator
3.1.5 Explain the Construction & working of simple optical comparator
3.1.6 Explain the Construction & working of zeiss optical comparator
3.1.7 Draw the sketches of electromechanical comparator and explain its operation
3.1.8 Study the advantages and disadvantages of various types of comparators

UNIT – IV

4.1.0 Understand the different types of force measurement

4.1.1 Explain the principle of equal arm and unequal arm balance system
4.1.2 With sketch explain the working of pendulum scale
4.1.3 Explain the working principle of spring type force measurement
4.1.4 Explain circular & linear type spring type force measurement
4.1.5 Explain weighbridges.
4.1.6 Describe load cells – types
4.1.7 Explain the construction and working of electric Load cells
4.1.8 Explain the construction and working of pneumatic load cells
4.1.9 Explain the construction and working of hydraulic load cells

4.2.0 Understand different types of Torque measurement

4.2.1 explain the working of absorption Dynamometer
4.2.2 explain the working of transmission Dynamometer

UNIT – V

5.1.0 Understand the various methods of speed measurement

5.1.1 Know the classifications of tachometers
5.1.2 With a sketch explain the construction & working of mechanical tachometer
5.1.3 Explain the construction & operation of Drag – cup tachometer
5.1.4 Explain the construction & operation of Tacho- generator
5.1.5 Describe the method of measurement of speed by non-contact type instruments

5.2.0 Understand the necessity for measurement of vibration

5.2.1 Study the principle of vibrometer & accelerometer
5.2.2 Study the different types of accelerometers
5.3.3 Explain the construction & working of seismic accelerometer
5.3.4 Explain the construction & working of LVDT accelerometer
5.3.5 Explain the construction & working of Piezoelectric accelerometer

CONTENT DETAILS

UNIT – I

Mechanical components – Levers – Gears – rack and pinion – ratchet drives – cams – Geneva mechanism – Bearings – bush – journal – antifriction bearings – pivots & jewels – scales and pointers
Limit gauges – Limits – fits – tolerance - plug – ring – tapes limit gauges – combined limit gauge

UNIT – II

Linear measurements – standards of length – measuring instruments – vernier height gauge vernier depth gauge – micrometer depth gauge – dial indicator
Slip gauges – uses – selection of slip gauges for required dimension

UNIT – III

COMPARATORS
Comparators – uses-Classification

1. mechanical comparators- reed type-Johanssonson Mikrokator – Zigma typawe
2. optical comparators – simple - Zeiss
3. Pnuematic - Solex
4. Electro-Mechanical comparators –
5. Comparisons - advantages and disadvantages

UNIT – IV

Force measurements – principle of equal arm & unequal arm balance system –spring type- linear & circular – weighbridge-pendulum force measuring mechanism – Load cell – mechanical – electrical – pneumatic
Torque Measurements – methods-classification- absorption type dynamometer – transmission type dynamometer

UNIT – V:

Speed measurements - Methods – Tachometers – Mechanical – electrical – electronic tachometers – Non-contact type – stroboscope
Vibration and acceleration measurements – necessity for measurement – principles of vibrometer & accelerometer- types of accelerometers – seismic – potentiometer type – L.V.D.T type – piezo electric accelerometer-

REFERENCE BOOKS

1. Engineering Metrology – R.K.Jain
2. Mechanical and Industrial Instrumentation – A.K.Sawhney
3. Engineering Measurement and Instrumentation – L.F.Adams
4. Principles of Measurement and Instrumentation – Alan.S.Morris
5. Modern Electronic Instrumentation & Measurement Techniques – Albert.D.Helfricr, William.D.Cooper
6. Engineering Metrology – Mahajan

SUBJECT TITLE : INSTRUMENT WORKSHOP
SUBJECT CODE : IT 405
PERIODS/WEEK : 3
PERIODS/SEMESTER : 48

LIST OF EXERCISES

1. **Instrument Pointer**

   - To make any two type of pointers

2. **Engraving machine**

   - Operation – methods of enlarging and reduction – engraving in different form – straight engraving, radial and circular engraving.

3. **Drilling Machine**

   - Drilling practice

4. **Tubing**

   - Bending, flaring and glanding of metal tubes

5. **Winding**

   - Study of winding machine
   - Winding a single phase transformer

6. **Soldering Practice**

   - Soldering of simple circuits

7. **PCB Design and Construction**

   - Design and construction of simple circuits

8. **Servicing and Repairing of Instruments**

   - Pressure gauges, transmitters, recorders, relays, regulators, control valves, pressure switches and level switches.

9. **Study of Instrument Fitting**

   - Elbow, tee, union, connectors etc.
   - Threads – NPT,BSP,BSPT,BSPP etc

10. **Mini Lathe**

    - Different operations – straight turning, taper turning, thread cutting etc.

11. **Piping and Instrumentation Drawing**

    - Study of symbols as per ANSI standards – indicators, recorders, transmitters, actuators, final control elements, process lines.
    - Identify letter symbol, balloon symbol
    - Math function:- Preparation of P & ID for process control system

12. **Study of Control Panel**

SUBJECT TITLE : MICROCONTROLLER AND INTERFACING LAB
SUBJECT CODE : IT 406
PERIODS/WEEK : 3
PERIODS/SEMESTER : 48

CONTENT DETAILS

Micro controller programming and interfacing

1. Familiarization of 8051/89C51/52 Micro controller Kit and writing and executing a sample program
   Programs for the following in the kit and test
2. Multiplication of two numbers
3. Finding the maximum value in an array
4. Ascending order
5. BCD to Hex conversion
6. Hex to BCD conversion
7. Binary to ASCII
8. ASCII to Binary
9. Program using I/Os in port 1
10. Counter using timer
11. Program using interrupt

Interfacing with application boards

1. Digital I/O
2. Matrix keyboard
3. Seven segment displays
4. LCD Displays
5. Traffic light
6. 8 bit ADC and 8 bit DAC
7. Stepper motor control
8. DC motor control
9. Sending data through serial port of controller and receiving data from PC

8085 Programming

Familiarization of assembler (TASM)

Writing programs and testing the following programs in PC itself

1. Multiplying 2 numbers
2. Finding the maximum value in an array
3. Factorial n
4. Sorting an array
5. BCD to binary and binary to BCD
6. Binary to ASCII and ASCII to Binary
7. Finding the Square root
8. Look up table
9. Familiarization of Macros

SUBJECT TITLE : MEASUREMENT SYSTEM LAB
SUBJECT CODE : IT 407
PERIODS/WEEK : 3
PERIODS/SEMESTER : 48

LIST OF EXPERIMENTS

1. Determine the terminal based & zero based Linearity of preesure guage using dead weight tester
2. Plot the Hysterisis curve of measuring instruments
3. Determine the dynamic characteristic of different types of thermometers
4. Find out the response time of different type thermometers
5. Plot the step response of different type first order type instrument
6. Plot the error chart & correction curve of pressure gauges
7. Determine the linearity of Vapour pressure thermometer
8. Study the error and accuracy of an instrument.
9. Determine the Unknown resistance using Wheastones bridge
10. Find unknown Low Resistance using Kelvin Double Bridge
11. Find unknown Inductance using Maxwell's Bridge
12. Find unknown Inductance using Hays Bridge
13. Find unknown Capacitance using Shering Bridge

SUBJECTS OF STUDY AND SCHEME OF EVALUATION

SEMESTER V

Branch : Instrument Technology

Code	Subject	Periods Per Week			Evaluation (Marks)			
		Theory	Practical/ Tutorial	Total	Theory	Practical	Internal	Total
IT 501	Analytical Instruments	5	1	6	75		25	100
IT 502	Process Control	5		5	75		25	100
IT 503	Industrial Instrumentation - I	5	1	6	75		25	100
IT 504	Control Engineering	5	1	6	75		25	100
IT 505	Process Control Lab-I		3	3		75	25	100
IT 506	Industrial Instruments Lab-I		3	3		75	25	100
IT 507	Analytical Instruments Lab		3	3		75	25	100
	Project & Seminar		3	3				
	TOTAL	**20**	**15**	**35**	**300**	**225**	**175**	**700**

SUBJECT TITLE : ANALYTICAL INSTRUMENTS
SUBJECT CODE : IT 501
PERIODS/WEEK : 6
PERIODS/SEMESTER : 96

TIME SCHEDULE

UNIT	TOPIC	PERIODS
I	Dispersion, Interference, Diffraction & Polarization	15
	Test - I	1
II	Analysers and Pollution Instrumentation	15
	Test - II	1
III	UV & Visible photometer	15
	Test - III	1
IV	Flame photometer, mess spectrometers, NMR Spectrometers & Raman spectrophotometer	15
	Test - IV	1
V	Fiber Optics & Lasers	15
	Test - V	1
	Total	80

OBJECTIVES

UNIT – I

1.1.0 Understand the phenomenon of Reflection, Refraction and Total internal reflection
- 1.1.1 Define prism
- 1.1.2 Understand the phenomenon of dispersion in prisms
- 1.1.3 Understand how two prisms can be combined to have
  - (a) Dispersion without deviation
  - (b) Deviation without dispersion

1.2.0 Understand the principle of interference
- 1.2.1 Define path and phase difference
- 1.2.2 State the conditions for permanent interference
- 1.2.3 Explain Young's double slit experiment
- 1.2.4 Explain how Newton's rings are formed
- 1.2.5 Explain how we can use this arrangement for the measurement of refractive index of a liquid

1.3.0 Understand the principle of diffraction
- 1.3.1 Distinguish between Freseals and Fraunhoffer type diffraction

1.4.0 Understand the principle of polarization by reflection and refraction
- 1.4.1 Study the phenomenon of optical activity
- 1.4.2 Explain the principle of polarimeter
- 1.4.3 Explain the method of determination of concentration of a solution using polarimeter

UNIT – II

2.1.0 Introduction to Analyzers: -
- 2.1.1 Describe Thermal conductivity gas analyzer—Principle-Construction and operation
- 2.1.2 Describe Paramagnetic oxygen analyses- Principle-Construction and operation
- 2.1.3 Describe Zirconia oxygen analyzer - Principle-Construction and operation

2.1.4 Describe Infrared analyzers – positive and negative filter type- Principle-Construction and operation
2.1.5 Describe Electrical conductivity analyzer-Principle-Construction and operation
2.1.6 Describe Chromatography
2.1.7 Explain the classification of Gas chromatography- construction and application

2.2.0 Introduction to Pollution Instrumentation: -
2.2.1 Explain the Major air pollutants and sources
2.2.2 Describe the principles of monitoring
a) sulfur dioxide
b) carbon monoxide
c) carbon dioxide
2.2.3 Explain with block diagrams
2.2.4 Explain the Common water pollutants and sources
2.2.5 Explain the Electrostatic precipitation in pollution controls

UNIT – III

3.1.0 Understand the various regions of electromagnetic spectrum
3.1.1 Study the types of spectrum (absorption and emission)
3.1.2 State and explain fundamental laws of photometry
3.1.3 Study the basic components of photometry
3.1.4 Explain principle, construction and working of single beam and double beam filter photometer
3.1.5 Explain the principle, construction and working of single beam and double beam spectrophotometers
3.1.6 Study quantitative and qualitative analysis
3.1.7 Study the basic components of infra red spectrophotometers
3.1.8 Understand the different sources, monochrometers and detectors used in spectrophotometers
3.1.9 Explain the principle, construction and working of single beam and double beam spectrophotometer

UNIT – IV

4.1.0 Study the basic principle of flame photometer
4.1.1 Briefly describe the parts of flame photometer
4.1.2 Explain the working of flame photometer
4.1.3 Study the method of analysis by using flame photometer
4.1.4 Study the principle of mass spectrometers
4.1.5 Explain the construction & working of mass spectrometers
4.1.6 Study the principle of N.M.R spectrometer
4.1.7 Describe the construction & working of N.M.R spectrometer
4.1.8 Explain the working of Fourier transform N.M.R spectrometer
4.1.9 Understand Raman effect
4.1.10 Explain the construction & working of Raman spectro-photometer
4.1.11 Study the application

UNIT – V

5.1.0 Study the basic structures of fiber optics
5.1.1 Understand the classification of fiber
5.1.2 Explain the different modes of propagation
5.1.3 Know the different materials used to construct optical fibers
5.1.4 Explain fiber fabrication technique, fiber drawing apparatus and vapour deposition method & double crucible method
5.1.5 Study the construction of fiber cables
5.1.6 Understand the fiber coupling & coupling losses

5.1.7 Explain the sources & detectors
5.1.8 Understand the characteristics of laser beam
5.1.9 Study spontaneous emission, stimulated emission & population emission
5.1.10 Explain the methods of production of laser beam
5.1.11 Explain the construction & operation of solid laser, gas laser, dye laser & semiconductor laser (Energy level diagram should be included)
5.1.12 Study the different applications of lasers in industries – such as laser cutting, drilling – welding – soldering, communication etc
5.1.13 Explain lasers in holography

CONTENT DETAILS

UNIT – I

Dispersion in prisms – dispersion – Chromatic combination of prisms – conditions for a chrometism – deviation without dispersion – dispersion without deviation

Interference – principle of super position of wave – condition for permanent interference – Young's double slit experiment – Newtons ring by reflected light – determination of refractive index of liquid .

Diffraction - Frensel's and Fraunhoffer diffraction

Polarization – Plane polarized light – production – by reflection & reflection – optical activity – polarimeter -determination of concentration of a solution using polarimeter

UNIT – II

ANALYSERS & POLLUTION INSTRUMENTS

Analyzers: -

Thermal conductivity gas analyzer—Principle-Construction and operation
Paramagnetic oxygen analyses- Principle-Construction and operation
Zirconia oxygen analyzer - Principle-Construction and operation
Infrared analyzers – positive and negative filter type- Principle-Construction and operation
Electrical conductivity analyzer-Principle-Construction and operation
Chromatography – its classification - Gas chromatography- costruction and application

Pollution Instrumentation: -

Major air pollutants and sources – principles of monitoring sulfur dioxide, carbon monoxide , and carbon dioxide analyses
Common water pollutants and sources - Electrostatic precipitation in pollution controls

UNIT – III

U.V & Visible photometers – Electromagnetic spectrum – types of spectrum – fundamental laws of absorption photometry – components of photometer -filter photometer – single beam and double beam spectrophotometers – single beam and double beam – quantitative and qualitative analysis.

Infrared photometers – components of I.R. spectra – photometers – Infrared spectro photometers

UNIT – IV

Flame photometers – its principle – parts of flame photometer – method of analysis.

Mass spectrophotometer – Basic principle – construction and working – commercial mass spectrometer – application Nuclear Magnetic Resource spectrometer – basic principle construction and working – Fourier transform NMR spectrometer.

Raman spectro- photometer – Raman effect – applications.

UNIT – V:

FIBER OPTICS & LASERS

Fiber optics – Basic structure – modes of propagation – fiber classification – materials – fiber fabrication – fiber cables – coupling and coupling losses – signal sources and receivers

Laser – laser beam characteristics – method of production of laser beam – types of lasers – solid, gas, dye and semiconductor laser –applications of lasers in industry –and medicine - laser in holography .

REFERENCE BOOKS

1. A Text Book of Optics – N. Subrebmanyam & Brijlal
2. Engineering Physics – B.L.Theraja
3. Instrumental methods of analysis – Williard, Deen Merit & Settle
4. Instrumental methods of Chemical Analysis – Chatwal – Anenand
5. Analytical instrumentation – R.S.Khendpur
6. Optical Fibers & Fiber optic communication system – Subirkumar sankar
7. Optical fiber communication – Gerd Keiser
8. Laser theory & application – K.Thyagarajen & Ghatak
9. An introduction to Lasers (Theory & Application) – M.N.Auadhnulu
10. Instrument Technology - Vol. I, II, III – E.B.Jones

SUBJECT TITLE : PROCESS CONTROL
SUBJECT CODE : IT 502
PERIODS/WEEK : 5
PERIODS/SEMESTER : 80

TIME SCHEDULE

UNIT	TOPIC	PERIODS
I	1.1 Introduction to process Control System	8
	1.2 Block Diagram Representation	7
	Test - I	1
II	2.1 Analog Signal Conditioning	7
	2.2 Operational Amplifiers	8
	Test - II	1
III	3.1 Controller Principle	8
	3.2 Continous & Discontinous Controllers	7
	Test - III	1
IV	4.1 Electronic Controllers	8
	4.1 Pnuematic Controllers	7
	Test - IV	1
V	5.1 Final Control Operation	8
	5.2 Control Valves	7
	Test - V	1
	Total	80

OBJECTIVES

UNIT – I

1.1.0 Introduction of process control

1.1.1 Define Process, Process Control & Process Plant
1.1.2 Define Error,setpoint,controller & Final control element
1.1.3 Define Controlled variable,Manipuleted variable,
1.1.4 Define controlled variable, manipulated variable & Measured Variable
1.1.5 List examples of Process Variable
1.1.6 Describe each element in a process control loop
1.1.7 Describe the criteria used to evaluate the response of a process control loop
1.1.8 With suitable example explain Temperature Control system
1.1.9 With suitable example explain Level Control system
1.1.10 With suitable example explain Pressure Control system
1.1.11 With suitable example explain Flow Control system

UNIT II

2.1.0 Signal Conditioning, Introduction

2.1.1 Explain analog signal conditioning
2.1.2 Describe, signal level changes, linearization, signal conversion & filtering impedance matching
2.1.3 Describe RC High pass and low pass filter
2.1.4 Describe passive circuits, voltage divider resistive circuit

2.2.0 **Signal Conditioning using Operational Amplifiers**

2.2.1 Describe op-amp circuits such as inverting and non-inverting amplifier, voltage follower, integrator& differentiator, adder & subtractor, Multiplier & divider

2.2.2 Describe current to voltage and voltage to current converter.

2.2.3 Describe Precision Rectifier & Comparators

2.2.4 Describe the instrumentation amplifiers

2.2.5 Describe the features and characteristics of an instrumentation amplifiers

UNIT – III

3.1.0 **Introduction to Controller principles**

3.2.1 Define process load, process log, and self regulation

3.2.2 Define error, controller output, control log, dead time, cycling

3.2.3 Describe Discontinuous controller modes -two position, multi position and floating control modes. Give examples

3.2.4 Describe proportional control mode

3.2.5 Define proportional bond, offset

3.2.6 Give example for offset error

3.2.7 Define integral control mode

3.2.8 Describe integral control mode with example

3.2.9 Describe the derivative control mode

3.2.10 Describe PI, PD and PID control modes

3.2.11 Compare P,PI,PD and PID Controller modes

3.2.12 Provide a description of the controller output for fixed and variable error input for all the controller modes

UNIT – IV

1.1.0 **Introduction to analog controller construction**

1.1.1 Recognize the essential elements of an Analog electronic controller using Op amps.

1.1.2 Describe the implementation of electronic -Proportional, Derivative,Integral,and its composit modes using Op amps.

1.1.3 Describe the implementation of two-position proportional, integral and combinational control modes using op-amp

4.1.4 Recognize the essential elements of an Analog pneumatic controller

4.1.5 Describe the working & construction of Pneumatic -error detectors , proportional, integral ,Derivative and combinational control modes.

1.1.6 Compare the performance of electronic and pneumatic analog controllers.

UNIT – V

5.1.0 Introduction to final control element

5.1.1 Draw the figure of a pneumatic control valve and explain the parts

5.1.2 Explain principle of pneumatic, electric and hydraulic actuators, with diagram

5.1.3 List the classification of control valves

4.1.3.1 Explain air to open and air to close control valves

5.1.4 List the different valve plugs

5.1.5 Explain the constructional details of valve plugs

5.1.6 Describe single seated & double seated valve.

5.1.7 With a suitable Diagram explain - butterfly valves, ball valve, gate valve, globe valve & Solenoid valve

5.1.8 Describe the flow characteristics of control valves(Linear,Equal Percentage & Quick Opening)

5.1.9 Explain the constructional details and working principle of auxiliary units for control valve such as valve positioner, motion transmitter, limit switch, air pressure regulator, I/P converter

5.1.10 Define control valve coefficient Cv, Rangeability, Turn down, inherent flow characteristic, installed flow characteristics

5.1.11 Describe control valve sizing

CONTENT DETAILS

UNIT – I

Introduction to process Control System: -

Definition of

Process, Process Control, Process Plant, Error, Set point, Controlled variable, Manipulated variable, Controller,Feedback,Measured Variable, Final control Element. Actuating Signal.

Process Control principle-Process Control Block Diagram – typical control variables – criteria to evaluate process control block diagram –functions of each block-control variables with examples – criteria to evaluate process control loop response-explanation with simple example(Temperature, Flow, Pressure & Level Control systems)

UNIT – II

Signal Conditioning:

analog signal conditioning with Passive circuits – Principles-

signal level changes – linearization – conversions – filtering and impedance matching

Voltage divider circuits

Operational amplifiers in instrumentation –

Characteristics – voltage follower – inverting and non-inverting amplifier –integrator-differentiator-adder-Substractor-Multiplier-Divider-comparator- precision rectifiers.

voltage to current and current to voltage converter

Instrumentation amplifier – features- Characteristics

UNIT – III

Controller principles: - process characteristics – process equation – process load – process lag-self regulation-control system parameters: - error – variable range – control lag-dead time - cycling.

Discontinous Controller modes – two position, multi-position& floating- examples-applications

Continuous control modes: - proportional, integral, derivative control mode. Composite control modes: - PI, PD and PID- examples-application.

UNIT – IV

Analog controllers: - introduction –Types- general features

Electronic controllers: - Error detectors, proportional, integral, derivative and its composite modes using operational amplifiers-costructional details- comaprison.

Pneumatic controllers. Error detectors, propotional, integral, derivative and its composite modes – constructional details

Performance comaparison of electronic and pneumatic controllers.

UNIT – V

Final control: - Introduction – Final control element – Control Valves – main parts of a control valve

Actuator: - pneumatic – electric and hydraulic actuators. Different classification of control valves Air to open and air to close – According to valve plug –

Body types: - Single seated, double seated, angle valves, three way valves

Types of Valves-butterfly valves, ball valve, gate valve, globe valve & Solenoid valve valve characteristics – linear, equal percentage and quick opening

Auxiliary unit for control valve: - Valve positioner. Motion transmitter, limit switch, air lock relay, air pressure regulator, I/P converter. Control valve sizing

REFERENCE BOOKS

1. Process control instrumentation technology – Curtis .D.Johnson Seventh edition
2. Understanding Neural networks and fuzzy logic basic concepts and applications – Stamatios. V. Kartalopoulos
3. Artificial Neural Networks – B. Yegnanarayana
4. Automatic process control – Donald .P. Eckman
5. Process Control – D. Patranabis
6. Chemical Process Control – George slephaun poulus
7. Instrument Engineers Hand book – Liptak, Volume II
8. Control Valves – Chatwal & Anand
9. Instrument Technology – E.B.Jones, Volume I, II, III
10. Computer based Industrial Control – Krishnakanth

SUBJECT TITLE : INDUSTRIAL INSTRUMENTATION– I
SUBJECT CODE : IT 503
PERIODS/WEEK : 6
PERIODS/SEMESTER : 80+16

TIME SCHEDULE

UNIT	TOPIC		PERIODS
I	Temperature Measurements – I		15
		Test – I	1
II	Temperature Measurements – II		15
		Test – II	1
III	Pressure Measurements		15
		Test – III	1
IV	low pressure & humidity measurement		15
		Test – IV	1
V	Specific gravity & viscosity measurements		15
		Test – V	1
		Total	80

OBJECTIVES

UNIT – I

1.1.0 **Define temperature**

- 1.1.1 Understand different temperature scales
- 1.1.2 Explain the construction and working of industrial type mercury in glass thermometer
- 1.1.3 Explain the construction and working of mercury in steel thermometer
- 1.1.4 Understand the general principle of filled system thermometer
- 1.1.5 Explain the working and principle of liquid, gas and vapour filled thermometer
- 1.1.6 Explain the sources of errors and compensation techniques used in filled system thermometers.
- 1.1.7 Explain the construction and working of bimetal thermometer
- 1.1.8 Understand the response of different thermometer
- 1.1.9 Understand the Stefan –Bolt man law, Planck's radiation law and Wein displacement law

1.2.0 Explain the construction and working of radiation pyrometer

- 1.2.1. Describe the construction and working of optical pyrometer (disappearing filament)

UNIT – II

2.1.0. Understand the principle if thermistor

- 2.1.1 Know NTC and PTC types
- 2.1.2 Understand the characteristics of thermistors
- 2.1.3 Study the different shapes of thermistors and materials of construction
- 2.1.4 Know the uses of thermistor

2.1.5 Describe the characteristics of junction semiconductor temperature sensor
2.1.6 Understand the principle, construction and working of a resistance temperature detector
2.1.7 Study the different types of materials
2.1.8 Explain the deflection type measuring circuit using RTD
2.1.9 Point out the errors occurring in the bridge circuit

2.2.0 **Explain the compensating methods**

2.2.1 Explain 3-lead wire system (callender – Griff bridge and double slide-wire bridge)
2.2.2 Explain the working of a null- type measuring circuit
2.2.3 State the principle of a thermocouple – See beck effect, Peltier effect and Thomson effect
2.2.4 Understand laws of thermocouple – laws of intermediate temperature and laws of intermediate metals – its applications
2.2.5 Explain the construction of Industrial thermocouples and their types – J, K, S, R
2.2.6 Understand the characteristics of different types
2.2.7 Know the lead wire compensation
2.2.8 Study the response of thermocouple.

UNIT – III

3.1.0 Define pressure, pressure head, absolute pressure, gauge pressure and vacuum pressure

3.1.1 Understand the units of pressure
3.1.2 Know the principle of elastic pressure sensors
3.1.3 Explain the constructional details and working of c-type, spiral and helical type Bourden tube pressure gauges
3.1.4 Explain the working of diaphragms and bellows pressure gauges
3.1.5 Understand the working of dead weight tester and its application in the calibration of pressure gauge
3.1.6 Explain the working of differential pressure transmitter
3.1.7 With a sketch explain bulk modulus gauge used for very high pressure measurement
3.1.8 Understand diaphragm seal, liquid seal and gas purge system used in pressure measurement
3.1.9 Explain fiber optic pressure sensor

UNIT – IV

4.1.0 Understand a u-tube manometer

4.1.1 Derive the manometer equation for u-tube manometers in measuring absolute, gauge and differential pressure
4.1.2 Derive the discharge equation of an inclined u-tube manometer
4.1.3 Understand manometer sealing liquids

4.2.0 vacuum Measurement

4.2.1 With a sketch describe the working of McLeod gauge, Pirani gauge & ionization gauge

4.3.0 Define Humidity, relative humidity, absolute humidity and dew point

4.3.1 Explain the operation of wet and dry bulb psychrometer
4.3.2 Know the principle of Hygrometers
4.3.3 Describe the construction and working of Hygrometers (Hair & Resistive)
4.3.4 Explain the operation of dew cell
4.3.5 Using schematic diagram explain the measurement of dew point by cold mirror method

UNIT – V

5.1.0 Define Density and specific gravity

5.1.1 With sketch explain static pressure operated system
5.1.2 Explain the working of weighing tube type instrument for specific gravity measurement

5.1.3 Know the principle of hygrometer
5.1.4 Explain the principle of hydrometer
5.1.5 Explain the operation of hydrometer used for remote indication
5.1.6 Explain the method of totally immersed displaces

5.2.0 Define viscosity, kinematics viscosity, specific viscosity, relative viscosity, absolute viscosity

5.2.1 Understand say bolt universal seconds and say bolt fenol seconds
5.2.2 Explain the working of say bolt viscometer
5.2.3 Understand redwood seconds
5.2.4 Explain redwood viscometer
5.2.5 Explain viscosity measurement by measuring differential pressure in a given length of pipe

CONTENT DETAILS

UNIT – I

Temperature measurements-I

Types- Definition, Non-electrical methods – Temperature scales –
Mercury in glass – industrial type – mercury – in – steel thermometer
Bimetal thermometer – industrial type – filled system thermometers – its principle – liquid, gas & vapour pressure thermometers – errors and compensation techniques – response of thermometer –
Non Contacting Type – radiation fundamentals – radiation pyrometer & optical pyrometers.

UNIT – II

Temperature measurement – II

Electrical methods – thermistors – (NTC & PTC) – materials & characteristics – thermister shapes – measurement – junction semiconductor temperature sensor
Resistance temperature detectors principle, construction and working – materials of construction – measuring circuits deflection type – errors – compensation – two wire & three wire system (single & double slide wire system) – null type.
Thermocouples – Seebeck effect, Peltier effect and Thomson effect – law of intermediate metals – law of intermediate temperature – industrial thermocouple – types – characteristics – extension wires – lead wire compensation – response of thermocouples.

UNIT – III

Pressure measurements

Definition – pressure head – types absolute, gauge & vacuum pressure – units.
Elastic pressure sensors – principle – constructional details & working principle of C-type, spiral & helical type Bourden tube pressure gauges – diaphragm and bellows pressure gauges – calibration of pressure gauges using – dead weight tester – pressure measurement by differential pressure method
Differential pressure transmitter very high pressure measurement – electrical resistance pressure gauges (Bulk modulus gauge) – Installation notes for pressure gauges – diaphragm and liquid seals gas purge system;
Fiber optic pressure sensors.

UNIT – IV

Vacuum measurements

Measurement of vacuum by using Mc load gauge, Pirani gauge & ionization gauge manometers – u-tube, inclined and differential manometer.
Derivation of pressure balance equation for u-tube manometer -manometer sealing liquid,

Humidity and dew point measurements

Definition of humidity, relative humidity, absolute humidity and dew point - Wet and dry bulb psychrometers, hair hygrometer,
Resistive transducer, dew cell for dew point determination; dew point determination by cold mirror method.

UNIT – V

Specific gravity & viscosity measurements

Definition of density & specific gravity – specific gravity measurement by static pressure operated system – weighing tube method – hydrometers – totally immersed displacer

Definition of viscosity – kinematic viscosity – specific viscosity – relative viscosity – say bolt universal seconds – say bolt ferrol seconds – say bolt viscometer – redwood viscometer – viscosity measurement by differential pressure in a given length of pipe.

REFERENCE BOOKS

1. Instrument Technology Vol. I – E.B.Jones
2. Industrial Instrumentation – Donald.P.Eckmen
3. Industrial Instrumentation fundamentals – Austin.E.Fribance
4. Principles of Industrial Instrumentation – D.Patrenelis
5. Principles of measurement & instrumentation – Alan.S.Morris
6. Mechanical & Industrial measurement – R.K.Jain
7. Industrial Instruments & Control – S.K.Singh

SUBJECT TITLE : CONTROL ENGINEERING
SUBJECT CODE : IT 504
PERIODS/WEEK : 6
PERIODS/SEMESTER : 80+16

TIME SCHEDULE

UNIT	TOPIC	PERIODS
I	1.1 Introduction	2
	1.2 Laplace Transforms	10
	1.3 inverse Laplace transform	6
	Test – I	1
II	2.1 Transfer function concept	1
	2.2 Transfer functions of systems	10
	2.3 Analogous systems	4
	Test - II	1
III	3.1 introduction to control system	1
	3.2 Block diagram Algebra	7
	3.3 signal flow graph	7
	Test - III	1
IV	4.1 Time Response	5
	4.2 Error Analysis	5
	4.3 Frequency Response	5
	Test - IV	1
V	5.1 Control system stability	2
	5.2 Routh Hurwitz criterion	3
	5.3 Root locus	5
	5.4 Polar plots	3
	5.5 Compensation Networks	2
	Test - V	1
	Total	80

OBJECTIVES

UNIT – I

1.1.0 Understand Lap lace transforms

1.1.1 Define the Lap lace transforms of step, ramp, impute, e^{at}, te^{at} sin at, cos at, t^n

1.1.2 Derive the Lap lace transform theorems – differentiation theorem, integration theorem, final value theorem, initial value theorem-simple problems.

1.2.**0 Understand inverse Laplace transform**

1.2.1. Know partial fraction method - simple problems

1.2.2. Solve linear differential equations-simple problems

UNIT – II

2.1.0 Understand the procedure for transfer function derivation

2.1.1 Derive the transfer function of mechanical translational and rotational system

2.1.2 Derive the transfer functions of RLC series and parallel circuits

2.1.3 Derive the transfer functions of liquid level systems, pressure systems, & thermal systems

2.1.4 Derive the transfer functions of AC and DC servomotor

2.1.5 Know analogous systems

2.1.6 Contrast force – voltage and force – current analogy

UNIT – III

3.1.0 Introduction to Control System: -

3.1.1. open loop and closed loop control system – comparison - advantages -application

3.1.2. linear time variant and linear time invariant systems - characteristics

3.2.0 Understand Block diagram Algebra

3.2.1 Know the block diagram Algebra concept

3.2.2 Explain the Rules for Block diagram reduction

3.2.3 Solve problems (single input single output systems only)

3.3.0 Understand signal flow graph

3.3.1 Define the signal flow graph terminology

3.3.2 Explain Mason's Gain formula

3.3.3 Solve problems

UNIT – IV

4.1.0 Understand Time response of control systems

4.1.1 Obtain the time responses of I order systems to step Ramp & Impulse inputs

4.1.2 Obtain the time response of II order systems to step

4.1.3 Explain Transient response specifications

4.2.0 Understand 'Type' of a control systems

4.2.1 Know type 0, Type 1 and Type 2 control systems

4.2.2 Obtain static error coefficients K_P, K_V, K_A

4.2.3 Obtain steady state error for Type 0, Type 1, Type 2 systems

4.3.0 Understand frequency response concept

4.3.1 Know Bode plot

4.3.2 Obtain bode plot for systems with G(s) = K, G(s) = 1/s, G(s) = S, G(s) = 1/(1+TS), G(s) = 1+TS

4.3.3 Define gain cross over frequency, gain margin, phase margin

UNIT – V

Stability Analysis

5.1.0 Understand stability concept

5.1.1 Define absolute and relative stability

5.1.2 Know Routh Hurwitz criterion

5.1.3 Solve problems relating Routh Hurwitz criterion and analyze whether the system is stable

5.2.0 Understand root locus concept for system stability

5.2.1 Explain the Rules for constructing root lows

5.2.2 List the properties of Root locus

5.2.3 simple problems

5.3.0 understand polar plot method of stability criteria

5.4.0 understand compensation networks

5.4.1 explain Phase Lag,Phase Lead, Phase Lag & Lead netwok

5.4.2 compare the different compenation networks

CONTENT DETAILS

UNIT – I

Introduction to Laplace Transforms: -

Derivation of Laplace transforms of standard time function – step, ramp, impulse, sinusoidal functions, e^{at}, te^{at}, t^n, Sin at, Cos at.

Laplace transforms theorems – differentiation theorem, integration theorem. Initial value theorem, final value theorem.

Inverse Laplace transforms – partial fraction method – for solution of simple linear differential equations.

UNIT – II

Systems and Transfer Functions: -

Definition of transfer function – order of system. Transfer function of linear systems – general equation of derivation of transfer function of

1. Mechanical Translational system – Mass, spring, dashpot
2. Mechanical Rotational system
3. Electrical circuits – R, L and C (series & parallel)
4. Pressure systems
5. Thermal systems
6. Two phase AC servo motor
7. DC servo motor(armature control only)
8. Electrical analogy for mechanical systems – Force voltage analogy and force current analogy

UNIT – III

Introduction to Control System: -

open loop and closed loop control system – comparison - advantages -application
linear time variant and linear time invariant systems - characteristics

Block Diagram Algebra: -

Block diagram representation – rules for block diagram algebra – blocks in cascade and their reflection – (single o/p only)

Signal Flow Graph: -

Signal flow graph terminology – single flow graph formulation for simple system – Mason's gain formula – derivation of transfer function using signal flow graphs.

UNIT – IV

Response of Control Systems

Time response – First order systems to step, ramp, and impulse inputs.
Second order systems – step response only – transient response specifications

Error Analysis

Type of a control system – Type 0, Type 1, Type 2, Static error coefficients – Kp, Kv, Ka

Frequency Response

Bode plot – Bode plot for systems with G(s) = K, G(s) = 1/s, G(s) = S, G(s) = 1/(1+TS),
G(s) = 1+Ts. Gain cross over frequency, gain margin, phase margin

UNIT – V

Stability

Control system stability – Concept – Absolute – Relative stability Routh Hurwitz criterion– Problems-
Root locus method – Rules – Properties – Problems
Polar plots
Compensation network – phase lead, phase lag, phase lag – lead – derivation of transfer functions of compensation networks – comparison.

REFERENCE BOOKS

1. Modern Control Engineering – Katsuhiko Ogata
2. Control systems – Nagrath Gopal
3. Linear Control Systems – B.S.Manke
4. Control Engg., – Banyopadhyay
   Introduction to Instrumentation and Cont

SUBJECT TITLE : PROCESS CONTROL LAB-1
SUBJECT CODE : IT 505
PERIODS/WEEK : 3
PERIODS/SEMESTER : 48

LIST OF EXPERIMENTS

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1. Study the characteristics of an operational amplifier
2. To obtain Slew rate , CMMR ,Offset voltage ,and Bias voltage of an opamp
3. Design and set up inverting amplifier
4. Design and set up non-inverting amplifier
5. Design and set up integrator circuits
6. Design and set up differentiator circuits
7. Design and set up adder circuits
8. Design and set up subtractor circuits
9. Design and set up current to voltage converter.
10. Design and set up voltage to current converter.
11. Design and set up Half wave and full wave Precision Rectifier
12. Design and set up an instrumentation amplifiers
13. to find CMRR of an instrumentation amplifiers
14. Design and set up an active second order LPF
15. Design and set up an active second order HPF
16. Design and set up an active second order BPF

SUBJECT TITLE : INDUSTRIAL INSTRUMENTS LAB – I
SUBJECT CODE : IT 506
PERIODS/WEEK : 3
PERIODS/YEAR : 48

LIST OF EXPERIMENTS

1. Calibrate the bourdon tube and diaphragm pressure gauge
2. Plot the characteristics of curve and also find out the sensitivity of LVDT
3. Plot the characteristics of curve and also find out the sensitivity of RTD
4. Plot the characteristics of curve and also find out the sensitivity of Thermistor
5. Compare the sensitivity of various thermocouple
6. Determine the temperature coefficient of different resistance thermometers
7. Find out the kinematic & absolute viscosity of given fluid by using redwood viscometer
8. Plot the negative response of first order type instrument & also find the response time.
9. Study the response of second order system
10. Obtain the characteristics of a second order system with different damping ratios.
11. Plot the charestic of capacitive level transducer
12. Plot the characteristics of photoconductive and photo emissive transducer
13. Plot the characteristics of potentiometer transducer
14. Measure the angular velocity using Tachometer & magnetic pick up
15. Measure the angular velocity using by stroboscope
16. Measurement of linear displacement by using inductive pick up.
17. Measure the response time of series combination of thermocouples
18. Measure the response time of parallel combination of thermocouples

SUBJECT TITLE : ANALYTICAL INSTRUMENTS LAB
SUBJECT CODE : IT 507
PERIODS/WEEK : 3
PERIODS/SEMESTER : 48

TIME SCHEDULE

1. Determination of refractive index of glass prism by minimum deviation method using spectrometer.
2. Determination of refractive index of water and glass slab using traveling microscope.
3. Determination of the refractive index of a given sample of liquid using polarimeter.
4. Determination of the wavelength of light by Newton's ring method.
5. Study of gas analyzers-thermal conductivity and electrical conductivity analyzer.
6. Measure the ECG by using Electrocardiograph.
7. Measure the blood pressure by using blood pressure instrument
8. Measure the PH value of solution using PH meter
9. To determine PH of a solution using PH meter & calibrate it
10. To determine the sample concentration filter photometer & calibrate it
11. To determine the sample concentration Spectro photometer & calibrate it
12. To determine the sample concentration Infrared photometer & calibrate it
13. Study a paramagnetic O2 analyzer
14. Study a thermal conductivity gas analyzer
15. Study a mass spectrometer
16. Study an NMR spectrometer
17. Study gas Chromatograph
18. study a Liquid Chromatograph
19. study air pollution monitoring equipment

SUBJECTS OF STUDY AND SCHEME OF EVALUATION

SEMESTER VI

Branch : Instrument Technology

Code	Subject	Periods Per Week			Evaluation (Marks)			
		Theory	Practical/ Tutorial	Total	Theory	Practical	Internal	Total
GE 601	Industrial Management & Entrepreneurship	5	1	6	75		25	100
IT 601	Industrial Instrumentation - II	5		5	75		25	100
IT 602	Computer Based Process Control	5	1	6	75		25	100
IT 603	Biomedical Instrumentation	5	1	6	75		25	100
IT 604	Process Control Lab-II		3	3		75	25	100
IT 605	Industrial Instruments Lab-II		3	3		75	25	100
IT 606	Seminar		3	3			25	25
	Project Work		3	3		50	25	75
	TOTAL:	**20**	**15**	**35**	**300**	**200**	**200**	**700**

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

TIME SHEDULE

UNIT	TOPIC	PERIODS
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 Out line 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)

Leader ship - Define leadership, different types of leadership, qualities of a good leader

Motivation - characteristic of motivation, importance, Marlow 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 speciation , 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, Mangers 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 off 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 Inolvement (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. Fore casting 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 fint impression, developing mutual expectations, hounouring 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 territory, 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 Scitcch Publications

SUBJECT TITLE : INDUSTRIAL INSTRUMENTATION - II
SUBJECT CODE : IT 601
PERIODS/WEEK : 5
PERIODS/SEMESTER : 80

TIME SCHEDULE

UNIT	TOPIC	PERIODS
I	1.1 Level Measurement	15
	Test - I	1
II	2.1 Types of Flow	7
	2.2 Head Flow meter	8
	Test - II	1
III	3.1 Open channel Flow measurement	7
	3.2 Miscellaneous flow meters	8
	Test – III	1
IV	4.1 Variable Area Flow meters	7
	4.2 PH Measurement	8
	Test – IV	1
V	5.1 Telemetry	15
	Test – V	1
	Total	80

OBJECTIVES

UNIT – I

1.1.0 Understand the uses of slight glass for level measurement

1.1.1 Understand the float and cable method of level measurement
1.1.2 Explain the construction and working of float type magnetic level gauge
1.1.3 Explain the construction and working of displacer type level indicator using torque tube
1.1.4 Explain the construction and working air purge type level indicator
1.1.5 Describe the operation of capacitive and conductive level indicator
1.1.6 Explain the working of ultrasonic level gauge
1.1.7 Know the principle of radiation absorption method
1.1.8 Explain the construction and working of radiation level indicator
1.1.9 Explain the laser method used for level indication
1.1.10 Explain fiber optic level sensor
1.1.11 With sketch describe mercury level switch
1.1.12 Explain the working of a level transmitter
1.1.13 Understand the measurement of level of dry materials
1.1.14 Explain the method of level measurement using strain gauges

UNIT II

2.1.0 Define the different types of flow (Uniform and non uniform flow, steady & unsteady flow, compressible & uncompressible flow, laminar and Turbulent flow)

2.1.1 Define & give the significance of Reynold's number
2.1.2 Explain the equation of continuity of flow
2.1.3 Describe the Bernoulli's equation
2.1.4 Derive the general energy equation
2.1.5 With figure explain the construction, working & discharge calculation of pitot tube

2.1.6 With figure explain the construction, working and discharge equation of a Venturimeter
2.1.7 Explain the construction, working and discharge equation of a Flow Nozzle
2.1.8 Explain the working of Dahl tube
2.1.9 Draw the figure of orifice plate and explain the construction, working and discharge equation of orifice plate
2.1.10 Explain the different types of orifice plate (Concentric, eccentric and segmental)
2.1.11 Draw and explain the different types of tappings
2.1.12 Solve simple problems on Bernoull's equation and discharge equations of ventarimeter, nozzle and orifice plate

UNIT – III

3.1.0 Understand the meaning of open channel and Miscellaneous flow measurements
3.1.1 Derive the discharge equation of triangular, rectangular and trapezoidal notches
3.1.2 Explain the working of notches and weirs
3.1.3 Derive the discharge equation of rectangular and cippoletti weir
3.1.4 Understand the principle of positive displacement meter
3.1.5 With diagram explain the working of rotating disk, rotary vane, reciprocating piston and sliding vane type meter
3.1.6 Explain the working of gas flow meter
3.1.7 Describe the construction and working of electro magnetic flow meter
3.1.8 Explain the construction and working of turbine flow meter
3.1.9 Explain the working of Hot wire anemometer and ultrasonic flow meter
3.1.10 Understand the meaning of mass flow meter
3.1.11 Explain the construction and working of coriolis flow meter

UNIT – IV

4.1.0 Variable Area Flow meter
4.1.1 Explain the principle of variable area flow meter
4.1.2 Explain the construction and working of Rota meter
4.1.3. Explain the working of piston type area flow meter

4.2.0 Define pH and pH scale
4.2.1 Give the importance of Buffer solution
4.2.2 Explain the construction and working of Hydrogen electrode
4.2.3 Explain the construction and working of glass electrode
4.2.4 Point out the sources of errors and methods to reduce them in glass electrode
4.2.5 Explain the construction and working of calomel electrode
4.2.6 Draw the figure of combined pH electrode and explain it
4.2.7 Explain industrial electrode assemblies
4.2.8 Describe a digital pH meter
4.2.9 Explain the pH control

UNIT – V

5.1.0 Draw the block diagram of general Telemetering system and explain it
5.1.1 Know the classifications
5.1.2 Understand the signal transmission standards
5.1.3 Describe the principle of operation of Flapper/Nozzle system and Flapper/Nozzle system with feedback bellows
5.1.4 Explain the principle of Force-balance and motion balance transmitter
5.1.5 Know the concept of 2-wire transmitter
5.1.6 Explain the working of 2-wire transmitters
5.1.7 Understand the importance of Barriers used in transmission system
5.1.8 Describe the errors occurring in signal transmission and its precautions
5.1.9 Know the concept of SMART transmitter

CONTENT DETAILS

UNIT – I:

Level measurements

Direct methods – sight glass – float systems – displacer method – use of torque tube magnetic level gauge, Types– hydro static methods – electrical method – capacitive & conductive method

Non- contact method- ultrasonic level gauge – radiation absorption method – laser method – fiber optic level sensors . Level switches – Level transmitter – level measurement of dry materials.

UNIT – II:

Flow Measurement – I

Introduction – Kinematics of fluids – classification of flow – steady and unsteady flow – uniform and non-uniform – laminar and turbulent flow – Reynold's number – continuity equation – general energy equation – Bernoulli's equation for ideal fluid – simple problems – limitations

variable head flow meters

Pitot tube – venturi meter – Flow Nozzle – Dahl tube – simple problems involving discharge.

Orifice plates – coefficients of flow – Tappings: - radius, corner, pipe, flange, D and D/2 taps – types of orifice plates – concentric, segmental and eccentric orifice plates – discharge calculation and eccentric orifice plates – discharge calculation – simple problems – installation notes.

UNIT – III:

Flow Measurement – II

Open channel flow measurements: - Weirs and Notches. Positive displacement flow meters: - Rotating disc type, Rotary Vane type, Reciprocating piston type, sliding vane type meter, Gas flow meters

Miscellaneous flow meters: - electromagnetic flow meter, Turbine flow meter, Hot wire anemometer, Ultrasonic flow meter, Mass flow meter: - Coriolisis flow meter.

UNIT – IV:

Variable area flow meters

Rota meter and position type area flow meter

PH Measurements

Introduction – Sorensen's scale – Buffer solution – electrodes for pH measurements Hydrogen electrode, glass electrode, calomel electrode, combined pH electrode.

Sources of error and methods of reducing the errors in glass electrode, industrial electrode assemblies

Digital pH meter, pH control

UNIT – V:

Telemetry

General Telemetering system – classification: - different types of signal – pneumatic current, voltage.

Flapper/Nozzle system- flapper/nozzle system with feed back bellows, principle of force balance and motion balance transmitters.

2 – wire transmitters – barrier – electrical noise in signal transmission – earthing procedure SMART transmitter concept.

REFERENCE BOOKS

1. Instrument Technology Vol. I, II, III – E.B.Jones
2. Flow measurement – Arrora
3. A text book of Hydraulics – R. S. Khurmi
4. Instrument Engineers Handbook Vol. I – Liptak
5. Industrial Instrumentation Fundamentals – Austin.E.Fribance
6. Industrial Instrumentation – Donald .P. Eckman
7. A course in Mechanical Measurement and Instrumentation – A.K.Sawhney
8. Biomedical Instrumentation – Dr. Arumugham
9. Mechanical Measurements and Control – D.S. Kumar
10. Industrial Instrumentation & Control – S.K.Singh

SUBJECT TITLE : COMPUTER BASED PROCESS CONTROL
SUBJECT CODE : IT 602
PERIODS/WEEK : 6
PERIODS/SEMESTER : 80+16

TIME SCHEDULE

UNIT	TOPIC	PERIODS
I	1.1 Introduction	1
	1.2 Signal Conditioning	14
	Test - I	1
II	2.1 Computers in process control	15
	Test - II	1
III	3.1 Control System Configuration & Application	15
	Test - III	1
IV	4.1 P & I D Symbols	7
	4.2 Control system tuning	8
	Test - IV	1
V	5.1 Fuzzy Logic & Artificial Nueral network	15
	Test - V	1
	Total	80

OBJECTIVES

UNIT – I

1.1.0 Introduction computer in ProcesControl

- 1.1.1 Advantages & Disadvantages of computer in Process control
- 1.1.2 Describe Digital signal Conditioning
- 1.1.3. Explain use of comparators & Universal Gates in process control
- 1.1.4 Explain the role of alarm in process control
- 1.1.5 Define Batch & continuous process
- 1.1.6. Compare Batch & continuous process
- 1.1.7 Explain Data Loggers with suitable Block Diagram
- 1.1.8 Explain Data Acquisition System with suitable Block Diagram
- 1.1.9 Explain Supervisory control with suitable Block Diagram
- 1.1.10 Explain Direct Digital Control with suitable Block Diagram
- 1.1.11 Compare Supervisory and Direct Digital Control

UNIT – II

2.1.0 Introduction to Centralized Computer control

- 2.1.1 Describe General features of Centralized Computer control
- 2.1.2 Explain the application Centralized Computer control with suitable Block Diagram

2.2.0 Introduction to Basic concept of PLC

- 2.2.1 Explain power supply module, CPU, Bus unit, input/output module, interface module and programmer
- 2.2.2. Explain the working of PLC
- 2.2.3 Explain the methods of programming a PLC
- 2.2.4 Describe statement list, ladder diagram, and control system flow chart
- 2.2.5 Explain application of PLC to a simple process control

2.3.0 Introduction to SCADA

2.3.1 Explain with Block Diagram
2.3.2 Introduction to distributed control system
2.3.3 Explain DCS architecture

UNIT – III

3.1.0 Introduction to control system configuration

3.1.1 Explain the characteristics of single, variable, independent variable, interactive variable, compound variable and multivariable control
3.1.2 Explain the characteristics of cascade control
3.1.3 Explain the characteristics of feedback control
3.1.4 Explain the characteristics of feed forward control
3.1.5 Explain the characteristics of ratio control
3.1.6 Explain the characteristics of adaptive control
3.1.7 Explain the characteristics of split range control
3.1.8 Comparison different control schemes
3.1.9 Application of the above control schemes in
a) Boiler control system
b) Distillation column control
c) Heat exchanger

UNIT – IV

4.1.0 Introduction to instrumentation diagram - P& ID as per ISA (Instrument Society of America)

4.1.1 Know the instrumentation symbols for signals, sensors, Transmitters, controllers and Final control elements
4.1.2 Know the instrumentation codes for PID
4.1.3 Draw and Explai the instrumentation diagram for a simple process control application, Water treatmant Plant, Cement Kiln, Paper Industry

4.2.0 Adjustment of controllers

4.2.1 Describe Ziegler – Nichols methods of process control loop tuning
4.2.2 Describe the control loop stability criteria with respect to a Bode plot
4.2.3 Explain how the frequency response method can be used to tune a process control loop

UNIT – V

5.1.0 Introduction to intelligent control

5.1.1 Describe biological Neural Networks, and Neuron physiology
5.1.2 Compare computer and Biological Neural Networks
5.1.3 Explain the concept of Artificial neural network
5.1.4 Define learning in artificial neural network
5.1.5 Explain supervised learning, unsupervised learning, reinforced learning, competitive learning

5.2.0 Introduction to fuzzy logic

5.2.1 Explain the concept of fuzzy logic
5.2.2 Describe membership function & fuzzy set
5.2.3 Explain fuzzy rule generation and defuzzification of fuzzy logic
5.2.4 Describe open-loop ANN controller and closed-loop ANN controller
5.2.5 Describe the open loop fuzzy controller with block diagram
5.2.6 Describe the application Artificial neural network and fuzzy logic in signal processing, image data processing and in communication systems

CONTENT DETAILS

UNIT – I

Introduction of Computer in Process Control--general features
Digital signal conditioning – Comparators-universal gates-alarm design for process control applications
Process: - continuous and batch
Data Loggers- explanation with block diagram
Data Acquisition system – explanation with block diagram
Supervisory Control - explanation with block diagram
Direct digital Control - explanation with block diagram
Comparison

UNIT – II

Centralised Computer control
general features-explanation with block diagram
Basic concepts of PLC
Components of a PLC, Operation of PLC, Benefits of PLC Programming of PLC and application to simple process control.
SCADA
Architecure -general features- explanation with block diagram
Distributed control systems
Data high way – general features- explanation with block diagram

UNIT – III

Control system configurations:
Single variable – independent variable – interactive single variable – compound variable. Multivariable control
Types of Control Schemes
Feedback-cascade control – ratio controls – feed forward –Adaptive-split range
Application- Boiler control -Distillation column control and Heater Exchanger

UNIT – IV

Piping and instrumentation diagrams: -
instrumentation symbols and codes used in P&ID.
P&ID for simple process- water treatment plant, cement kiln, paper Industry.
Adjustment of controllers:
Open loop transient response method – Ziegler – Nichols method – Frequency response method.
Instrumentation in- cement kilns-paper industry-Blast furnace-water treatment plant

UNIT – V

Fundamentals of intelligent controls: - Biological neural networks – neuron physiology – artificial neural networks concepts – basic model of a neuron – learning in artificial neural networks. Fuzzy logic – Membership function – fuzzy rule generation – defuzzification of fuzzy logic
Neuro – fuzzy control – open loop and closed loop artificial neural network controller – open loop fuzzy controller
Application of artificial neural network and fuzzy logic in signal processing – image data processing and in communication systems

REFERENCE BOOKS

1. Process control instrumentation technology – Curtis .D.J ohnson Seventh edition
2. Understanding Neural networks and fuzzy logic basic concepts and applications – Stamatios. V. Kartalopoulos
3. Artificial Neural Networks – B. Yegnanarayana
4. Automatic process control – Donald .P. Ekman
5. Process Control – D. Patranabis
6. Chemical Process Control – George slephaun poulus
7. Instrument Engineers Hand book – Liptak, Volume II
8. Control Valves – Chatwal & Anand
9. Instrument Technology – E.B.Jones, Volume I, II, III
10. Computer based Industrial Control – Krishnakanth

SUBJECT TITLE : BIOMEDICAL INSTRUMENTATION
SUBJECT CODE : IT 603
PERIODS/WEEK : 6
PERIODS/SEMESTER : 80+16

TIME SCHEDULE

UNIT	TOPIC	PERIODS
I	1.1 Introduction	1
	1.2 Physiological Transducers	10
	1.3 Blood pressure & blood flow measurement	4
	Test	1
II	2.1 Diagnostic Medical Instruments	15
	Test	1
III	3.1 Therapeutic and Analytical Instruments	15
	Test	1
IV	4.1 Imaging Systems & Bio telemetry	15
	Test	1
V	5.1 Safety Precautions	7
	5.2 Computer in Medical Field	8
	Test	1
	Total	80

OBJECTIVES

UNIT – I

1.1.0 Introduction
- 1.1.1 Explain resting and action potentials. Sodium pump and transmission of impulses. Describe the wave forms
- 1.1.2 Explain different types the different types of electrodes used for ECG, EEG and EMG.

1.2.0 Understand the working of different physiological transducers
- 1.2.1 List the different types of pressure transducers used in biomedical instruments
- 1.2.2 Describe with sketches, the working principle of variable capacitance pressure transducers, LVDT, Bonded and unbonded strain gauges
- 1.2.3 Describe the working principle of thermo couple and thermistors used in Biomedical measurement
- 1.2.4 List the selection procedure
- 1.2.5 Explain the working principle of optical fiber temperature sensors
- 1.2.6 State the working principle of photo electric pulse transducers
- 1.2.7 State the principle of piezo-electric arterial pulse receptor
- 1.2.8 Explain the working principle of strain gauge type respiration sensor.

1.3.0 Blood Pressure measurement
- 1.3.1 Describe direct blood pressure measurement with a diagram
- 1.3.2 Describe indirect blood pressure measurement

1.4.0 Blood flow meters
- 1.4.1 Explain the working principle of electromagnetic blood flow meter with diagram
- 1.4.2 Explain the principle of operation of ultrasonic Doppler – shift flow velocity meter with a block diagram
- 1.4.3 Describe with a block diagram the principle of operation of LASER Doppler Blood flow meter.

UNIT – II

2.1.0 Draw the diagram and explain electrical activity heart
- 2.1.1 Explain the significance of ECG wave form
- 2.1.2 Lead system of ECG
- 2.1.3 ECG block diagram explanation
- 2.1.4 Explain the bio-electrical potentials associated with muscle activity,
- 2.1.5 EMG Block diagram explanation
- 2.1.6 Explain the electrical activity of Brain. I
- 2.1.7 Indicate the different frequency regions & Lead system
- 2.1.8 EEG Block diagram explanation

2.2.0 Diagnostic Medical Equipments
- 2.2.1 Draw the building Blocks of an electro cardio graph (ECG)
- 2.2.2 Compare the bipolar and unipolar leads
- 2.2.3 Specify the importance of placement of electrodes while monitoring ECG waveforms
- 2.2.4 Draw the electrocardiogram indicate its amplitude and duration and state their importance
- 2.2.5 List the application of ECG
- 2.2.6 List the types of electrodes used and their arrangement while monitoring EEG
- 2.2.7 Explain with Block diagram, the working principle of an EEG machine
- 2.2.8 Classify the EEG frequency hands
- 2.2.9 Draw the block diagram set up for EMG recording
- 2.2.10 Identify the frequency and amplitude EMG

UNIT – III

3.1.0 Understand the different types of therapeutic instruments
- 3.1.1 State the need of pacemakers
- 3.1.2 Classify different types of pacemakers
- 3.1.3 Compare the advantages of implantable pacemakers over external pacemakers
- 3.1.4 Draw the block diagram of a ventricular synchronous demand pacemaker and explain its operation
- 3.1.5 State the need of defibrillators
- 3.1.6 Compare ac defibrillators and dc defibrillators
- 3.1.7 Explain the functions of dialysis machine
- 3.1.8 List different types of themodialysis machine
- 3.1.9 State the working principle of a portable Hemo-dialysis machine with a diagram
- 3.1.10 State the use respirators
- 3.1.11 Explain the classification of respirators according to pressure cycling and volume cycling
- 3.1.12 List the different types of diathermy equipments
- 3.1.13 Draw the methods of applying electrodes in short wave diathermy treatment
- 3.1.14 List the advantages and disadvantages of short wave diathermy treatment
- 3.1.15 Draw the schematic diagram of microwave diathermy unit and explain its working

3.2.0 Understand the functions of different types of analytical instruments
- 3.2.1 State the necessity of blood cell counting
- 3.2.2 List the different methods of blood cell counting
- 3.2.3 Explain blood gas analyzer

UNIT – IV

4.1.0 Understand the methods of producing X-rays
- 4.1.1 Describe the construction and operation of an X-ray machine with a block diagram
- 4.1.2 Describe the working principle of CAT Scanner
- 4.1.3 Explain the working principle of an ultrasonic imaging system
- 4.1.4 Explain the working principle of nuclear magnetic resonance imaging system

4.2.0 Bio telemetry
- 4.2.1 State the need of Bio telemetry
- 4.2.2 Draw the bio telemetry system block diagram and explain
- 4.2.3 State the application of Bio telemetry system with example

UNIT – V

5.1.0 Safety Precautions
- 5.1.1 list the effect of electricity ,electromagnetic radiation & magnetism in the Human body
- 5.1.2 State the precautions to be taken while handling biomedical instruments
- 5.1.3 List the precautions to be taken while handling X-ray machines
- 5.1.4 List the electrical safety considerations with respect to machine operators and patients -Macro shock – Micro shock (explanation)

5.2.0 Understand the use of computers in bio medical field
- 5.2.1 State the method of using computer for medical field
- 5.2.2 List the information networks for medical education and patient care, INTERNET & INTRANET

5.3.1 Explain Computer Hardware System
- 5.3.2 Explain multimedia system
- 5.3.3 Explain computer networking
- 5.3.4 Understand the video conferencing
- 5.3.5 Explain the concept of Telemedicine

CONTENT DETAILS

UNIT – I

Introduction

physiological systems of a body. Bio electricity – Resting and action potential - transmission of impulses - Electrode used for Bio potential measurement

Physiological Transducers (Principles of operation, types and selection criteria)

Pressure Transducers - Transducers for body temperature measurement - Optical – Fiber temperature sensors - Photo electric pulse transducers - Piezo – electric arterial pulse receptor - Respiration sensors

Blood Pressure Measurement

Direct Blood pressure measurement - Indirect Blood pressure measurement

Blood Flow Meters

Electromagnetic Blood flow meters - Ultrasonic Blood flow meters - Laser Doppler Blood flow meter

UNIT – II

Diagnostic Medical Equipments

Electrical activity of the heart; ECG waveform – ECG lead system Electro cardio graph (ECG) Electrical Activity of the brain, EEG wave form -frequency bands-10-20 lead system -Electro encephalograph (EEG)

Electrical Activity of the muscles; EMG Wave form -Electro mayo graph (EMG) -

(Principle of operation & specifications only)

UNIT – III

Therapeutic and analytical instruments

Therapeutic Instruments (Basic Principles only) - Cardiac Pacemakers- types- Cardiac Defibrillators – types-–diathermy- Short wave diathermy - Micro wave diathermy

Hemo-dialysis machine – Respirators-ventilators

Analytical Instruments - - Blood cell counters - Blood gas analyzer

UNIT – IV

Imaging systems and Bio – Telemetry

X-Ray Machine & Computed Axial Tomography(CAT)

Ultrasonic Imaging - Magnetic resonance Imaging

Biotelemetry system – components in Biotelemetry system - Application of Bio telemetry

UNIT – V

Safety Precautions

Intrinsic Safety - Electrical safety – macro shock – micro shock computer applications

Computers in medical field

Soft ware - Multimedia & Net working

Hospital Administration System-Computer assisted therapy - Computer care of critically ill patient - INTERNET, INTRANET,LAN application in medical field – video conferencing – telemedicine.

REFERENCE BOOKS

1. Hand Book of Biomedical Instrumentation – R. S. Kandpur
2. Principles of Applied Bio medical Instrumentation – L. A. Taddes & Baker
3. Biomedical Instrumentation and Measurements – Leslie Cromwell & Free. J. Weibell
4. Medical Instrumentation – John. G. Webster
5. Biomedical Instruments – Dr. Arumugham.
6. Advanced Biomedical Engineering – Levine
7. Computer the Machine – LELE
8. Biomedical Digital Signal Processing – Tampkins
9. Neural Networks & Artificial Intelligence for Biomedical Engg., – Hudson and Cohen
10. Introduction to Biomedical equipment Technology – Joseph Carr & Joseph Brown

SUBJECT TITLE : PROCESS CONTROL LAB-II
SUBJECT CODE : IT 604
PERIODS/WEEK : 3
PERIODS/SEMESTER : 48

LIST OF EXPERIMENTS

1. Design and set up an alarm circuit for liquid level system.
2. Plot the response characteristics of ON-OFF controller.
3. Design and set up ON-OFF temperature controller.
3. Design and set up of PID, PI, PD&PID controllers using OP amps.
3. PLC ladder diagram programming.
4. PC – interfacing of PLC.
5. PLC – Programming in hydraulic and pneumatic control system.
6. Plot the response curve of PC based closed loop temperature controller system.
7. Plot the response of curve of Pc based closed loop level control system.
8. Plot the response curve of PC based closed loop flow control system.
9. Study of supervisory control – SCADA package.
10. Study of cascade control.
11. Study of ratio control.
12. Study of feed forward control system.
13. Open loop transient response method of controller tuning
14. Ziegler – Nichols method of controller tuning

SUBJECT TITLE : INDUSTRIAL INSTRUMENTS LAB -II
SUBJECT CODE : IT 605
PERIODS/WEEK : 3
PERIODS/SEMESTER : 48

LIST OF EXPERIMENTS

1. Determination of humidity by using wet and dry bulbs psychrometer, sling psychrometer & hygrometer.
2. Construct a temperature measuring circuit –using thermistor and calibrate it.
3. Measurement of vibration by using accelerometer.
4. Position measurement by using Synchros.
5. Determine the strain by using piezoelectric transducer.
6. Measurement of flow using venturimeter, orifice meter & Pitot tube
7. Flow measurement by using rotameter.
8. Study of circular chart, step chart and X-Y plotters.
9. Calibration of P/I transmitter.
10. Calibrate the pneumatic differential pressure transmitter.
11. Draw the characteristics curve of a flapper nozzle system.
12. Measurement of sir flow by using hot wire anemometer and calibrate it.
13. Determine the gauge factor of the strain gauge by using strain gauge circuit.
14. Plot the characteristics of a control valve with and without positioner.
15. Using thermistor measure the gas flow.
16. Measurement of flow in open channel by using weirs and notches.
17. Prove Bernoulli's theorem.
18. To measure the displacement by using Digital Transducer – Encoder.

SUBJECT TITLE	**: PROJECT WORK & SEMINAR**
SUBJECT CODE	**: IT 606**
PERIODS/WEEK	**: 6 (Project –3, Seminar – 3)**
PERIODS/SEMESTER	**: 96**

Project work should be undertaken by the students as a creative activity aimed at developing them the abilities of diagnosing problems for solutions, literature survey, planning, designing, costing and estimating, choosing the right materials and components, selecting proper tools and instruments and processes, rigging up circuits testing them, interpreting the results and finally reporting on the entire work.

Seminar should be taken as a test of mental ability to comprehend new topics present it before selected in a lucid manner.

LIST OF SAMPLE PROJECTS

1. PLC based sequential process
2. PC based control system for level, flow, temp and pressure
3. Construction of Biomedical measuring instrument for blood flow, respiration rate, blood pressure, ECG etc.
4. Micro processor and micro controller based control system
5. Alarm annunciates system for process control
6. Construction of Industrial measuring meters for level, flow, temperature and pressure
7. Construction of meters for speed velocity, acceleration etc.
8. Construct a complete process control loop for pressure, level, temperature, flow, speed etc.

List of Faculty who made Contributions to the Curriculum Revision 2006

Sl. No	Name	Designation
1	Shri. C.C. Joseph	Scientist, VSSC
2	Shri. Thiagarajan	Professor, NITTTR, Chennai
3	Shri. Dhanasekharan	Professor, NITTTR, Chennai
4	Shri. Saji A.J	Asst. Professor, CET
5	Sri. Philip Kurian	Asst. Professor&Head in Charge, NITTTR Extn Centre, Kalamassery
6	Sri. Cyriac Jose	Head of Section in Electronics
7	Sri. Subair P.H	Head of Section in Electronics
8	Smt. Anitha C.G	Head of Section in Electronics
9	Sri. Sanjeevan B.K.	Head of Section in Electronics
10	Sri. Jayakumar R	Head of Section in Electronics
11	Sri. Rajesh	Head of Section in Electronics
12	Smt. Geetha Devi R.	Head of Section in Electronics
13	Sri. Stanly John	Head of Section in Electronics
14	Smt. Geetha S.	Head of Section in Electronics
15	Smt. Ajitha Kumari	Head of Section in Electronics
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17	Sri. Soju S.S.	Lecturer in Electronics
18	Sri. Assainar M	Lecturer in Electronics
19	Smt. V. Sulochana	Lecturer in Electronics
20	Sri. Padmakumar P.K	Lecturer in Electronics
21	Sri. Ajith Kumar	Lecturer in Electronics
22	Sri. Shajan Jacob	Lecturer in Electronics
23	Smt. Sheeja T.S	Lecturer in Biomedical Engg
24	Sri. Pradeep T.G	Lecturer in E&I
25	Smt. Manju A.R	Lecturer in E&I